



Operations Manual

BLACK CREEK STUDY
ALLEN COUNTY, INDIANA

ENVIRONMENTAL IMPACT OF LAND USE
on
WATER QUALITY

** OPERATIONS MANUAL **

for the
Black Creek Study
Maumee River Basin
Allen County, Indiana

Reduction of Sediment
and Related Pollutants
in the
Maumee River
and
Lake Erie

Allen County SWCD, Project Administrator
Ellis McFadden

Allen County SWCD, Project Director
James E. Lake

U.S. Environmental Protection Agency, Project Officer
Carl D. Wilson

Prepared by

ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT

for

U.S. ENVIRONMENTAL PROTECTION AGENCY
Region V, Office of the Great Lakes Coordinator, Section 108A Program
Chicago, Illinois
with assistance from
USDA SOIL CONSERVATION SERVICE
PURDUE UNIVERSITY
FOURTH CONGRESSIONAL DISTRICT INDIANA

March 1974

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FOREWORD

This handbook contains the basic policies, regulations, and specifications for the administration of the Black Creek Study Program.

The Black Creek Study came about through the efforts of the Allen County Soil and Water Conservation District, Board of Supervisors, (Indiana). The district submitted a proposal to the Environmental Protection Agency to study the relative success of various existing erosion control techniques in improving water quality; the effect of various land use and agriculture practices on erosion and the resulting effect on sedimentation and related pollutants as they relate to water quality. The study will also identify the type of incentives that will be needed to convince individual landowners to voluntarily participate in erosion control programs.

It is hoped that data obtained from this study can be applied specifically to the Maumee Basin, and in general to other areas to reduce sedimentation and improve water quality.

Mention of trade names or commercial products in this manual does not constitute endorsement or recommendation for use.

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Project 621
 Soil Conservation
 Bureau of Reclamation
 Department of the Interior

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II APPLICABLE

1. Cooperating
 2. Cooperating
 3. Land
 4. Priority
 5. Priority
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Section 1
BASIC POLICIES

The Black Creek Sediment Study shall emphasize the land use changes, erosion control, and management practices, which in combination by conservation treatment units, will provide, over a period of years, the most enduring conservation benefits for the purpose of reducing sediment and improving water quality.

The program is fully voluntary on the part of the individual landuser (cooperator). Its voluntary character shall be continuously emphasized.

Any landuser in the Black Creek Study Area, is eligible to become a cooperator with the Allen County Soil & Water Conservation District and participate in the land treatment program.

A plan of operations, including a time schedule for conservation treatment units, shall be a prerequisite to participation in the program.

The cooperator will be responsible for developing and carrying out his plan of operations. The SWCD, will provide technical assistance to any cooperator for developing the plan of operations.

The SWCD shall offer to cooperators long-term contracts under which the SWCD, with the approval of the U.S. Environmental Protection Agency Project Officer, will make commitments to share with the cooperator the cost of establishing the combination of conservation practices provided for in his plan of operations. These contracts may be entered into during the period ending no later than December 31, 1976. No contract shall exceed the end of the program period (September 30, 1977).

The cooperator will be encouraged to carry out his plan of operations in the shortest period consistent with climatic conditions and his resources.

The program shall make provision for contracts on all lands, including non-farm lands where erosion is so serious as to make such contracts necessary for the reduction of sediments and related pollutants.

The program shall provide for inclusion in contracts, at the exclusive decision of the landowner, practices and measures to reduce sedimentation and to enhance the environment; and reduce non-point sources of pollution.

The program shall be carried out in close cooperation with interested federal, state and local governmental units and organizations and other groups and individuals.

Funds to administer this program are provided by the U.S. Environmental Protection Agency, State and County Government and local landowners.

The study committee, consisting of the SWCD, SCN, landowners, and the U.S. EIA will assist in developing and reviewing guidelines and procedures best suited to the Black Creek Study area. Representatives of other interested agencies or groups working in the area may be invited to participate as determined by the study committee.


Guidelines for land treatment will be provided on the basis of data submitted to the SWCD by the U.S. EIA.

Land treatment will cover all land owned, or controlled for the period of the contract, by the cooperator.

The cooperator will be provided with soil survey information with recommendations to use as a basis for preparing a plan of operation.

Soil and water conservation practices as set forth in the Appendix (Table 4-10) for Black Creek Study will be eligible for use. They may be applied in combinations set forth in the plan of operation. (Also see Appendix I).

W. J. H. H.


District Administrator
Chickman, Allen County SWCD

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Section II
ADMINISTRATION

2.1 Definitions

The succeeding terms shall have the following meanings in this handbook and all contracts, forms, documents, instructions, and procedures in connection therewith, unless the context or subject matter requires otherwise.

- (a) SWCD means the Allen County Soil and Water Conservation District.
- (b) BCSA means Black Creek Study Area which is the currently recognized area as outlined in the work plan.

BCSP means Black Creek Sediment Program.
- (c) SCS means the U.S. Soil Conservation Service.
- (d) EPA means the U.S. Environmental Protection Agency.
- (e) PU means Purdue University.
- (f) Operating unit means a parcel or parcels of land whether continuous or non-continuous, constituting a single operating unit for agricultural purposes.
- (g) Other land means non-farm land that can be covered by the program to the extent necessary to reduce sediment and related pollutants.
- (h) Cooperator means any landuser **having** control of an operating unit in the designated area and voluntarily entering into a cooperative agreement with the SWCD.
- (i) Conservation practice or conservation measures means any process used to protect the soil from water or wind erosion and deterioration or any process to develop or use a soil and water **resources**. The terms "eligible conservation practice" or "eligible conservation measure" refers to those practices listed in Table A-10 of the work plan.
- (j) Conservation treatment unit means a field of an operating unit or part of an operating unit in a specific land use requiring a particular type of management and the use of related conservation practices.
- (k) Plan of operations means a written conservation plan for all the acreage of an operating unit incorporating a time schedule of landuse and treatment and providing for such combinations of landuse adjustments such as cropping or grazing systems, and conservation measures as are needed to develop, use and

protect the soil and water resources. It includes estimated cost-share amounts, by year, for each eligible conservation practice.

- (l) Time Schedule of Land Use and Treatment means a schedule of planned land treatment, listed by fields and by years for an operating unit included in the plan of operations.
- (m) Identifiable Unit means all or an essential part of an eligible conservation practice that, when carried out, can be clearly identified as a segment of the whole practice.
- (n) Cost-Share Payments means payments to cooperator signatory to the contract as provided in the plan of operations, at established rates, for the carrying out of identifiable units for which costs are shared, and who have complied with the applicable provisions of the contract.
- (o) Contracting Officer shall be an employee of the SWCD designated by the board of Supervisors to handle the contractual agreements.
- (p) Designated SCS Representative means the Soil Conservation Service, District Conservationist at Fort Wayne Field Office or in the absence thereof the employee of the Soil Conservation Service named by the District Conservationist.
- (q) Certification of Performance and Compliance means a written statement by the designated SCS representative that an identifiable unit has been properly carried out and that the cooperator signatory to the contract is in compliance with the terms and conditions of the contract.
- (r) Actual Cost means (1) the amount actually paid or engaged to be paid by the cooperator for equipment use, materials and services for carrying out an identifiable unit, or (2) if the cooperator uses his own forces in carrying out an identifiable unit, the constructed value of his own labor, his own equipment use, materials he produced and used, and such other costs as may be set forth in the list of eligible conservation practices.
- (s) Average Cost means the average of the actual costs and current cost estimates considered necessary to carry out an identifiable unit.
- (t) Specified Maximum Cost means the maximum amount, with respect to an identifiable unit to which cost sharing will apply.

2.2 Authority and Responsibility (see Figure 2.1)

2.2.1. The Allen County Soil & Water Conservation District

The Board of Supervisors of the Allen County, all of which two are appointed by the Governor of Indiana and three are elected by the county landowners have overall administrative responsibility for the program. All program activities are reviewed at monthly board meetings. The chairman of the board acts as the project administrator.

The project administrator is responsible for the administration of the BCSP and shall:

- (a) Serve as chairman of the program committee and as such shall:
 - (i) Schedule meetings of the committee
 - (ii) Arrange for keeping minutes of meetings
- (b) Issue all instructions and policies required in addition to those contained in this handbook to implement and carry out the program;
- (c) Carry out the duties and responsibilities with regard to appeals as set forth;
- (d) Carry out the duties and responsibilities with regard to contract violations as set forth;
- (e) Maintain relations with other local, state and federal agencies to assure continuation of assistance;
- (f) Appoint in writing the project director and inform all participating agencies of the appointment.

2.2.2 The Project Director (PD)

The project director is the direct representative of the Allen County SWCD and as such, is responsible for the conduct of the project. All technical direction and guidance for construction plans and specifications, analytical work, evaluation of plans, reports, voucher preparation, time schedules, etc., are channeled through him to the U.S. EPA project officer.

The project director is responsible for directing the Black Creek Study Program and shall:

- (a) Serve as contracting officer in accordance with the authority delegated by the project administrator and as such is responsible for:

- (i) Receiving and reviewing plans of operations for legal adequacy as a basis for contracts.
- (ii) Preparing the contractual agreement between the District and the Cooperator using the forms prescribed by the SWCD.
- (iii) Oversee the contract through the program period to see that all requirements are met by both parties.
- (b) Provide direct supervision and training to district employees.
- (c) Coordinate activities of technical personnel in accomplishing program objectives.
- (d) Follow-up, regular on-site spot checks to insure that practices are being carried out in accordance with the plans of operations and the terms of the contract.
- (e) Perform other related duties directed by the SWCD board.
- (f) Develop and carry out an information program.
- (g) Maintain all District related records.
- (h) Maintain all District financial records.
- (i) Review applications with SWCD board to determine priorities.
- (j) Serve as chairman of the program committee and perform related duties in the absence of the project administrator.

2.2.3 Project Officer (PO)

The project officer is the official representative of the U.S. EPA designated to monitor the project. Federal technical assistance and guidance relative to the project are channeled to or through him. His general responsibilities are to:

- (a) Meet with the grantee and outline (in general) procedures for accounting, preparation of plans and specifications, reports, purchases, assurances and reimbursement procedures.
- (b) Assist the grantee in conforming to the objectives (scope of work) set forth in the project application and "offer and acceptance" (O&A) documents.
- (c) Review project detailed work plans and budget as described in the " " document and provide approval to proceed.

- (d) Review and approve construction plans allowing the grantee to proceed.
- (e) Review the final plans and specifications and provide notification to the grantee of approval to advertise for bids.
- (f) Review bid tabulations, proof of advertising, and other necessary assurances before granting authority to award construction or equipment contract. Approval must be obtained from project officer before contract can be awarded to the low or best choice of bidders.
- (g) Review and authorize proposed purchases for article, supplies, equipment and services having a unit value exceeding \$1,000.00. (The obtaining of a grant does not in itself constitute prior approval, even though those were itemized in the application for a grant).
- (h) Determine that provisions for reasonable access to the project site and project results have been made.
- (i) Perform inspections and program reviews and provide technical assistance to the project.
- (j) Certify that the cost included in a voucher, were necessary to the conduct of the project, the amounts claimed are reasonable, and all required reports were received and are satisfactory.
- (k) Designate those materials that are no longer necessary to the completion of the project.
- (l) Review a preliminary copy of all final project reports and provide approval to proceed with preparation of the final reports.
- (m) Review and approve publications or other dissemination of information.

2.2.4 Soil Conservation Service

The Soil Conservation Service is responsible for providing technical assistance to the SHCD to implement the land treatment portion of the Black Creek Study "work plan". To fulfill this responsibility the SCS shall:

- (a) Provide technical assistance to cooperators in developing their plan of operations.
- (b) Jointly review all plans of operations with the local governing body.

- (c) Provide technical assistance to the coordinator in carrying out the plan of operations.
- (d) Arrange for nonresident SCS technical assistance as needed in cooperation with the project director.
- (e) Inform project director of all alleged or suspected violations.
- (f) Make an annual progress review and report of each current contract.
- (g) Make final on-site review and report of all completed contracts.
- (h) Maintain a complete file of current technical specifications for eligible conservation practices.
- (i) Maintain all SCS records.
- (j) Perform other related duties as requested by the SWCD board.

2.2.6 Navajo University

Navajo University has contracted with the SWCD to do research on the BOSP. In doing so, they are responsible for providing materials and personnel to carry out the following activities:

- (a) Modeling and prediction in the study area.
- (b) Sociological studies.
- (c) Monitoring of runoff, sedimentation, etc.
- (d) Microscopy analysis.
- (e) Experimental plots.
- (f) Simulation studies.
- (g) Biological studies.
- (h) Muck bank studies.
- (i) Irrigation studies (related to tile drains).
- (j) Provide quarterly and annual progress, technical and financial reports to the SWCD.

2.2.6 Typical Flow Diagram of Grant Process

Figure 2.2 contains elements that are typical of most Section 108A Planning or Demonstration Projects. The explanations that follow are listed to correspond to the sequence of events identified on the diagram:

- (a) Region V, Chicago Office, EPA (appointment by the Regional Administrator), appoints project officer from among EPA personnel to provide assistance to the grantee. He is the federal representative with whom all correspondence, direction, questions, approvals and requests shall be channeled to or through.
- (b) The EPA project officer shall meet with the grantee and his representatives to discuss the project and begin the action toward accomplishing the objectives of the project. Items to be reviewed are principally those concerned with the responsibilities of the PD and PO.
- (c) Instructions are given to the grantee by the PO. Questions are welcomed by the PO so that clarification can be made on any point not understood by the grantee. The grantee shall develop a work plan and submit it to the PO for approval.
- (d) PO shall review the work plan to see that it will provide the information necessary to accomplish the objectives of the project. He will offer comments for consideration if he feels it will help accomplish the objectives. He will send either his comments and/or approval of the plan so that you can proceed.
- (e) The grantee shall prepare and submit two copies of plans and specifications to the PO for review and approval prior to advertising for bids.
- (f) PO reviews plans and specifications and sends letter of approval to grantee to advertise for bids. Grantee advertises for bids on the approved plans and specifications.
- (g) Grantee prepares bid tabulation, provides proof of advertising, selects successful bidder and submits copy to the PO for approval.
- (h) PO reviews bid tabulations and sends letter to grantee authorizing the contract award to the successful bidder (if other than the low bidder is selected, a brief explanation of the decision is needed).
- (i) Grantee receives approval from PO to award contract. When contract is awarded, two signed and certified copies should

and answers to the IO. Procurement of equipment or construction of facilities can begin.

- (f) Construction of facilities are completed and evaluation begins.
- (g) Grantee evaluation period for project. IO will be in contact with IO on time during this period. Draft of the final report will be prepared and submitted to IO for review.
- (h) IO sends draft of final report. Comments will be made by IO to grantee.
- (i) Grantee shall prepare the final report as shall be outlined by the IO. Report will be given to grantee as project progresses. Number of copies of the final report will be given in the offer and acceptance document as specified by the IO.
- (j) The IO shall request an audit of the project account so that final payment can be made. The IO submits the final report to the Regional Administrator for distribution and grant completion.
- (k) The Regional Administrator, Region V, receives the final report for distribution.

ENVIRONMENTAL
PROTECTION AGENCY

1. Carl D. Wilson

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WATER CONSERVATION DISTRICT

1. J.E. Lake
2. E.F. McFadden

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1. R.M. Brooks

Technical

1. R. Land

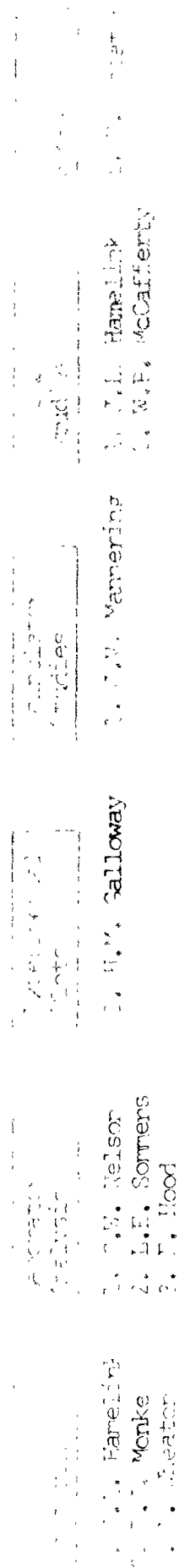
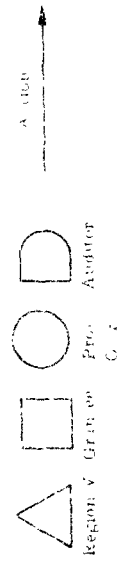
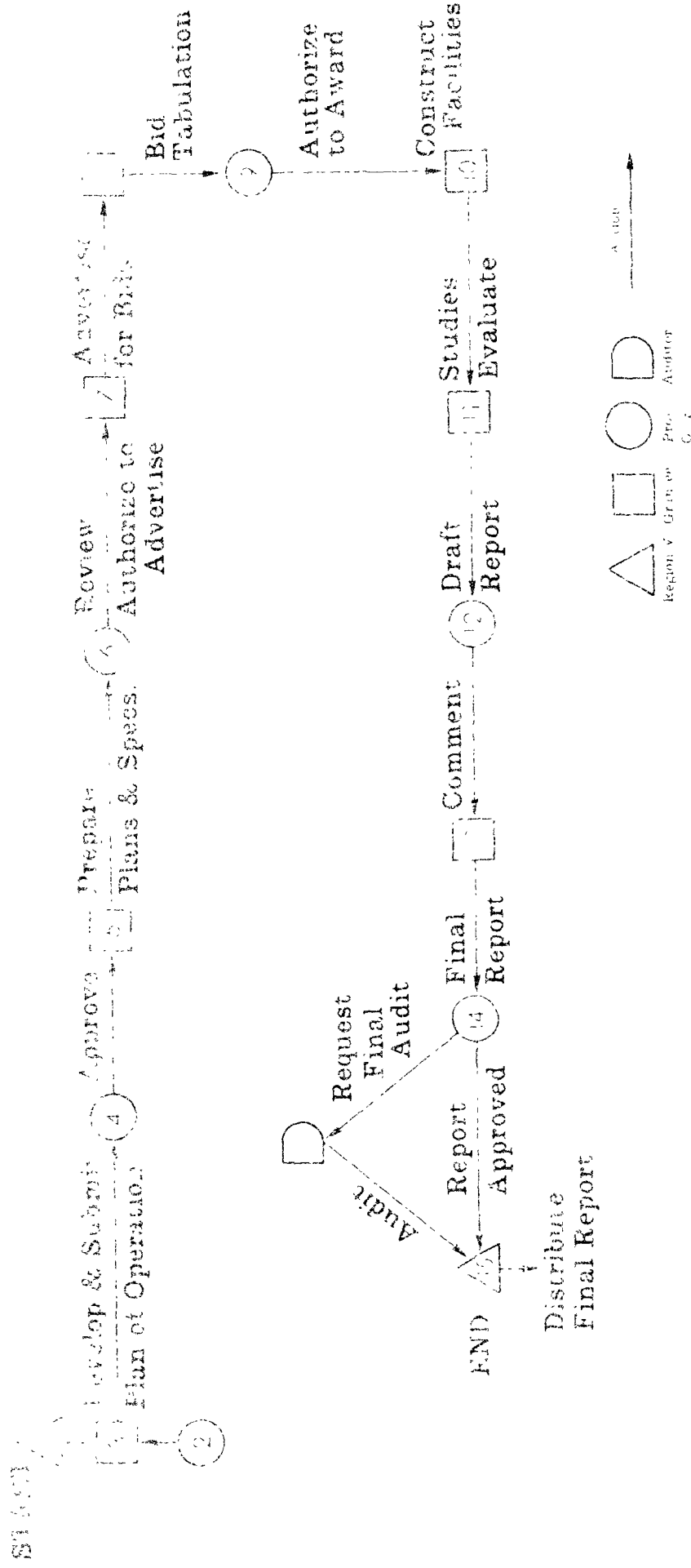


FIGURE 2.1



Section III
APPLICATION

3.1 Application for Program Assistance

Application by cooperators of farm or other lands shall be made on Form BCS-1, see Exhibit. Group application made on Form BCS-1a see Exhibit.

The application should be dated and signed by the applicant and show:

- (a) Description and location of the farm or other lands.
- (b) Who owns and who operates the farm, or other lands. If the applicant is not the owner, the application should show under what arrangements the applicant occupies and operates the land; e.g. lease, permit, etc. The term of the lease or permit should be shown.

Only one copy of the application is required. Applications shall be filed with the SWCD.

3.2 Cooperators Applications Received

The priority for participation in the program shall be determined and shown on each application.

A register of applicants received is required.

3.3 Cooperators Eligibility

Any cooperator who has control of an operating unit in BCSA, is eligible for participation in the BCSP provided that (1) the cooperator submits an acceptable plan of operations, and (2) has control of the operating unit for a period required to carry out the plan of operations. Control as used herein means ownership or documented proof of control for the contract period. It is the responsibility of the cooperator who has made an application on Form BCS-1 to provide evidence acceptable to the project director what he has control of all of the operating unit, for the period that will be required to carry out an acceptable plan of operations, before any technical assistance is furnished.

3.4 Land Eligibility

The program shall be applicable to (1) privately owned lands, (2) non-federally owned public lands under private control for the contract period and included in the cooperator's operating unit.

3.5 Priority of Applications for Participating in the Program

The county director shall review all applications, Form 305-1, with the C.W.D. Board of Supervisors and set the priority of assistance to applicants in developing the plan of operation.

3.6 Policy of Technical Assistance to Cooperators

After the planning priorities have been established, the following factors shall be considered in setting technical assistance priorities:

- (a) The work plan and objectives of the applicant
- (b) Seriousness of the soil and water problem, including its relationship to sediment and agriculture related pollution
- (c) The need for simultaneous action to get maximum cooperation in controlling erosion - a group of applicants, each an individual applicant, agreeing to coordinated action in treating erosion problems would ordinarily be preferred over an individual applicant
- (d) The need for revegetation of land being used for crops not suited for cultivation
- (e) Urgency for application of conservation measures to solve recurring seasonal problems such as wind or water erosion on critical areas
- (f) Time of filing application in relation to other applicants
- (g) Interest and attitude of applicant and his understanding of the program.

Section IV
PLAN OF OPERATIONS

The cooperator is responsible for developing a plan of operations. An approved plan of operations developed in cooperation with the SWCD shall form a basis for negotiating a contract. Available technical assistance in preparing the plan of operations will be provided by SCS.

The SCS Resource Conservation Planning handbook and technical guide amended for use in BCSP prescribes the minimum requirements for the plan of operations. Each plan of operations must be approved by the SCS District Conservationist.

4.1 Selection of Conservation Practices

The cooperator on the operating unit shall determine how he will use his land and the combination of conservation practices he will use in treating each conservation treatment unit.

The conservation practices agreed to be carried out shall be carried out in conformity with the plan of operations. Conservation practices shall be carried out in accordance with the current specifications obtained from the local Soil Conservation Service office.

Practices to be included in the plan of operations, shall be a voluntary decision of the cooperator.

Measures planned on lands not eligible for cost-share, but which are part of the operation unit shall be included in the plan of operations.

The following statement must be included in the plan of operations with the item to which it applies properly referenced:

"Conservation measures on land not eligible for cost-share under the contract. The cooperator will not be in violation or non-compliance if these practices are not carried out."

The plan of operations (see Exhibit Form BCS-2) shall show:

- (a) Planned treatment for each conservation treatment unit. The practice to be applied shall be identified and each identifiable unit shall be listed.
- (b) Estimated extent or amount of each identifiable unit.
- (c) Average cost, or specified maximum cost, current at the time the plan is developed for each identifiable unit.
- (d) Cost-share rate for each identifiable unit.

(d) Time schedule, by year, for carrying out each identifiable unit.

(e) Estimated total cost share, by year, for each identifiable unit.

(g) Certification of technical adequacy by the District Conservationist.

2. The Conservation Treatment Unit

The conservation treatment unit shown in the plan of operations will be a field or a group of fields with similar soil and water conservation problems and requiring similar combinations of landuse, cropping or grazing systems, and conservation practices.

3. The Time Schedule of Land Use and Treatment

Land use changes, use of cropping or grazing systems, and application of conservation practices are closely interrelated. Proper timing and sequence of land treatment is essential to successful implementation of conservation plans. The time schedule shall provide a sequence for carrying out planned conservation measures.

The plan of operations may provide that specified identifiable units may be carried out at any time prior to or no later than one year after the year shown in the time schedule.

The time schedule must be realistic. Schedules must consider not only proper sequences but must take into consideration availability of contractors, cooperator's ability to complete work, and urgency of planned treatment. In addition, adequate time should be provided following the application of certain practices, to determine proper actual results.

It is, therefore, SWCD policy to schedule first all cross seedings, tree and shrub plantings, or application of management practices, such as crop residue use or pasture management as early as practicable in contract schedules.

4. Technical Assistance

The SWCD will provide technical assistance to the cooperator in developing and carrying out a plan of operations under the program. The cooperator will be encouraged to use all other available sources of assistance in developing and carrying out his plan of operations.

The project director is responsible for scheduling technical assistance requested by the cooperator. The SWCD representative is responsible for assistance in site selection, layout, and necessary supervision of the installation of the practices in the plan of operations. The cooperator will be encouraged to use all other available public

and private sources of assistance in the installation of practices. Whether they are to be cost-shared or not. The project director will receive assistance from the SCS representative to make arrangements with the Area Conservationist for services of staff or levels not located in the field office.

4.5 Plans of Operations that Involve Groups

Cooperator, in the BCSA may, with the prior approval of the project director, include two or more operating units under contract in the program if a group plan of operation satisfactory to the SCS representative is developed and will result in a better and more economical treatment program for the operating units through increased participation that would be obtained through individual operating unit participation.

4.6 Plans of Operations Involving Units of Government

In some instances, the most practical location for conservation practices, such as grade stabilization structures and erosion control basins, that are required may be on an existing road or its-of-way where the county can also use the conservation practice to advantage in the installation of road crossings of water control. In such cases the cooperator may receive cost-sharing assistance from the BCSA in carrying out the conservation practice. Cost-sharing assistance to the cooperator would be limited, to that necessary to install the conservation structure using the standard SCS specifications and rates applicable to the practice and outlined in the handbook. Any additional expense for structural work or materials that may be required to render the practices, serviceable as a road crossing must be an obligation of the unit of government. For example, if a sediment dam is to be constructed with a greater height or width than is required to impound runoff water in order for it to also serve as a roadway, cost-sharing shall be limited to that which would have been payable for a dam on the minimum SCS specifications required to meet the needs of the site for a sediment basin.

The cooperator and the unit of government shall execute a cooperative agreement covering the working arrangements, division of costs and responsibilities for construction and maintenance and such other matters as may be pertinent. Copies of the agreement will be provided for the Allen County SCS files.

Where a structure is designed for a road crossing, the plans and specifications for that portion of the structure pertaining to the roadway shall be in accordance with standards established by the unit of government. The authorized representatives of the unit of government must occur in the plans and specifications. Such concurrence must be in writing and made a part of the contract.

4.7 Approval of Plan of Operations

The plan of operations developed by a cooperator must meet the approval of the district conservationist. The district conservationist in making the decision that the plan of operations is a satisfactory basis for a long term cost-sharing contract is acting for the project director. The primary criteria for this decision is whether the plan, within practical limits, provides for the use of the land within its capabilities and its treatment is in accordance with standards and specifications set forth in the SCS technical guide as amended for use in the BOSP. When the district conservationist is convinced that the plan of operations meets regulations he shall sign BCS-1 and BCS-2.

4.8 Soil Conservation District Review

The project director shall provide an opportunity for the supervisors to review plans of operations developed by the cooperator and the soil conservationist.

In the event such a plan is not concurred in by the supervisors and/or the project administration because, in their opinions, it does not meet the objective of the district or there is some question as to its practicability the project director shall so advise the district conservationist. The district conservationist together with the project director, soil conservationist and the cooperator, shall endeavor to work out a plan acceptable to all. The final plan must, of course satisfy the criteria with respect to its adequacy. In case agreement cannot be reached, the matter will be referred to the SWCD Board of Supervisors, who will make the final decision.

When supervisors have reviewed a plan, evidence of such review shall be shown on the plan of operations.

4.9 Certification by Contracting Officer (project director)

The project director will certify that the plan of operations has been reviewed with the supervisors of the SWCD and that it meets requirements for participation in the BOSP and is adequate for a cost-share contract. This shall be accomplished on Form BCS-2,3.

4.10 Carrying Out the Plan of Operations

The cooperator is responsible for carrying out his plan of operations. He should be encouraged to carry it out as rapidly as climatic conditions and his own resources permit in conformity with the priority of projects installation set in the plan of operations.

4.11 Annual Review of Plan of Operations

Each cooperator in the BOSP who had developed a plan of operations will be contacted at least once each year. This contact will be made

by the SCS personnel working on the project. Progress of the plan of operations will be discussed and the results will be recorded on Form BCS-9, Annual Status Report.

All cooperators will be contacted by June 30th of each year. The Annual Status Report will be completed by the SCS representative and submitted to the contracting officer and the SWCD for their reviews.

Section V CONTRACTS

Contracts shall be based on the cooperator's plan of operations and shall be developed in coordination with the project director.

The project director is the contracting officer and is responsible for the legal sufficiency of the contract.

The beginning date of a contract is the day it is signed by the cooperator. The contract is not binding on the part of the district until (1) the contract is signed by the project administrator and (2) the contracting officer certifies that funds are available for the cost-sharing obligation of the contract. See contract forms BCS-2 and BCS-3 (see Exhibit #2 and #3).

In order for cooperators to participate in the program, a contract must be entered into by him for the contract period by which he shall agree to carry out his plan of operations. The person who has control of the operating unit for the proposed contract period, must sign the contract.

The contract shall be for a period that is needed to carry out and establish the conservation practices listed in the plan of operations and for which federal cost-share commitments are made under the program. Contracts may be entered into during the period ending no later than December 31, 1976. The period of any contract shall not exceed the end of the program period. (September 30, 1977).

The contracting officer having determined that the plan of operations is adequate for a contract may execute the contract with the cooperator subject to certification by the EPA project officer. It is the responsibility of the cooperator who signs a contract to keep the contracting officer informed of his mailing address.

If, during the contract period, all or part of the right and interest of any cooperator signatory to the contract in an operating unit is transferred by sale or otherwise, his successor, as transferee, during the contract period may upon his request be substituted under the contract for that transferred by executing a form prescribed by the SWCD for such purposes.

Contracts previously entered into with a cooperator may be terminated upon mutual agreement of the cooperator and the contracting officer, only if such termination is specifically approved by the SWCD. No contract may be so terminated unless the SWCD determines that such termination would be in the public interest.

Requirements of contracts previously entered into with a cooperator may be waived or modified by the contracting officer only if such waiver or modification is specifically approved by the SWCD, or is authorized under general policies established by the SWCD.

The contracting officer may find, in accordance with standards determined by SCS, that an identifiable unit has been carried out in accordance with applicable program provisions but, due to conditions beyond the control of the cooperator signatory to the contract, has failed to achieve the desirable results. In such cases the contracting officer and/or the BCSF may agree to modify the contract to authorize cost-share payments for again carrying out the identifiable unit: provided, that the remaining period of the contract is of such length of time as to allow the carrying out and establishment of the identifiable unit. The cooperator may not be required to again carry out an identifiable unit that has failed due to conditions beyond his control.

The contracting officer may find, in accordance with standards determined by the SCS, that an identifiable unit has been carried out in accordance with applicable program provisions and has achieved the desired results but, due to conditions beyond the control of the cooperator signatory to the contract, subsequently deteriorated during the contract period to the point of need of repeat applications. In such cases the contracting officer and/or the BCSF may agree to modify the contract to authorize the cost-share payments for again carrying out the identifiable unit: Provided, that the remaining period of the contract is of such length of time as to allow the carrying out and establishment of the identifiable unit. The cooperator may not be required to again carry out an identifiable unit that has deteriorated due to circumstances beyond his control.

5.1 Practices Already on the Land

If practices on the land at the time a BCSF contract is entered into were cost-shared under another program, the cooperator's obligations, if any, with regard to such practices remain with the agency that cost-shared in carrying out the practices. However, maintenance of such practices may need to be specified in the BCSF contract.

A BCSF contract does not relieve a cooperator from any obligations with another federal agency for practices carried out under another program before or after a BCSF contract is entered into.

Practices on the land that were cost-shared under a BCSF contract is entered into may be utilized in carrying out the contract or in carrying out another practice or identifiable unit of a practice that is to be cost-shared under the BCSF. Cost-sharing by an agency for practices carried out before a BCSF contract is entered into, does not affect cost-sharing under the BCSF.

When it is planned by a BCSF contract to break up or destroy a practice on the land at the time a contract is entered into, the Soil Conservationist must make inquiry of the cooperator if such practice were cost-shared under another program. If such practices were cost-shared under another program, the cooperator must furnish evidence to the project

director that all obligations with regard to such practices have been met. A record of such evidence shall be included in every copy of the contract.

5.2 Conservation Practices Maintenance

Each cooperator signatory to the contract shall agree to maintain for the contract period, or if lesser, for the period of his control of the operating unit, conservation practices on the operating unit as specified in the contract. Failure to maintain for the required period the conservation practices shall be considered a contract violation.

5.3 Other Programs

In developing a conservation plan, SCS technicians assisting the cooperator and the cooperator must recognize that a BCSP contract does not relieve a cooperator from obligations he may have under any other program.

5.4 Cooperator Control of Land

Contracts may be entered into with cooperators who have control of the land units for the contract period. Control means ownership or a long-term lease of the land unit under contract. It is the cooperators responsibility to provide the contracting officer with proof of control should it be requested.

When a cooperator is buying a land unit on contract, he must show proof that he is buying the land and that he has control of this land for the period of the BCSP contract.

In all cases the cooperator is to be informed of the consequences if he loses control of the operating unit prior to completion of the contract.

Every cooperator who has control of an operating unit to be included in a BCSP contract must sign the contract.

5.5 Contract Item Number

A separate contract item number will be assigned to each practice. This number will be the same as that used in the data processing system for computing this program.

5.6 Second Contracts

For the purpose of protecting the investment of the District a second contract may be entered into on the same operating unit with the same or a new cooperator for the purpose of repairing or reconstructing practices supplied under the BCSP that failed or

deteriorated provided such failure or deterioration was beyond the control of the cooperator.

As used in this section, the term, "the same operating unit" means (1) originally under a contract less any acreage transferred by sale or otherwise, and (2) land originally under a contract plus any added acreage that is not substantial in size with relation to the original acreage.

5.7 Time Limitations

All contracts on an operating unit shall be for the same time length as the program period which ends September 30, 1977. However, the period on the initial or first contract shall not be less than 1 year (12 months) nor more than 3-1/2 years (42 months, except contracts involving transfer of only a part of an operating unit which does not become part of another operating unit under contract may be for less than 36 months. All contracts will start on the day it is signed by the cooperator, contracting officer and the SWCD.

5.8 Contract Modification

Changes in contracts shall be accomplished by Form FCS-4, 'Modification (or waivers) of contract, see Exhibit.

The effective date of a contract modification shall be the day it is signed by the cooperator. The modification is not binding on the part of the District until (1) the contracting officer certifies that funds are available and (2) the project administrator approved the action.

The cooperator is on his own so far as any cost-sharing is concerned for an identifiable unit(s) started before the modification is signed by the above listed parties.

The reason for any changes in a contract must be clearly stated on the modification Form BCS-4; changes that may require contract modifications are:

- (a) Adding land to an operating unit
- (b) Deleting land from an operating unit
- (c) Changing the period of the contract
- (d) Adding contract items

This includes adding an item to provide for the reapplication of a practice that has failed. When a contract item is added or deleted which will change the land use of a field, such as pasture land seeding, then the appropriate management practice must also be adjusted or added to the contract.

(e) Deleting contract items

A contract should contain all of the practices required for a plan of operations that will serve the needs of the cooperator and accomplish the objectives of the BCSF. When the cooperator signs the contract, he is expected to carry out all of the practices. There must be a valid reason not adverse to the SWCD's interest for deleting any contract item. Every modification to delete a contract item must show the reasons for the deletion. Modifications and pertinent attachments must be prepared in a manner which will permit anyone to clearly identify and locate any affected practice.

When a contract modification brings about changes in the contract that are not readily apparent on the plan map, an overlay or sketch map must accompany the modification to reflect these changes, this includes seeding, stripcropping, and windbreaks in only part of a field. If two or more of the same practice - such as two diversions - are located in the same field, they should be numbered or lettered, i.e., Diversion #1, Diversion #2, or Diversion A, Diversion B.

(f) Changing specifications on material

To permit the use of any supply or material other than that specified in the contract, provided the substitution adequately meets standards and specifications set forth in BCSF Technical Guide.

(g) Increasing average costs and specified maximum costs

If an average cost increases between the time a contract is written and the time an identifiable unit is begun, contracts may be modified to permit cost-share payment based on the increased average cost. This does not mean that because average costs increase, contracts must be modified to reflect increased average costs. Because of the cost of preparing and processing modifications, contracts should not be modified unless failure to do so would result in a significant loss to the cooperator. Modifications to increase average costs and specified maximum costs should be limited to the current year. Modifications to increase average costs or specified maximum costs only, and that involve no other change, need to be signed only by the project director and SWCD. The signature of the cooperator is not required, provided the following clause is included in the modification:

"This modification reflects increases in approved average costs or specified maximum costs. The SWCD agrees to cost share on the average costs or specified maximum costs cited herein. The cooperator's initial action to carry

out the contract items covered by this modification shall be deemed to be his acceptance of this modification."

(4) Changing the amount or extent of a practice

Modification to change the amount or extent of a practice shall be executed only when the increase or decrease in extent is (1) known before actual installation, and (2) will result in a significant increase or decrease in the cost-share obligation. The SWCD shall determine what they wish to consider significant for application of this requirement. Any significant change in "amount or extent" of a contract item that is not covered by a modification must be explained with submission of the BCS-4 application for payment.

(i) Permitting cooperators to destroy or break up a practice

Authority to destroy or break up a practice or an identifiable unit carried out and/or cost-shared under the Black Creek Study Program must be obtained by the cooperator from the SWCD. Modifications to permit a cooperator to destroy or break up a practice or identifiable unit are required only when the practice to be broken up or destroyed was carried out and/or cost-shared under the BCSF.

Modifications to permit a cooperator to destroy or break up a practice or an identifiable unit are subject to the following:

- (i) Clearly defined needs must be determined by the contracting officer prior to approving the destruction or breaking up of a practice or identifiable unit.
- (ii) Planned land use of the area concerned with due regard to practical limitations.
- (iii) The breaking up or destroying of a practice or identifiable unit must be followed by the installation of needed compensatory treatment which will preserve the effectiveness of identifiable units already installed on the operating unit.
- (iv) The changed conservation treatment applied within the land use must meet technical standards and specifications applicable to the practice or identifiable unit required for protection of the land.
- (v) The breaking up or destroying of a practice or identifiable unit is deemed essential, by the SWCD, to the most stable operation of the farm or land.

5.9 Reapplication of Practices that Fail or Deteriorate

Reapplication of practices that (1) initially fail to achieve desired results, or (2) deteriorate after achieving desired results, may be approved and cost-share paid, provided that:

- (a) Reapplication is essential
- (b) The specifications for the practice were met in the original application
- (c) The failure or deterioration was due to conditions and circumstances beyond the control of the cooperator.

A cooperator cannot be required to reapply practices that fail or deteriorated because of conditions or circumstances beyond his control. When a practice fails or deteriorates because of conditions or circumstances within the control of the cooperator, he is in violation of the terms of the contract. When such a violation occurs, the District may permit the cooperator to reapply the practice that has failed or deteriorated without federal cost-sharing and therefore keep the remainder of his contract valid.

Each item for reapplying a practice shall be numbered the same as the original contract item suffixed with the letters "A."

Unless a separate cost-share rate is established and approved, any repeat application will be at the same cost-share rate shown in the contract for the original application. For re-application use the contract modification form BCS-4.

5.10 Reconstitution of Operating Units

If, for any cause:

- (a) Two or more operating units, as constituted at the time a contract is entered into, are later combined, or
- (b) One operating unit, as constituted at the time the contract is entered into, is later divided into two or more operating units, or
- (c) Land is added to or deleted from an operating unit under a contract which significantly affects the plan of operations;

The operating unit shall be considered reconstituted, when an operating unit is reconstituted. The contract shall be modified in accordance with procedures prescribed by the SWCD.

5.11 Transfer of Land

For application of this section, acreage will be considered "trans-

ferred" if control of the acreage is lost by a cooperator for any reason. The term "transferee" means the cooperator who acquires control of the land.

When all or part, of an operating unit under a BCSP contract is transferred, the contract terminates with respect to the transferred acreage. If the transferee will not assume the obligations of the BCSP contract with respect to the transferred acreage, the transferor is subject to certain forfeitures and refunds.

The transferee may assume the obligations of the BCSP contract with respect to the transferred acreage.

The procedure to follow in transferring the rights and obligations of a BCSP contract from one cooperator to another is dictated by the extent of the acreage transferred and how the land will be operated after the transfer. For transferring land the transfer agreement BCS-5 shall be used, see Exhibit.

In addition to the description of the acreage transferred, all items, cost-shared and noncost-shared, to be carried out by the transferee shall be listed on the transfer agreement.

The transferee shall be furnished a complete copy of the contract which shall include a copy of all pertinent documents including modifications. The original copy of the executed transfer agreement shall be filed with the SWCD copy of the contract. Copies manually signed by both parties plus the contracting officer and the SWCD shall be furnished to the transferee and the transferor. Conformed copies shall be furnished for all other copies of the contract.

The financial and time limitations of a contract are not affected when all of an operating unit is transferred and will be operated as a separate operating unit.

To transfer all of an operating unit to be combined with another operating unit already under a contract, use the contract modification procedure.

5.12 Contract Termination

If all or a part of an operating unit is transferred by sale or otherwise, the contract terminates with respect to the acreage transferred. Acreage will be considered "transferred" if the control of the acreage is lost by a cooperator for any reason. A refund of cost-share payments for identifiable units carried out on the transferred acreage is required unless the cooperator assumes the obligations of the contract with respect to the rights and interests transferred.

Contracts expire at twelve midnight on the final date of the contract. If all of the identifiable units in the contract have not been carried out before the contract expires, the following shall apply:

- (a) If the failure to carry out all of the identifiable units in a contract was due to circumstances beyond the control of the cooperator, a refund or adjustment of cost-share payments is not required.
- (b) If the failure to carry out all of the identifiable units in the contract was due to circumstances within the control of the cooperator a refund or adjustment of all cost-share payments is required.

An on-site review of all items in a contract must be made at least 90 days before the final date of a contract. This review should be made with the cooperator. A record of the findings must be made on form BCS-9, annual contract status report, see Exhibit.

5.13 Contracts May Be Terminated by Mutual Consent If:

- (a) For valid reasons, it is impractical for the cooperator to carry out the contract. Termination under this circumstance requires a refund of all cost-share payments that have been made to the cooperator.
- (b) Encroachment for public purposes such as highway development, military installations, or municipal expansion have so altered the operating unit that the remaining portion of the operating unit unsuited for a practical operation.

Only that part of the contract that covers the acreage remaining after encroachment for public purposes may be terminated by mutual consent. Termination under this circumstances does not require a refund of cost-share payments.

- (c) It is determined that the cooperator of the operating unit is under such physical or mental disability that it would not be reasonably possible for him to carry out the terms and conditions of the contract and that to require him to do so would work an undue hardship on him. In such cases, the contract may be terminated without recovery of cost shares with approval of the contracting officer and the SWCD.

Any notice terminating a contract shall state whether or not a refund or adjustment in cost-share payments will be required. The notice shall also provide that the SWCD will inform the cooperator of the amount of the refund or adjustment and how such a refund or adjustment is to be affected. To notify a cooperator of contract termination use BCS-10, see Exhibit.

5.14 Actions that Tend to Defeat the Purposes of a Contract

The following actions tend to defeat the purposes of the contract: Knowingly or negligently destroying or breaking up a conservation practice listed in the plan of operations, irrespective of cost-share payments, unless prior approval in writing is given by the contracting officer to the destroying or breaking up under standards determined by the SWCD or SCS. Such actions by a cooperator on an operating unit while he has control thereof during the life of the contract shall constitute a violation of the contract.

5.15 Contract Violation

The cooperator shall agree by signing a contract to forfeit all rights to further cost-share payments or grants under the contract and to refund all cost-share payments or grants received thereunder, if the contracting officer determines that there has been a violation of the contract during the time the cooperator has control of the operating unit and that such violation is of such a nature as to warrant termination of the contract. The cooperator who signs the contract will be obligated to refund all cost-share payments.

The cooperator shall agree by signing a contract to make refunds of cost-share payments or grants received under the contract or to accept payment adjustments in the contract, if the contracting officer determines that there has been a violation of the contract during the time that the cooperator has control of the operating unit and that such violation is of such nature as to warrant termination of the contract. Payment adjustments may include decreasing the rate of a cost-share or deleting from the contract a cost-share commitment or withholding cost-share payments earned but not paid. The cooperator who signs the contract will be obligated to refund cost-share payments.

A contract has been violated if the cooperator:

- (a) Does not comply with all terms and conditions of the contract. This includes, but is not limited to, failure to carry out the plan of operations as scheduled failure to meet SCS Specifications in establishing practices. (A cooperator who failed to carry out a practice(s) in his plan of operations as scheduled will not be considered in violation if he promptly reschedules the practice(s) by modification).
- (b) Without approval of the contracting officer and/or SWCD, destroys or breaks up a conservation practice established under the terms of the contract.
- (c) Files a false claim.

All employees involved in the Local Food Stamps are required to furnish the contracting officer any information they obtain that indicates a violation may have occurred. In every instance, the contracting officer is required to ascertain if a violation has occurred and if so, determine if a forfeiture, refund or payment adjustment or termination may be warranted. If a violation has occurred and a forfeiture, payment adjustment, or termination may be warranted, the contracting officer shall see that the SWCD cooperator is informed of the details of the violation in writing.

The contracting officer shall make a narrative report to the SWCD on each case. The report shall include the information received by the contracting officer his findings of facts and determination.

If the SWCD approves the report of the contracting officer, and no violation has occurred, or if a violation has occurred but no forfeiture, refund, payment adjustment, or termination is required, no further action is necessary. A copy of the report of the contracting officer, approved by the SWCD, shall be filed in the SWCD office.

If a violation has occurred and a forfeiture, refund, payment adjustment or termination is required, efforts shall be made by the contracting officer to obtain a non-compliance agreement BCS-7, see Exhibit.

If an agreement is not made, a notice of violation shall be issued. The notice shall be on form BCS-8, notice of contract violation. This notice shall be forwarded to the cooperator by certified mail, return receipt requested. After a notice of contract violation, form BCS-8, has been issued the contract violations procedure outlined in the contract violations procedures section of the handbook shall be followed.

If a violation involves considerable money or a possible termination of a contract, it would be advisable to confer with the attorney-in-charge or the IIA project officer. He may serve as the hearing officer.

4.10 Contract Violations Procedure

This section prescribes the regulations for determining whether a violation of a contract has occurred and for the effect and result of such violation. The SWCD reserves the right to modify, amend, revise, or supplement any of the provisions of this section at any time: provided, that such action shall not adversely affect a cooperator where determination or decision has been made and the cooperator has been officially notified thereof before such action is taken. No cost-share payment or cost-share shall be made pending the determination or decision as to whether a contract violation has occurred.

If the contracting officer receives information indicating that a violation of a contract may have occurred but determines, without the insurance of a notice as provided in this section and with the approval of the SWCD, that no violation has occurred, or that the violation does not call for any forfeiture, refund, or payment adjustments, no further action shall be taken.

If the cooperator subject to a forfeiture, refund, payment adjustment, or termination agree in writing on a form prescribed by the SWCD, to accept such forfeiture, refund, payment adjustment or termination, no further proceeding under this section shall be undertaken. The contracting officer and the SWCD shall give approval to this agreement. The agreement shall specify the remaining obligations to the contract by both parties.

- (a) If the SWCD believes, on information submitted by the contracting officer or otherwise, that a violation of a contract has occurred which would call for a forfeiture, refund, payment adjustment or termination under the provisions of this section, written notice thereof, on a form prescribed by the SWCD, shall be given to the cooperator simulatory to the contract.
- (b) Notice to a cooperator under this section may be shown by (1) a written statement by the contracting officer that the notice was personally delivered to the cooperator; (2) a written statement by a cooperator acknowledged receipt of the notice; and (3) a post office return receipt (registered or certified mail) showing that the notice was delivered at the last address of the cooperator or showing that the notice could not be delivered to the cooperator at his last address because he had moved without a forwarding address. Under this section a cooperator will be considered to have received the notice at the time of personal receipt, or at the time of the return of an undelivered registered or certified letter.
- (c) The notice shall set forth the nature of the alleged violation and shall inform the cooperator that he will be given an opportunity to appear at a hearing before the SWCD board if he files a written request for such hearing in the SWCD office not later than 30 days before the time he received the notice. The cooperator shall be notified in writing by the project administrator of the time, date and place set for the hearing. If the cooperator does not file written request for a hearing, or does not appear at the appointed time, he may still have an opportunity for a hearing. The board may, at their discretion, permit such cooperators to appear before them at another time.

- (i) The hearing before the SWCD board shall be held at the time and place and on the date set forth in the notice of the hearing to the cooperator.
- (ii) The hearing shall be conducted in the manner deemed most likely to obtain the facts relevant to the alleged violation. The SWCD board shall have full authority to confine the presentation of facts and evidence to pertinent matters and to exclude irrelevant immaterial, or unduly repetitious evidence, information or questions. In so doing, the SWCD board shall not be bound by the strict rules of evidence as required in courts of law. The hearing may be sworn at the discretion of the board. The hearing shall be public.
- (d) The cooperator, or his representative, at the hearing shall be given a full opportunity to present facts and information relevant to the alleged violation and may present oral or documentary evidence. Statements and evidence may be submitted at the hearing by the contracting officer. Individuals not otherwise present at the hearing to give information or evidence may, at the discretion of the board, be requesting or permitted to give information or evidence. The board at its discretion, may permit witnesses to be cross-examined, including those individuals called by it.
- (e) The board shall provide for the making of a record at the hearing as will enable it to make a summary of the testimony received at the hearing if the cooperator and the contracting officer agree. If the contracting officer feels that the nature of the case is such as to make a transcript desirable and if the cooperator requests such a transcript a reasonable period prior to the time that the hearing begins, a transcript of the hearing shall be made. If a transcript is desired only by a cooperator, he will be required to provide for its preparation and for the payment of expenses thereof. If a transcript is desired by both the contracting officer and the cooperator the cooperator will be required to pay only the expense of a copy of the transcript. The remainder of the expense will be paid by the SWCD.
- (f) If, at the time scheduled for the hearing, the cooperator is absent and no appearance is made on his behalf, the board shall after a lapse of such a period of time as they may consider proper and reasonable, close the hearing, or may, at their discretion accept information and evidence submitted by others present for the hearing.
- (g) In every case where a cooperator is sent a notice of an alleged violation pursuant to paragraph (d) of this section,

except where the cooperation amount to the forfeiture, refund, payment adjustment or other action in paragraph (c) of this section, the board shall furnish the contracting officer with a written report setting forth its findings, conclusions, and recommendations.

- (ii) The board may authorize or require the rescinding of any award for any reason at any time prior to its determination.
- (i) If the determination or decision is that the violation is of such a nature as to warrant termination of the contract, the determination or decision shall state that the contract is terminated and that all rights to further cost-share payments or grants received under the contract shall be refunded. The determination or decision will state the amount of the refund and how payment may be accomplished.
- (i) If the determination or decision is that the violation is of such a nature as not to warrant termination of the contract, the contractor may be required to make a refund of cost-share payments or decision shall state the extent of refunds of cost-share payments or grants or payment adjustments. In arriving at the extent of the violation the board must determine (1) whether the violation was deliberate or within the control of the contractor; (2) the effect on the program if no refund or payment adjustment is required; (3) the extent to which the contractor benefited by the violation; (4) the effect of the violation on the contract as a whole; and (5) other pertinent considerations including the appropriateness and reasonableness of the refund or payment adjustment.

5.17 Compliance with Regulatory Measures

Cooperators who carry out conservation practices shall be responsible for obtaining the authorities, rights, easements or other approvals necessary to the carrying out and maintenance of the conservation practice in keeping with applicable laws and regulations. Cooperators shall save the SUCB harmless from any infringements upon the rights of others or from any failure to comply with applicable laws or regulations.

5.18 Appeals

Any contractor may request the contracting officer to reconsider prior to the execution of the contract by the contractor, any determination made by him affecting the contract except this may not include development of eligible conservation practices, cost-share rates and average costs. Such requests shall be in writing and shall be filed within 15 days after receiving notice of such determination. A contractor shall be deemed to have received notice of the determination

if a letter, form, or other document has been mailed or delivered to him which discloses such determination. The contracting officer shall notify the cooperator of this decision in writing (by mailing or by delivery of the decision) within 30 days after the filing of the written request for reconsideration.

If the cooperator is dissatisfied with the decision of the contracting officer, he may within 15 days after receiving written notice of the decision file a written appeal with the SWCD Board. The SWCD Board shall notify the cooperator of its decision in writing (by mailing or by delivery of the decision) within 30 days after filing of the appeal. If the cooperator fails to request reconsideration of a determination by the contracting officer or fails to appeal from a decision of the contracting officer, within the 15 days period, the determination of decision of the contracting officer shall be final.

The contracting officer may submit statements or briefs, including a review of the case, to the SWCD Board.

Whenever the regulations in this section require the filing of a document, it is deemed filed when received, in the SWCD office.

5.19 Access to Operating Unit and Program Records

Any authorized representatives of the SWCD and U.S. EPA, for the purpose of ascertaining the accuracy of any of the representations made in or in connection with or leading up to any contract entered into hereunder and the entering into any contract of the performance of the terms and conditions of such contract shall have the right to enter the operating unit at any reasonable time in order to measure the acreage, to render technical assistance, to inspect the work undertaken under any contract and to examine any program records pertaining to the operating unit and the cooperator shall furnish such information relating to the operating unit as may be requested by authorized representatives of the Board.

5.20 Procedure for Individual Farm Contracts

The following procedure will be used for developing individual contracts.

- (a) The individual cooperator will sign up as a cooperator with the, Allen County Soil & Water Conservation District. The basic agreement allows the District representatives to provide assistance.
- (b) The District will assist the cooperator in developing a plan of operations, which will identify all conservation practices needed on the land. The plan will be approved by the U.S. EPA's project officer.

- (c) The individual plan of operations will be valid from October 17, 1972 through September 30, 1977.
- (d) On the basis of the plan of operations, the district will enter into a contract with the individual cooperators to provide cost-share assistance for the application of conservation practices on the land. The conservation practices to be applied will be outlined in the plan of operations giving the estimated cost-sharing amount to be provided by the district in the year the practice(s) will be installed. All payments will be made on certification by the Soil Conservation Service that the installation meets the technical guide specifications. Cost-sharing will be based on the percentage determined by the district, and approved by the U.S. EPA's project officer.
- (e) Each conservation practice in the individual plan of operations will be considered a contract item and must be certified by the appropriate Soil Conservation Service representative before payment can be authorized. If the estimated contract item cost is equal to or exceeds \$2500.00, the bidding procedure will be used as outlined in group contracting.
- (f) If the cost of the contract item is equal to or exceeds \$2500.00 the bidding procedure will be used, and a Soil Conservation Service representative will develop the plans and specifications for the work to be performed for the individual to advertise for a contractor. The design will be developed from field surveys and engineering design criteria established by the Soil Conservation Service, and approved by the U.S. EPA's project officer, before contractors are notified of bid opening date.
- (g) Notification of contractors of bid opening date will be by public advertisement.
- (h) The individual farmer may request assistance from the district in preparing the advertisement to prospective bidders advising the contractor of the date to pick up their bid packet and also notify the contractor of the date of the bid opening and selection date of the successful bidder.
- (i) A listing of potential bidders will be prepared and updated periodically by the Allen County Surveyors Office, and the Allen County Soil & Water Conservation District.
- (j) Notices to the prospective bidders will contain (bidder's packet):
 - (i) Brief outline of the work.
 - (ii) Estimated cost range.

- (iii) Bond requirement
- (iv) Bid notice will be a minimum of fourteen (14) days from the time the bid notice goes out until the contract bids are open. The U.S. EFA's project officer will approve the bid before the contract is let
- (v) A bond of 1-1/4 times the contract price will be required
- (k) An SCS representative will be placed in charge of supervising the installation of all conservation practices in the contract.
- (l) Upon completion and certification of the contract practice installation, the district will make payments based on the cost-sharing schedule, (sub-section 9.6) payment will not exceed the amount in the individual plan of operation.
- (m) The individual cooperator will provide the district contracting officer with bills covering installation costs in order to receive cost-sharing payment.

5.21 Conservation Materials or Services

Conservation materials or services needed by cooperators to carry out their contracts will be obtained or contracted for by the cooperator.

5.22 Materials and Services, Inspection and Analysis

Conservation materials or services, used for installing practices to be cost-shared must meet the quality standards set forth in the SCS Technical Guide.

5.23 Procedure for Group Contracting

The following procedure will be used for developing group contracts:

- (a) The group members first will sign a cooperative agreement with the District, which allows the district representatives to provide assistance
- (b) The district will then assist the group in developing a plan of operations which will identify all conservation practices needed on their land
- (c) On the basis of this plan of operations, the district will enter into a contract with the group to provide cost-sharing assistance for the application of conservation practices on their land. These conservation practices will be outlined

in the plan of operations spelling out the estimated cost sharing amount to be provided by the District in the year the practice(s) will be installed. All payments will be made on certification by the Soil Conservation Service that the installation meets the technical guide specifications. Cost sharing will be based on the percentage determined by the District and applied to the actual cost not to exceed the SCS representative's estimate.

- (d) The Soil Conservation Service will develop the plans and specifications for the work to be done for use by groups in advertising for a contractor. This design will be developed from field surveys and engineering design criteria established by the Soil Conservation Service, and approved by the U.S. Environmental Protection Agency before contractors are notified through local advertisements of the bid opening date. A list of responsible bidders will be prepared and updated periodically by the Allen County Surveyors Office and the Allen County Soil and Water Conservation District.

The group with assistance from the District, if requested, will prepare the bid advertisement and select the bid opening date. In the notice to the prospective bidders a brief outline of the work to be done and estimated cost ranges and a bond requirement will be stated. The individual or group will always provide the contractor with a minimum of fourteen (14) days notice from the time the bid notice goes out until the contract bids are open. The U.S. EPA will approve the bid before the contract is let. The award of the contract will be made to the responsible bidder submitting the lowest responsive bid. The contractor who is selected to do the work will be required to provide a bond in the amount of 1-1/4 times the contract price. This bond will be payable to the respective individual or group, not to the District. A representative of the Soil Conservation Service will be placed in charge of supervising the installation of all conservation practices in the contract. Upon completion and certification of practice installation, the District will make payments based on the cost sharing rate set up in the plan of operations. Cost sharing will be based on actual cost not to exceed the engineers estimate.

Section VI
COST-SHARE

Cost-share incentives will be made to individuals and groups to encourage application of various conservation practice to the land.

6.1 Eligible Conservation Practices

The list of soil and water conservation practices for the BCSA are described on pages A-41 through A-46 of the work plan and are listed in Table A-10 of that document. These practices are eligible for cost-shares when carried out in combination as set forth in plans of operations for the primary purpose of protection against wind or water erosion and reducing or controlling anti-cultural related pollution, these are:

(a) Conservation Cropping System

Growing crops in combination with needed cultural and management measures. Cropping systems include rotations that contain grasses and legumes as well as rotations in which the desired benefits are achieved without the use of such crops.

(b) Contour Farming

Farming sloping cultivated land in such a way that plowing, preparing and planting, and cultivation are done on the contour. (This includes following established grades of terraces, diversions, or contour strips).

(c) Critical Area Planting

Stabilizing silt-prone areas and cover deterioration by establishing vegetative cover. This includes tree plants, such as trees, shrubs, or vines, and planted grasses or legumes established. (Does not include tree planting mainly for the production of wood products).

(d) Crop Residue Management

Using plant residues to protect cultivated fields during critical erosion periods.

(e) Diversions

A channel with a converging ridge on the lower side constructed across the slope.

(f) Farmstead and Feedlot Windbreaks

A belt of trees or shrubs established next to a farmstead or feedlot.

(g) Field Border Planting

A border or strip of perennial vegetation established at the edge of a field by planting or by converting from trees to herbaceous vegetation or shrubs.

(h) Field Windbreaks

A strip or belt of trees or shrubs established to reduce wind erosion.

(i) Grade Stabilization Structure

A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include stream channel improvement, streambank protection, diversion, or structure for water control).

(j) Grassed Waterways

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose of runoff from a field, diversion, terrace or other structure.

(k) Holding Ponds and Banks

A fortified pit or are or one made by constructing a pit dam or embankment for temporary storage of animal or agricultural waste, associated runoff and waste water.

(l) Land Reclamation

Restoration of land to the land surface by use of natural or artificial means.

(m) Land Use Restriction

Exclusion of livestock from an area where grazing is not permitted.

(n) Livestock Handling Facility

A group of structures and related devices for water control to facilitate handling of livestock.

(o) Planting Schedule

Timing the sequence of cultural operations to only those operations which are essential to produce a crop of maximum yield per acre. (For this project schedule will be determined by the contractor).

(p) Pasture and Hayland Management

Proper treatment and use of pastureland or hayland.

(q) Pasture and Hayland Planting

Establishing and re-establishing long-term stands of adapted species of perennial, biennial, or reseeding forage plants. (Includes pasture and hayland renovation, does not include grassed waterway or outlet on cropland).

(r) Ponds

A water impoundment made by constructing a dam across a watercourse or a natural basin, or by excavating a pit or "dugout." (Such ponds do not include spring development or irrigation reservoirs).

(s) Protection During Development

Treatment based on a plan to control erosion and sediment during development for residential, commercial-industrial, community services, transportation routes or utility uses.

(t) Recreation Area Improvement

Establishing grasses, legumes, vines, shrubs, trees, and other plants or managing woody plants to improve an area for recreation.

(u) Sediment Control Basins

A barrier or dam constructed across a watercourse or at other suitable locations to form a silt or sediment basin.

(v) Stream Channel Stabilization

Stabilizing the channel or a stream with suitable structures. (Includes 90,000 feet, fencing; 6,000 feet structural stabilization).

(w) Streambank Protection

Stabilizing and protecting banks of streams or excavated channels against scour and erosion by the use of vegetative or structural means.

(x) Stripcropping

Growing crops in a systematic arrangement of strips or banks on the contour to reduce erosion.

(cc) In-field Drain

Drainage control for collecting excess water within a field. This project include graded waterway or outlet.

(c) Ditchway, or Ditch

An earthen embankment or a ridge and channel constructed across the slope at a suitable opening and on an acceptable grade to reduce erosion and pollution in intervening surface and conducting it to a stable outlet.

(a) Terrace, Spill

An earthen embankment or a ridge and channel constructed in parallel across the slope at a suitable spacing and acceptable grade to reduce erosion and pollution and provide a more suitable terrace system.

(ii) Tile Drains

A conduit, such as tile, pipe or tubing, installed beneath ground surface and which collects and/or conveys drainage water. The project goal is approximately 200,300 linear feet which is needed for erosion and sediment control of surface erosion and graded waterways.

(cc) Tree Planting

Planting tree seedlings and cuttings.

(dd) Wildlife Habitat Management

Retaining, creating, or managing wildlife habitat for both upland and wetland.

(ee) Woodland Improved Harvesting

Systematically removing some of the merchantable trees from an immature stand to improve the conditions for forest growth.

(ff) Woodland Improvement

Improving woodland by removing unmerchantable or unwanted trees, shrubs, or vines.

(gg) Woodland Pruning

Removing all or parts of selected branches from trees to improve timber quality.

6.2 Basis for Cost-Sharing

Cost-sharing may be on the basis of (1) average cost, or (2) actual cost not to exceed a specified maximum cost as set forth in the Table A-10 of the work plan and current specifications for the practices including cost-sharing procedures, see Exhibit.

Each identifiable unit to be cost-shared must be clearly identifiable in the plan of operations (Form BCS-2).

6.3 Average Cost and Specified Maximum Costs

Average cost and specified maximum cost shall be reviewed annually and must be approved by the SWCD.

County average cost and specified maximum costs shall be reviewed for a twelve month period, and shall be approved no later than January 31 each year.

Necessary changes in average costs and specified maximum costs shall be approved as deemed necessary by the SWCD. Generally, changes shall not be made in average costs unless actual costs have increased or decreased by 10% or more.

6.4 Determination of Average Costs

The basic element in the determination of an average cost is the actual cost to cooperators. Data on actual costs shall be collected on a continuing basis, from cooperators, by SCS technicians and the project director. Actual costs data must be collected on a representative number of jobs on all eligible practices. Such data need not be collected on all jobs. In the determination of average costs, information from suppliers, land grant colleges, and other sources may be considered in addition to data collected from cooperators. All cost data used in determining average costs, must be submitted to the office where the average costs are determined.

6.5 Specified Maximum Costs

When practices are to be cost-shared on an actual cost basis, and exceed a specified cost, a maximum amount to which cost-sharing may be eligible, shall be entered in the average cost column of the plan of operations for each identifiable unit of the practice.

The specified maximum cost shall be an amount not in excess of that considered by the SWCD to be a sound investment for the cooperator and the government, all factors considered.

6.6 Changing the Rate or Amount of Cost-Sharing

The SWCD will review cost-share rates annually and when if change affects practices not yet installed a contract modification will be needed to reflect the changes.

Section VII
PAYMENTS

7.1 Cost-Share

The procedure for cooperators to receive cost-share payment is as follows:

- (a) The cooperator makes an application for cost-share when the work is completed. Application is made on Form BCS-5, see exhibit. At the same time, he submits the necessary bills, invoice or other materials as prescribed by the contracting officer. He completes and signs an in-kind or cash contribution report, SBA-363, see exhibit.
- (b) The contracting officer notifies SCS that the work has been completed. SCS representatives then certify that work has been done as planned and according to standards and specifications.
- (c) After the work has been certified by SCS, the contracting officer prepares a voucher for payment and submits it to the SWCD.
- (d) The SWCD reviews the vouchers and approves them.
- (e) The contracting officer then makes out and mails or delivers a check to the cooperator.

It is the responsibility of the producer to make application for any cost-share payment that is due him on or before June 30, of the year following the calendar year in which the identifiable unit was applied or installed on the land.

Cost-share payments may be made only after an identifiable unit is carried out. "Carried out" means applied on the land. Cost-share payments may not be made for unapplied materials, or services that partially complete an identifiable unit of a practice.

Cost-share payments may not be made for a completed identifiable unit that is dependent upon the performance of a practice that failed to meet specifications. For example, a livestock watering facility that is supplied by a pond, not meeting specifications, will not be eligible for cost-share. In cases of this nature, the cooperator must be informed by an explanation to be included on the Form BCS-7, see exhibit, issued as a result of the practice not meeting specifications.

Cost-share payments may not be allowed for any work performed prior to the date the contract is signed by the Cooperator.

Payments must be drawn in the names of the cooperator signatory to a contract.

7.2 Cost-Share Payments

Cost share payments shall be made at cost-share rates applied in the contract.

(a) Cost share payments are made for carrying out identifiable units and are conditioned upon approval of the certificate of performance and compliance by the SCS representative. Upon certification by SCS the cooperator shall submit on an approved form an application for payment to the SWCD.

(b) A cooperator is not eligible to receive cost-share payments under the program for an identifiable unit which was not or is not to be carried out under this program.

7.3 Cost-Share for Groups

Due to the generally more complex and costly nature of group projects, they will be considered as special projects and will be subject to written approval by both the project administrator and project officer of EPA. Special cost-share rates and amounts will be subject to review and approval by the EPA project officer.

7.4 Cost-Share Payments not Subject to Claims

Any cost-share payment, or portion thereof, due any cooperator hereunder shall be determined and allowed without deduction of claims for advances and without regard to any claim or lien against any crop, or proceeds thereof.

7.5 Filing of False Claims

No cooperator shall file a claim for a cost-share payment to which he knows he is not entitled under the provisions for the program, including claim for a cost-share payments not carried out or for eligible conservation practices carried out in such a manner that they do not meet the required specifications thereof, and the filing of any such claim shall constitute violation of the contract.

7.6 Manner and Time of Cost-Share Payments

Cost-share payments shall be paid to the cooperator after he has carried out an identifiable unit of his plan of operations and arrangements therefor shall be made by the SWCD. Payments shall be made as soon as practicable after the unit is carried out and the extent of performance has been established. It shall be the responsibility of the cooperator eligible for cost-share payments to establish his claim to such payments. Cost-share payments for identifiable units carried out under the program will be made only upon application submitted on the form prescribed to the SWCD. Such application shall be filed within 90 days after the identifiable unit was carried out.

7.7 Payments Due Persons, Deceased, Disappeared, or Declared Incompetent

Death: Where any person who is otherwise eligible to receive a cost-share payment dies before payment is received, payment may be made upon proper application therefore, without regard to claims of creditors in accordance with the following order of precedence.

- (a) To the administrator or executor of the deceased person's estate.
- (b) To the surviving spouse, if there is no administrator or executor and none is expected to be appointed, or if an administrator or executor was appointed but the administration of the estate is closed (i) prior to application by the administrator or executor for such payment, or (ii) prior to the time when a check, draft or certificate issued for such payment to the administrator or executor is negotiated or used.
- (c) If there is no surviving spouse, to the children of the deceased person in equal shares. Children of a deceased child or a deceased person shall be entitled to their parent's share of such payment, share and share alike. If there are no surviving children of a deceased child or such deceased person, the share of such payment which otherwise would have been made to such child of the deceased person shall be divided equally among the surviving children of the deceased person and the estates of any deceased child where there are surviving direct descendants.
- (d) If there is no surviving spouse and no direct descendant, payment shall be made to the father and mother of the deceased person in equal shares, or the whole thereof of the surviving father or mother.
- (e) If there is no surviving spouse, or direct descendant, and no surviving parent, payment shall be made to the brothers and sisters of the deceased person on equal shares, children of a deceased brother or sister shall be entitled to their parent's share of the cost-share payment, share and share alike. If there are no surviving direct descendants of the deceased brother or sister of such deceased person, the share of the payment which otherwise would have been made to such brother or sisters shall be divided equally among the surviving brothers or sisters of such deceased person and the estates of any deceased brothers or sisters where there are surviving direct descendants.
- (f) If there is no surviving spouse, direct descendants, parent, or brothers or sisters or their descendants, the payment shall be made to the heirs-at-law in accordance with the law of the state of domicile of the deceased person. If any person who

is entitled to payment under the above order of precedence is a minor, payment of his share shall be made to his legal guardian, but if no legal guardian has been appointed, payment shall be made to his natural guardian or custodian for his benefit, unless the minor's share of the payment exceeds \$1,000.00 in which event payment shall be made only to his legal guardian. Any cost-share payment which the deceased person could have received may be made jointly to the persons found to be entitled to such payment or shares thereof under this section. A separate check may be issued to each person entitled to share in such payment.

7.8 Disappearance

(a) In case any person otherwise eligible to receive a cost-share payment disappears before receiving payment, such payment may be made upon proper application therefore, without regard to claims or creditors to one of the following in the order mentioned:

- (i) The conservation or liquidator of his estates, if one be duly appointed
- (ii) The spouse
- (iii) An adult son or daughter or grandchild for the benefit of his estate
- (iv) The mother or sister for the benefit of his estate
- (v) An adult brother or sister for the benefits of his estate
- (vi) Such person as may be authorized under state law to receive payment for the benefit of his estate.

(b) A person shall be deemed to have disappeared if (i) he has been missing for a period of more than 6 months, (ii) a diligent search has failed to reveal his whereabouts, and (iii) no person has not communicated within such period with other persons who could be expected to have heard from him. Evidence of such disappearance must be presented to the JUDGE in the form of a statement executed by the person making the application for payment, setting forth the above facts, and must be substantiated by a statement from a disinterested person who is well acquainted with the person who has disappeared.

(c) Interpretation: Where any person who is otherwise eligible to receive a cost-share payment is declared incompetent by a court of competent jurisdiction before payment is received, payment may be made, upon proper application therefore, with-

out regard to claims of creditors to the guardian or committee legally appointed, payment, if not more than \$1,000.00 may be made without regard to claims for creditors to one of the following in the order mentioned for the benefit of the incompetent person:

- (i) The spouse
 - (ii) An adult son, daughter or grandchild
 - (iii) The father or mother
 - (iv) An adult brother or sister
 - (v) Such person as may be authorized under state law to receive payment for the incompetent.
- (d) Application to Heirs: In case any person entitled to apply for a cost share payment pursuant to the provisions of this section, dies, disappears, or is adjudged incompetent, as the case may be, after he has applied for such payment but before payment is received, payment may be made upon proper application therefore, without regard to claims or creditors to the person next entitled thereto in accordance with the order of precedence set forth herein.
- (e) Definitions: As used in this subsection, the term "person" when relating to one who dies, disappears, or becomes incompetent, prior to receiving payment, means an individual cooperator who is due a cost-share payment pursuant to these regulations. "Children" shall include legally adopted children who shall be entitled to share in any cost-share payment in the same manner and to the same extent as legitimate children of natural parents. Brother or sister when relating to one who, pursuant to the regulations, is eligible to apply for a cost-share payment which is due a person, who dies, disappears, or becomes incompetent prior to the receipt of such payment, shall include brothers and sisters of the half blood who shall be considered the same as brothers and sisters of the whole blood.

7.9 Successors in Interest

If during the contract period all or a part of the right and interest of any cooperator signatory to the contract in the operating unit is transferred by sale or otherwise, the contract shall terminate as to such cooperators with respect to the acreage which has been transferred. In the event of such termination the cooperator whose right and interest is transferred shall forfeit all rights to further cost-share payments or grants made to him under the contract with respect to such acreage unless the transferee who acquires his right

and interest in such acreage is or becomes a party to a contract which will assume all obligations of the cooperator under, the contract.

The contract shall remain in full force and effect in accordance with the original terms and conditions of the contract with respect to the right and interest remaining to the cooperator. The contract may be modified by the contracting officer and the cooperator signatory to the contract, to reflect the changes, if any, brought about by the transfer, in the event necessary modifications cannot be agreed to with the contracting officer. The cooperator shall refund all cost-share payments or grants theretofore made to him with respect to his remaining right and interest in the operating unit and to the cooperator in the contract. If this refund occurs, the cooperator would have no further rights or obligations under the contract.

Section VIII RESEARCH PROCEDURES

This section sets forth the basic field and laboratory analytical procedures to be followed in the project described in this document and in the plan of work Environmental Impact of Land Use on Water Quality (EPA-G005103). It is supplemental to rather than a replacement for the basic discussion of that document.

The laboratory and field procedures described in this section represent those it is believed will be most appropriate to the work to be carried out in the project. For example, laboratory procedures described in Section 8.4 are believed to be those most appropriate to the concentrations of particular substances expected to be found in the samples collected on this project. If information developed during the course of the project reveals that initial estimates were not correct, changes in procedures and techniques may have to be made to take into account the unexpected results. In that case, this handbook should be considered a guide rather than a definitive statement which is subject to neither change nor deviation.

Already, some changes in the basic thrust of the study have been considered. For example, the initial objective of the biological monitoring program was to assess the effects of land treatment practices on the biota; however, as work has progressed, the effects of the biota on the watershed have become very interesting. A surprising abundance and diversity of fish have been identified in the various tributaries of Black Creek. This observation is interesting from a biological standpoint, and changes in these populations will no doubt be recorded during the course of the project. The effects of the fish on the watershed and on the sampling process are particularly interesting also. During normal to low flow periods, the fish become concentrated in pools. These pools are often located below bridges where the samples are most often collected. Thus, samples taken during low flow periods were found to contain unrealistically high levels of turbidity due to activity of fish and of muskrats. Furthermore, the activity of the muskrats along the stream banks may have a profound influence on bank stability and erosion problems within the ditches. Consequently, an effort will now be made to determine both the effects of the watershed on the biota and the effects of the biota on the watershed and sampling methods employed.

Sampling is, of course, a fundamental problem in any monitoring program of the type planned for Black Creek. At the present state of the art, quantitative data will certainly not be as accurate as could be desired. The data collected will, however, be precise enough so that it is useful for comparison of results before and after treatment. Efforts are being made to obtain a useable automated sampling device.

Sections 8.1 and 8.2 set forth a summary of the basic questions being investigated during this project and the basic techniques that are being employed. A more complete discussion of these factors is contained in the work plan.

8.1 Goals of the Project Research

The following questions are identified for study in the Black Creek Project:

- (a) Can a concentrated application of land treatment achieve a desired reduction of sediment in the Mauree Basin and Lake Pine?
 - (i) What is the estimated cost?
 - (ii) Can cost be accurately correlated with improvement in water quality?
- (b) What is the relationship between sedimentation and the nutrients that accelerate eutrophication?
 - (i) Is the phosphorus composition of the colloidal sediment typical of the Mauree Lake Plain significantly higher than sediment containing larger amounts of sand and silt?
 - (ii) What is the contribution of erosion and sediment transport from various soil types to NO_3 concentrations of runoff waters?
 - (iii) What is the availability of phosphorus and nitrogen in runoff and stream waters to algae?
 - (iv) Are nitrogen and phosphorus liberated from or absorbed by sediment over time?
- (c) What is the relative importance of raindrop energy to runoff in detaching soil material for transport in Mauree Basin soils? What is the relationship of quantity of surface flow to detachment and transport?
- (d) What are the contributions of various types of erosion (i.e. sheet, gulley, ditch bank, etc.) to sediment load?
- (e) What are the effects of the project on biological components of the Black Creek Watershed? Conversely, what are the effects of the biota on erosion?
- (f) What kind of program could be carried out on a basin-wide basis to convince individual landowners to apply needed conservation practices?
 - (i) What are the attitudes toward the environment and conservation?
 - (ii) What are the key factors that lead to a determination to participate in the project?

8.2 Techniques for Study

The techniques for study of these questions and the applications of these methods to the Black Creek Project are outlined below.

- (a) An accelerated program of land treatment will be carried out in accordance with the procedures outlined in the preceding sections of this handbook with conservation practices designed in accordance with the Universal Soil Loss Equation.
- (b) Monitoring of Black Creek and its tributaries for various parameters will be carried out. Data collected will be in the following categories:
 - (i) Surface and Subsurface water samples
 - (ii) Rain water samples
 - (iii) Water stage recorder data
 - (iv) Recording rainrage data
 - (v) Field notes
- (c) Laboratory analysis of the samples will be performed to measure:
 - (i) Organic Carbon
 - (ii) Phosphorus
 - (iii) Nitrogen
 - (iv) Calcium
 - (v) Magnesium
 - (vi) Sodium
 - (vii) Potassium
 - (viii) Heavy metals
 - (ix) pH, conductivity, dissolved oxygen, alkalinity
- (d) Additional laboratory work will be done to study the equilibria of nitrogen and phosphorus in sediment.
- (e) A series of experiments on trial plots using simulated rainfall will be conducted and the results analyzed to determine:
 - (i) The relative importance of raindrop energy and runoff energy in soil detachment and transport.
 - (ii) The effects of various cultural practices on erosion and sedimentation.
 - (iii) the effects of winter cover crop on erosion and sedimentation.
 - (iv) The effects of conservation tillage systems on erosion and sedimentation.
- (f) A computer simulation model will be developed based on data collected in the project and utilizing the Universal Soil Loss Equation in an attempt to relate model coefficients to physical constants.
- (g) Biological components of the watershed will be studied, primarily fish and insect life with general surveys being undertaken of other aspects of the biota.

(b) A sociological study will be conducted aimed at measuring the potential effectiveness of:

- (i) Legislation
- (ii) Education
- (iii) An incentive program

in securing the cooperation of landowners in Black Creek Watershed and the Maumee Basin in a program of improvement of water quality through reduction of erosion.

8.3 Monitoring (data collection)

Data that are presently being collected can be classified into the following categories:

- (a) Water samples from:
 - (i) Surface flow
 - (ii) Subsurface flow
 - (iii) Rainfall simulator plots
- (b) Rain water samples
- (c) Water stage recorder data
- (d) Recording rain gauge data
- (e) Field notes

8.3.1 Surface Flow

Sampling will be accomplished on the Maumee River, St. Joseph River, St. Mary's River, Black Creek and its tributary drains, and Wann Drain, which collects runoff from a check area immediately to the east of the Black Creek Watershed.

The rivers will be monitored to determine chemical and sediment concentrations using hand collection techniques according to procedures enumerated in Techniques of Water Resources Investigations of the United States Geological Survey, Book 3, Chapters C1, C2 and C3. Sampling sites will be on the St. Joseph and St. Mary's Rivers above Ft. Wayne and the Maumee River below Ft. Wayne. Reasons for the selection of these sites are (1) to supplement USGS data, (2) to isolate the sediment and chemical load contribution of Ft. Wayne, and (3) to study in particular the St. Mary's River which before entering Ft. Wayne drains mostly agricultural land. Samples to be used will be selected from the Inter-Agency Report "catalogue" (Federal Inter-Agency Sedimentation Project Report, 1966). Use of standard equipment and techniques will allow for a more reasonable comparison of data collected at these and other points in the Maumee Basin by other agencies.

Monitoring techniques for Black Creek and its tributary drains and the Wann Drain will differ from those used on the rivers because of the intermittent nature of these streams and the relatively short time to peak flow for the discharge hydrographs. For these reasons, strategically placed pumping sampler (IS-69) as developed by the Federal Inter-Agency Sedimentation Project will be used to automatically collect suspended sediment and chemical samples from the flowing streams. In addition, these samples will be supplemented by hand collected samples at intermediate and secondary sites throughout the Black Creek Watershed and the drainage area for the Wann Drain.

Samples to be collected by the automatic pumping sampler will be taken from the suspended load portion of the stream discharge using a float device. Comparison of the sediment concentration will be made to determine what correction factor if any will be necessary to apply to the singular point values.

Presently fourteen active surface water quality monitoring sites are in operation in the Black Creek Watershed and the drainage area connected with Wann Drain. Seven of these sites are at control sections of a stream or reservoir at which discharge measurements will be made. At the control sections, the surface stage measurements are continuously monitored using pressure-actuated stage recorders. The control sections on the streams have been improved by installing low flow weirs either constructed from sheet piling or steel plating. Calibration of stage with discharge will be accomplished using standard stream gaging equipment and techniques.

For each hand sample, two 500 ml aliquots of discharge are collected at each site. One 500 ml aliquot is frozen unfiltered immediately on return to the field laboratory located within the confines of Black Creek Watershed. About 200 ml of the other aliquot is filtered through a 0.45 μ pore-sized, acid (0.1N HCl) rinsed filter before being frozen. The remainder is used to determine the pH, dissolved oxygen, turbidity, and alkalinity if these parameters have not already been determined by the sampling sites.

In addition to the above surface water sites, several more will be installed at point pollution sources in the watershed and on sediment collection basins as they are constructed.

8.3.2 Subsurface Flow

Extensive subsurface drainage systems have been installed in the Maumee Basin to make the heavy, relatively poorly drained soils of the basin suitable for agriculture.

Subsurface flow will be monitored for chemical and sediment discharge using IS-69 automatic samplers. A minimum of three subsurface drainage systems which drain representative soil groups in the basin will be selected. Pumping facilities near the present outfalls are needed to alleviate backwater problems. Pumps to provide temporary storage of discharge will be calibrated so that a stage chart recording the pumping cycle will then provide a measurement of discharge.

Water samples will be treated similar to the surface flow sample described in the previous section.

8.3.3 Simulated Rainfall Plot Samples

Three sets of samples are collected from each simulator test site:

- (a) Nutrient analysis
- (b) Determination of total sediment and its physical composition.
- (c) Detailed phosphorus analysis

The samples for the first two of these uses are treated in the same manner as those described in Section 8.3.1. Samples for detailed phosphorus analysis are bulk runoff samples amounting to four liters per individual test storm.

The water applied during the operation of the rainfall simulator is determined from samples from small tributary channels placed diagonally across each plot. Runoff is recorded by a water level recorder on a small calibration flume. Samples for nutrient and nutrient analysis are collected by a sampling plot on a small retention pool. A more detailed description of the operation of the rainfall simulator is contained in Appendix 2.7.

8.3.4 Rainwater Samples

There are two additional rain water quality monitoring sites. Rain is collected and stabilized chemically. Samples are extracted and frozen for return to Purdue for analysis for nitrate, phosphate, sulfate and pH.

8.3.5 Water Stage Recorders

The water stage recorders, the use of which was described in Section 8.3.1, are now operated units which measure the water stage by noting the pressure required to allow bubbles to rise to the surface. The use of calibrated control sections in stream channels allows the recorded water stage to be related to discharge.

8.3.6 Recording Rainages

A relatively dense network of recording rain gauges has been established in such a way that neither natural nor man-made factors will interfere with the action of the gauges. The network has been established to measure rain on the ground, the nature and extent of distribution of rain.

Data is being recorded in flood control basins. The gauges have been established for the 12,000 acre catchment area of the flood control basins.

during the spring, summer, and fall when intensive thunderstorms are most likely. During the colder months, when precipitation has a more uniform areal distribution, the number of gages in operation is reduced. At least two gages will be operated in the winter and they will be prepared for full-winter operation including the collection of snow.

It is desirable to have shielded gages; however, it is not believed that the additional precision obtainable with shielded gages is necessary for the objectives of this project, particularly when it is considered that many individual landowners find the bulky shield mechanism objectionable when it is located near farm buildings or residences and are much less willing to give permission for the installation of a shielded raingages.

Calibration of each gage is checked after installation. It will be rechecked annually. Servicing of the gages is on a four to five day schedule. This service frequency provides good timing accuracy.

When the gages are serviced, charts are removed and sent to Purdue. Daily rainfall amounts for each gage are recorded.

8.3.7 Field Notes

The Purdue project coordinator is responsible for preparation of a detailed set of field notes. Although these notes are not of quantitative use, they are extremely useful for explaining anomalies in data that may result from extremely localized unusual weather or field conditions.

.4 Laboratory Analysis

Water quality samples collected from the systems outlined in the preceding section will be analyzed at the Purdue Field Laboratory at the town of Harlan and in the Water Quality Laboratory established in the Agronomy Department at Purdue University. Analyses of samples are as outlined on Figures 8-1, 8-2, and 8-3. Basically, analyses for suspended solids, N components, P components, and organic carbon will be emphasized. These indices of water quality were selected for the following reasons:

- (a) Suspended solids is the basic parameter which will be used in this study to assess decreases in sediment loads in streams through use of soil conservation practices. Suspended solids lower water quality and usefulness of water resources by increasing the cost of purifying drinking water, decreasing desirability of water for recreation, interfering with food supply and reproduction in some game fish, promoting siltation of lakes, reservoirs, harbors, etc., and causing excessive wearing of metal parts in hydroelectric generating plants.

- (f) Nitrogen content of water is important because nitrate in drinking water may impair the health of infants and ruminant livestock at concentrations greater than 10 mg-N/l (MPPS standard). In addition, available forms of N such as ammonium and nitrate may promote excessive growth of algae and aquatic weeds (eutrophication) in surface waters when concentrations exceed about 0.5 mg-N/l . It is important to measure the amount of nitrogen in the sediment phase because the N may be released to the water phase by microbial activity.
- (g) Measurement of the phosphorus components in water samples is necessary because P has been identified as the element most often limiting algae growth in aquatic environments. Therefore, any influx of P may promote luxurious growth of algae. Although dissolved forms of P are most available to aquatic plants, it is mandatory that the P content of sediment is determined to estimate the potential size of the P source which could be liberated to the water phase.
- (d) Organic carbon is a useful water quality parameter from several standpoints. The level of dissolved organic C provides an index of the trophic state of the water, indicates the size of the "energy pool" available to heterotrophic aquatic microorganisms, and provides information on the source of contamination, i.e. agricultural runoff or sewage discharge.

In addition, analyses for water temperature, dissolved oxygen, turbidity, pH, and alkalinity will be made at the time of sampling or immediately following sampling. Periodic measurements of K, Ca, Mg, Na, organochlorine pesticides, and selected heavy metals will be made on some samples to determine if any unusual conditions exist within the watershed. Follow-up samples will be taken if some unusual concentrations of the above listed elements or compounds are detected.

Methods to be employed are those specified in the Environmental Protection Agency publication Methods for Chemical Analysis of Water and Wastes published in 1971 or those in the following section of this handbook. Methods were chosen on the basis of those which are most suitable from the standpoints of precision, accuracy, and efficiency for the range of concentrations expected in the watershed samples. All methods were evaluated for suitability prior to adoption in the laboratory.

4.1 Laboratory Methods

The following are laboratory methods currently in use at the Water Quality Laboratory in the Purdue University Agronomy Department.

4.1.1 Nitrogen

- (a) Total soil nitrogen

1. Place 200 mg. soil samples (<100 mesh) into clean, dry Folin-Wu digestion tubes.
2. Add 1.1 g. of Kjeldahl catalyst mixture (Kjeldahl spatula).
3. Add 3 ml. of concentrated H_2SO_4 and swirl to mix.
4. Place digestion tubes into aluminum block preheated to $350^\circ C$. and place small glass funnels in the mouth of the tubes.
5. Heat samples at maximum setting on hot plate for 3 hours after digest clears.
6. Remove and cool.
7. Dilute to 50 ml. with deionized water and mix with a vortex mixer.
8. Transfer an aliquot of diluted digest containing from 0.2 to 0.5 mg. of N to a 100 ml. distillation flask without side arm.
9. Add 15 ml. of 10N NaOH through funnel on distillation apparatus.
10. Distill into a 50 ml. Erlenmeyer flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask is collected).
11. Titrate the distillate with sulfuric acid (standardized) to a pale grey.

(If material containing <.2%N are analyzed, a soil sample equivalent to 0.2 to 0.5 mg. N is digested. Samples with low N are not diluted but are transferred quantitatively to a distillation flask, using deionized water to rinse the digestion tube.)

(b) Inorganic Nitrogen-Water

Ammonium:

1. Pipette a 25 ml. aliquot of filtered water in a 100 ml. distillation flask with side arm.
2. Add 0.2 g. ignited MgO (MgO spatula).
3. Distill into a 5 ml. Erlenmeyer flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask is collected).

4. Titrate the distillate with standardized sulfuric acid to a pale grey.

Nitrate:

5. To the sample above previously treated with MnO add 0.2 g. of Devardas Alloy (D.A. spatula).
6. Distill and titrate as before.

(25 ml. deionized water will be used as a blank).

(c) Total Nitrogen - Water

Filtered Water:

1. Pipette 20 ml. of filtered water into a digestion tube.
2. Add 200 mg. of reduced iron and 0.3 ml. (5 drops) of concentrated sulfuric acid.
3. Evaporate the sample (to remove water) in the oven overnight at $105^{\circ}C$.
4. Remove and cool.
5. Add 3 ml. of concentrated sulfuric acid and heat sample to a gentle boil with the funnels on for 15 minutes in the aluminum block in the hood.
6. Remove, cool, and add 1.1 g. of Kjeldahl catalyst mixture (Kjeldahl spatula).
7. Stir to mix and put on funnel.
8. Digest at maximum heat on the hotplate in the hood 30 minutes past time of clearing of digest.
9. Remove, cool and add 10 ml. of deionized water. Mix with a vortex mixer.
10. Transfer sample to distillation flask without side arm
11. Add 15 ml. of 10N $NaOH$ through funnel on distillation apparatus.
12. Distill into a 50 ml. Brlenreger flask which contains 5 ml. of boric acid indicator till 30 ml. of distillate (max. 45 ml. on the flask is collected).
13. Titrate the distillate with standardized sulfuric acid to a pale grey.

Unfiltered Water:

Repeat the above procedure with unfiltered water.

(20 ml. of deionized water will be used as a blank).

(d) Inorganic Nitrogen - Soil

Ammonium:

1. Place 20 g. of soil into a 250 ml. Erlenmeyer flask.
2. Add 100 ml. of 2N KCL.
3. Stopper and shake for one hour.
4. Let stand 12 hours.
5. Transfer a 20 ml. aliquot of the solution into a distillation flask with side arm using a wide mouth pipette.
6. Add 0.2 g. ignited MgO (D.A. spatula).
7. Distill into a 50 ml. Erlenmeyer flask which contains a 5 ml. of boric acid indicator till 30 ml. of distillate (marked 35 ml. on the flask) is collected.
8. Titrate the distillate with standardized sulphuric acid to a pale grey.

Nitrate:

9. To the sample above previously treated with MgO , add 0.2 g. of Devarda's Alloy (D.A. spatula).
10. Distill and titrate as before.

(20 ml. of 2N KCL will be used as a blank).

$\mu g\ N/4 = ppmN/\bar{g}\ soil$

(e) Catalysts and Reagents

Devarda's Alloy:

1. Ball mill 1 lb. of commercial grade Devarda Alloy for at least 18 hours.

More than 90% should be <300 -mesh.

Kjeldahl Catalyst:

1. Grind 100 g. of potassium sulfate in a mortar and pestle to a coarse powder.
2. Grind 10 g. of copper sulfate in a mortar and pestle to a powder.
3. Mix 1. and 2. in a mortar and pestle.
4. Add 1 g. of selenium to 3. and mix with a mortar and pestle till well mixed.
5. Repeat above until supply is sufficient.

Boric Acid - Indicator Solution:

1. Dissolve 20 g. of pure H_3BO_3 in about 700 ml. of hot water, and transfer the cooled solution to a 1 liter volumetric-flask containing 200 ml. of ethanol and 20 ml. of a mixed indicator solution prepared by dissolving 0.330 g. of bromocresol green and 0.165 g. of methyl red in 500 ml. of ethanol.
2. After mixing the contents of the flask, add approximately 0.05 N NaOH cautiously until a color change from pink to pale green is just detectable when 1 ml. of the solution is treated with 1 ml. of water.
3. Then dilute the solution to volume with water and mix it thoroughly.

Ignited MgO :

1. Heat heavy MgO in the electric muffle furnace at 600° to 700° for 2 hours.
2. Cool the product just enough so that it will not crack a desiccator.
3. Cool to room temperature in a desiccator containing KOH pellets.
4. Store in MgO bottles.

Standardization of Sulfuric Acid for Kjeldahl Distillation:

1. Add 2 ml. of concentrated sulfuric acid to 18 l. deionized water in a carboy and mix thoroughly.
2. Make a 0.01 N THAM standard by weighing accurately a 1.12114g. of THAM and dissolving it in a one liter volumetric flask with deionized water.

3. Pipette 5 ml. of 0.1 N THAM, into a 50 ml. Erlenmeyer flask containing 5 ml. of boric acid - indicator solution.

4. Titrate to the endpoint using the micro burette with the sulfuric acid to be standardized.

Normality of acid = (normality of THAM) x (ml. of THAM) / (ml. of acid).

ug of nitrogen/ml. of acid = (normality of acid) x 14,000.

8.4.1.2 Phosphorus

Phosphorus is measured through the use of a spectrophotometer which is calibrated daily in the Purdue Laboratory utilizing the following calibration procedures:

25 ml. final volume:

- (1) Add from 1 to 10 ml. of 2 ppm. phosphorus solution to 50 ml. digestion tubes.
- (2) Add deionized water to 20 ml.
- (3) Add 5 ml. of Murphy-Riley Ascorbic Acid solution.
- (4) Mix with vortex mixer.
- (5) Read absorbance after 10 minutes at 880 nm.
- (6) Range:

| ml. of 2 ppm P | ppm of P in tube |
|----------------|------------------|
| 1 | 0.08 |
| 2 | 0.16 |
| 3 | 0.24 |
| 4 | 0.32 |
| 5 | 0.40 |
| 6 | 0.48 |
| 7 | 0.56 |
| 8 | 0.64 |
| 8 | 0.72 |
| 10 | 0.80 |

50 ml. final volume:

- (1) Add from 2-20 ml of 2 ppm. phosphorus solution to 50 ml. digestion tubes.
- (2) Add deionized water to 40 ml.

- (3) Add 10 ml. of Murphy-Riley/Ascorbic Acid solution.
- (4) Mix with vortex mixer.
- (5) Read absorbance after 10 minutes at 880 nm.
- (6) Range:

| ml. of 2 ppm P | ppm. of P in tube |
|----------------|-------------------|
| 2 | 0.08 |
| 4 | 0.16 |
| 6 | 0.24 |
| 8 | 0.32 |
| 10 | 0.40 |
| 12 | 0.48 |
| 14 | 0.56 |
| 16 | 0.64 |
| 18 | 0.72 |
| 20 | 0.80 |

(a) Soluble Water Phosphorus

1. Pipette 20 ml. of filtered water into a digestion tube.
2. Add 5 ml. of Murphy-Riley solution containing ascorbic acid.
3. Mix with a vortex mixer and read absorbance at 880 nm after 10 minutes.

(b) Total Phosphorus

Filtered Water:

1. Pipette a 20 ml. aliquot of water into a digestion tube.
2. Add 5 drops of concentrated sulfuric acid and evaporate in an oven at 105° C. overnight.
3. Remove and cool.
4. Add 1 ml. of perchloric acid with a pipette.
5. Put on funnel and digest for 15 minutes at 205°C. in the aluminum block in the perchloric acid hood.
6. Cool and add deionized water to a total volume of 30 ml.
7. Neutralize with 5 N NaOH using 1 drop of p-nitrophenol (0.25% solution) as an indicator.
8. Add 10 ml. of Murphy-Riley solution with ascorbic acid.

9. Bring to volume, mix with a vortex mixer, and read the absorbance at 880 nm after about 10 minutes.

Unfiltered Samples:

The procedure is the same for unfiltered samples with the exception that digestion in the aluminum block in the perchloric acid hood should continue for 30 minutes rather than 15.

(c) Murphy-Riley Solutions

For 19 liters stock solution:

1. Add 555 ml. of concentrated sulfuric acid to about 4000 ml. of deionized water in a 12 liter carboy. Allow to cool after swirling.
2. Dissolve 48 g. of ammonium molybdate in about 1000 ml. of deionized water.
3. Dissolve 1.097 g. of antimony potassium tartarate in about 1000 ml. of deionized water.
4. Transfer 2. and 3. to 1. Rinse beakers with deionized water and dilute to 10 liters in the carboy.

Ascorbic-Acid Solution:

1. Mix daily as needed.
2. Add 4.22 g. ascorbic acid to 1 liter of Murphy-Riley Stock Solution and mix.
3. Clean tubing and jar daily when in use.

4.1.3 Organic Carbon

Organic carbon in filtered and unfiltered samples is determined by a Dohrman Envirorotech DC-50. Organic Carbon Analyzer in accordance with the instruction manual furnished with the instrument. Specifically an acidified 30 μ e water sample is injected into a boat containing MnO_2 . The boat is moved to a 90° vaporization zone where water, carbonates, and volatile organic compounds are removed. Volatile organics are trapped on a porapak chromatographic column and subsequently back-flushed from the column and estimated as methane -C after reductive pyrolysis.

The boat is then moved to the pyrolysis zone (950°C) where residual organic C is pyrolyzed under reducing conditions and methane is liberated. Methane is determined by a flame ionization detector and the C concentration in the sample is calculated by integration of the methane release peak and the C content is displayed in digital form. The instrument has a range of 0-2000 ppm organic C and a precision of

... or + 2% whichever is greater.

8.4.2 Fractionation of N and P in Detailed Laboratory Studies

An important part of the work plan for this project is directed at chemical fractionation of N and P components in sediment-water systems and elucidation of relationships between the forms of these nutrients. This phase of the study will allow interpretations to be made based on monitoring data.

It is widely known that algae and non-rooted aquatic weeds derive their nutrients from those present in a dissolved state in the water in which the plants are growing. If there were not sources for replenishment of dissolved N or P the plants would utilize all that was present and their growth rate would become zero. In most aquatic systems, however, suspended or flocculated sediment (eroded soil particles) is present to release nutrients to the water phase. Thus, an equilibrium normally exists between soluble nutrients and those associated with the sediment phase. During nutrient depletion of the water phase, N and P are liberated from sediment, whereas the sediment may serve as a sink for nutrients during nutrient enrichment of water. Nutrients may be incorporated into sediments by absorptions, electrostatic attraction, precipitation, or biological immobilization.

If we are to determine the impact of agricultural erosion, subsurface drainage, and runoff water upon water quality, it is not enough to measure total nutrient loads derived from agriculture. We must know the forms of nutrients transported, the relationships between forms of nutrients (equilibria) and the availability of various nutrient forms to aquatic life. This study, therefore, attempts to collect some of the information for the soils of the Black Creek Watershed realizing that a large number of soil, land management, and hydrologic factors ultimately control nutrient transport and subsequent reactions in agricultural watersheds.

The outline in Figure 8-4 sets forth the procedures to be followed to accomplish study objectives. Samples of runoff from rainulator plots have been collected, frozen and stored. These samples represent fertilized and unfertilized plots of our soil types representative of soils in the watershed. The runoff samples were taken at varying times during the course of two, 2-1/2 inch rainstorms applied to each plot. Runoff samples will be thawed at room temperature and subjected to chemical and physical fractionation according to the scheme outlined in Figure 8-4.

The data obtained from the analyses outlined in Figure 8-4 will be utilized in two ways. First, an attempt will be made to relate total nutrient transport in the various forms to soil and fertility factors present at each experimental site. Secondly, correlation techniques will be used to establish relationships between the parameters measured for each soil type and for all soils considered together. After the relationships are established for surface runoff, samples of water will

be collected within the Black Creek Watershed and from the Maumee River to determine if similar nutrient equilibria between sediment and water exist. Of particular interest with these later samples is determination of the equilibrium phosphorus concentration (EPC). The EPC is determined by equilibrating the sediment with phosphorus solutions of varying concentrations and calculating the level of solution P at which neither sorption of added P or desorption of sediment P occurs. The EPC is an important parameter of sediments because it can be used to predict sorption or release of P when sediment comes in contact with water of varying P levels.

The availability of nutrients in sediment water systems to algae will be evaluated by a bio-assay technique in which a two-compartment growth chamber having a semi-permeable membrane between compartments is used. First the diffusion rate of nutrients in the system will be determined by placing sediment water in one compartment and pure water in the other and measuring the change in nutrient content of the pure water with time. Secondly, a seed solution of algae cells will be added to pure water side of the growth chamber and growth rates measured by increase in cell mass or chlorophyll content. Growth of algae in standard nutrient solutions will be used as a measure of the ability of the sediment water system to supply nutrients to algae assuming that diffusion of nutrients across the semi-permeable membrane is not a limiting factor. By appropriate chemical determinations, the rates of algae growth and nutrient uptake can be measured and equations developed to predict the rates of nutrient supply by the sediment phase based upon sediment properties and nutrient diffusion rates.

8.5 Rainfall Simulator Tests

The procedures for conducting simulated rain tests are essentially as follows:

Plot size -- Equipment is assembled over groups of four plots. Two plots are 12' x 35' separated by a 6' border. The other two plots are each 6' x 35' separated by a 1' border. The group of four plots occupy an area approximately 50' x 60'. This allows room for installing runoff measuring equipment at the base of the plots and anchor cables to hold the equipment in place.

Plot arrangements -- Plots are laid out so that slope direction is aligned with plot length. In all cases tillage and row directions are up and down the major slope.

Water supply -- A clean (free of sediment and nutrients) source of water is necessary. A portable tank with water hauled to the site is the most frequently used water supply.

Land preparation -- A variety of cultural practices and methods of land preparation will be tested. Runoff samples will be collected from both unfertilized plots and plots where a known application of fertilizer has been made.

Fertilizer to be used is in the form of NH_4NO_3 and treble super phosphate applied by broadcasting on the surface.

- (1) Tests to determine base values for runoff, sediment and nutrient concentrations.

Tallow plots are to be prepared by turn plowing and then disking to keep weed free. Tests are to be conducted on four major capability classes of soils that amount for more than 20% of the capability classes in the test watershed.

Test storms -- The following test sequence is applied to all locations. The two 12' x 35' plots receive the following test storms:

- (a) Storm 1a - 60 minute duration at 2-1/2 inches per hour.
- (b) Storm 2a - 20 minute duration 24 hours after storm 1a at 2-1/2 inches per hour.
- (c) Storm 3a - 30 minutes duration 15 minutes after the end of storm 2a at 2-1/2 inches per hour.
- (d) Storm 4 - 15 minutes duration 15 minutes after the end of storm 3a at 5 inches per hour.

The 6' x 35' plots are tested by the following storm sequence:

- (a) Storm 1b - approximately 45 minutes of rain, then rain stopped and inflow added until the runoff reached the level attained where rain alone was used.
- (b) Storm 2b - 20 minutes rain at 2-1/2 inches per hour plus inflow at the rate applied in storm 1b.
- (c) Storm 3b - 30 minutes total duration with first 15 minutes using inflow alone at the rate used in storm 1a and double inflow used for the last 15 minutes.
- (d) Storm 4b - 15 minutes duration with double inflow used in conjunction with 2-1/2 inches per hour of rain.

Runoff is sampled at approximately 5' intervals for both sediment content and nutrient content. Nutrient samples are frozen within two hours after runs are completed. All samples are returned to Purdue for analysis of sediment and nutrients.

- (2) Tests to determine effects of cultural practices on runoff, sediment and nutrient concentrations.

Several crop production and management systems will be compared on the same sites where base values were obtained. The test storm sequence and procedures for runoff samples discussed

earlier will be followed. Cultural practices tested by this technique include:

- (i) fall plowing
- (ii) winter cover
- (iii) several forms of conservation tillage
- (iv) crop rotations
- (v) residue management
- (vi) overgrazing of pasture
- (vii) animal waste disposal on crop and pasture land

Additional information about the use of the Purdue Simulator (a fall simulator) is found in Appendix 9.7 to this document.

8.6 Tillage Management Demonstration Areas

In order to encourage landowners in the Black Creek Watershed to gain experience with tillage management systems with which they are not familiar, a strip test system of comparisons will be established. All important soils of the watershed will be included with the exception of overflow bottomlands.

Soil manipulation in tillage generally reduces soil granule size and strength to resist impact of raindrops. It encourages faster break of granules, filling of surface soil pores, and reduction of water intake leading to conditions where soil erosion can increase. Effects are conditioned by the amount of tillage performed.

Much is known about the effects of heavy tillage, planting, and cultivating equipment on reduction of granule size, compaction of sub-surface layers, and reduction of crop rooting. These can produce delayed downward percolation of water, slow soil drainage, and decreased trafficability that delay planting in wet spring periods.

Much is also known about the effects of soil texture and organic matter in helping soils resist bad effects of heavy tillage and in promoting structural recuperation during the off-crop season.

In Black Creek Watershed, there are soils of a wide range of textures, organic matter content, and natural soil drainage. These range from low organic matter, rather unstable, loamy sands and sandy loams to high organic matter, silty clay loams and silty clays of high stability. This suggests desirability of adopting a wide range of tillage planting systems which can assure good plant populations, adequate weed control and satisfactory yield in various soils.

Based on long term Purdue research and field trials (see appendix 9.8), as well as work in neighboring states, acceptable systems to fit given soils can be based on Mold Board Plowing Spring or Fall, Chisel Plowing Spring or Fall. Till planting with sweeps eliminating the need for yearly planting, and narrow strip tillage in a mulch such as coulter planting, which can also eliminate needs for yearly plowing. While

Moldboard plowing has the widest adaptation, the other three systems can be adapted if choices are carefully made to suit soil and cropping conditions.

Early studies in Black Creek Watershed show that moldboard plowing is the most laborious land preparation followed by sufficient disking or harrowing to make a rather fine seedbed. This is usually called conventional tillage. At the same time such methods are usually the most labor and energy consuming and do the most to reduce granule size and make soil surfaces smoothest and most susceptible to erosion.

Use of simulated rainfall has repeatedly shown that on sloping land the three systems not based on a regular use of a moldboard plow are most protective against erosion. Coulter-plant tillage in a mulch can reduce erosion by 30-90 percent and tillplow can reduce it 60-70 percent especially if used cross-slope. Chisel plow systems offer real advantages in reducing plow sole compaction and inducing early spring soil drainage. For Fall basic tillage the chisel plow provides a cloddy, trashy surface which offers good protection against wind and water erosion losses in vulnerable early spring periods. Double disking for primary tillage leaves a trashy surface cover and may be adequate land preparation in some soils while still reducing erosive tendencies (see Appendix for Black Creek Specifications 475, for "Minimum Tillage").

Since need for tillage is the one common denominator in land management for cropland, any systems offering soil physical improvement as well as savings in labor and time are worth strong consideration. When adopted regularly they can become very important tools in erosion prevention and can be applied either with or without the use of other erosion control practices many of which are difficult to use in today's large equipment, row crop farming. Gradual adoption of limited or minimum tillage practices could effect an overall erosion reduction in the watershed of considerable magnitude.

For these reasons much emphasis will be placed on helping farmers study reduced tillage systems by use of field strip demonstrations comparing adapted systems to conventional ones side by side. These will hopefully lead to expansion of best adapted systems to a field basis. At the same time, use of simulated rainfall will be employed on plots over a wide range of soil textures on which tillage variables are employed in preparation of the plots. These will substantiate, for Black Creek Watershed soils, what improvements in surface soil stability, infiltration, water intake rate and erosion prevention can be achieved by reducing tillage operations. This will allow extrapolation of results to similar soils of the Maumee Basin as a whole.

8.7 Fish Collection Methods

Population abundance and species composition of fish is being studied in six specified areas in the Black Creek Watershed. Although fish

populations will be surveyed in some study areas by seining and **electro-fishing**, most of the comparative data will be obtained by rotenone. One fish sample will be obtained with rotenone for each study area annually. Although multiple stations should be established on each tributary, in order to obtain more accurate lists of the fish species present and to better estimate the average population abundance, the small area available makes such action difficult.

The first requirement considered in the site selection process was easy access to the sample site. Thus, all stations are accessible from a highway bridge or farm lane. After the general area is selected, the specific sample site is chosen to include the best fish habitat for that area. For example, at least one pool and one riffle area are included in every station. Bridges are not considered typical fish habitat and are excluded from every station.

Prior to treatment, each sample site is measured and block nets installed. Sample sites are always 300 feet long. Stream width and average depth are measured every 50 feet to determine water volume in the 300 foot section. In addition, a crude map is constructed for later reference to show the general shape of the stream, the depth and location of any pools, the site and type of any bridge in the stream, and areas of cover along the stream bank.

Sample sites are approached quietly and blocked off at both ends with a 1/4 inch mesh minnow seine. The seines are held in place and anchored tightly to the bottom by steel fence posts. Starting at the upstream net, 4 ppm by volume emulsified rotenone is applied by hand broadcasting the white liquid over a pail. Proceeding downstream, a special effort is made to treat quiet backwaters, muskrat holes, and other parts of the stream that the main slus of poison waters to bypass. As the rotenone approaches the downstream net, an assistant begins detoxification with 8 ppm potassium permanganate. The procedure and these concentrations were suggested by the Illinois Department of Fish and Wildlife, Indiana Department of Natural Resources through Bob Robertson, District Fish Management Biologist at Knox.

Fish are collected with hand nets as they float downstream. Several collection passes are also made throughout the sample site to pick up fish from the bottom and the shoreline. Collection is continued until no more fish are found, which usually requires three to four hours per station. The fish are preserved immediately in 10 percent formalin and then transported back to the laboratory. Samples for each sample site are kept separate from fish of other sample sites.

The fish are held in 10 percent formalin for approximately 24 hours, then washed in tap water and stored in 70 percent ethanol. Fish from each sample site are separated by species and counted. Total weight for all individuals of each species is determined by the nearest commercial or dietetic scale manufacturer available, Evanston, Illinois. The average weight for each species is determined by dividing the total weight of a species by the number

number of measurements. The site bases for each series is determined by measuring the total length of the shortest and longest side to the nearest millimeter.

8.8 Stream, Channel and Bank Study

The first objective is that a major cause of erosion and settlement is the removal of high stream channel banks from the area immediately adjacent to the stream. To determine the contribution of different types of stream channel and detailed study will be conducted.

The study will consist of the attempt to determine the relation of soil properties, bank slopes, cover and channel width. Five to ten sites will be selected for evaluation. The study will examine the possibility of a suitable condition for the interrelationship of the above factors. Some mechanical tests will be made by the Soil Conservation Service. The above data is reported to the above mentioned evaluation. Some of the soil mechanical tests to be conducted are: dispersion, shear parameters, bulk density, and moisture content. Geotechnical and slope stability measurements will also be made.

If a suitable site can be found in stream study will compare the stability of channels with tree covers, land to those under grass cover and to those where trees have recently been cut. This will require several sites with similar soil properties, cross section and channel flow, selected flow velocities for the various cover types to be compared.

The effectiveness of event machine material will be evaluated by using available sites or constructing new ones with bank slopes of 1:1, 1.5:1 and 2:1. Some of the materials to be studied are stone, straw, hay, etc., and commercially available erosion stabilizing materials. Each material will be evaluated for its effectiveness in exposing grass cover, while controlling erosion on the different slopes during the establishment of the grass cover. Each material or material tested for each slope condition will consist of a barrier of 100 ft. long on both sides of the channel. It should be noted that the material will be used for comparison. This study will be repeated for different locations throughout the watershed area. If other materials are available they may also be included in the study. The experiment of seeding or different seed materials will also be conducted for comparison.

Bank erosion control materials will be evaluated by the use of different types of materials for the various slopes. Effectiveness. Some materials are stone, straw, hay, etc., and other structural materials such as concrete or steel. The above mentioned materials will be evaluated for their effectiveness in controlling erosion.

The channel stability evaluation will consist of cross-sectional measurements using standard surveying techniques. In some cases, it is possible each cross-section will be made up of 10 or 20 sub-sections for a given set of conditions. The results of these measurements will be conducted.

The streambank studies continue with the evaluation of the best treatment measures. In and adjacent to the channel will provide information to reflect the effect of the Maumee Basin and should furnish some useful information on how a ditch bank treatment affects erosion and sedimentation.

8.3 Modeling and Prediction

The mechanism whereby it is hoped that a prediction of sedimentation and related chemical pollution of the Maumee River and Lake Erie can be related to land use is a systems approach using computer simulated models of sedimentation and related chemical pollution in the river and the lake.

A review of literature reveals six different approaches to the prediction of sediment yield from watersheds. Each of these approaches is being applied to the Black Creek Watershed. Fundamentally, all of these models are of the lumped variety and no accounting is made of special distributions within a watershed. The success of these models has been varied and depends to a great deal on the care with which model coefficients have been selected. Most of these have little relationship to physical constants. For this reason, the attempt will be to develop a distributed model.

As the size of a watershed increases, more and more of the variables will be lumped into larger, less descriptive variable. This is necessary because the model, even if computer-based, tends to become unwieldy. Perhaps more important, the detail, if confined to small areas will be essentially lost anyway. This is why it is important to model both the Black Creek Watershed, a representative watershed within the Maumee Basin, and the Maumee Basin for which answers are ultimately needed.

As of now, the statistically based Universal Soil Loss Equation is the best estimator of soil loss from small areas and should also be the best estimator of the maximum sediment potential into receiving streams and lakes. Other obviously needed information are estimates of sediment discharges at any point in the receiving water system. Hopefully, the long term USGS and Corps of Engineers records at various locations along the Maumee River and at the Toledo harbor will be sufficient data for the Maumee River Basin. If not, verification of the model cannot be fully attained since the collection of additional sediment rate data outside of the Black Creek Watershed region is not within the scope of this project. However, within the Black Creek Watershed and at a few select locations on the Maumee River near the target watershed, sediment sampling is a major item in the total monitoring program. Verification of any modeling of the Black Creek Watershed will be of necessity await the monitoring

results. However, within the watershed boundaries and land use-land cover, this could work to the advantage of the project. Improved land use practices were desired for an improved watershed and one condition for improved watershed status is land use practices that are both basic and extensive. If the effect of these practices are to show up significantly in both the sediment program and the water quality,

4.10 Data Management

After the sample analyses have been completed, data is organized on a data card sheet and computer cards are punched from it. A code number at the beginning of each data card indicates the type of sample and the geographical site of collection. The cards will be arranged in chronological order for each site for each type of data tested. This is a reliable and permanent record library will be available should something happen to the tape files. Periodically, the cards will be needed to update or correct the tape.

Both the data recorder and recording main frame data are recorded on paper charts that are data versus time. The charts are returned to the Agricultural Engineering Department at Purdue where they are read using a computer-connected reading table. The time, depth, and date for each point read are then printed out by computer. This process requires less time required to analyze the large number of charts that are being used in this project. A paper data sheet is then prepared and cards are re-punched using one date per card. The card punching process is identical with the process used on the water sample data as described above.

As previously stated, the card data will be read into the computer and recorded on magnetic tape. Considering the large quantity of data to be collected and handled during this project, the magnetic tape must be handled. Since the data is on tape, it may be retrieved in several different fashions. A complete printout of all of the data from one category may be obtained by specifying the category code only. A printout for a specific site within a category may be obtained by specifying both the category code and site identifier. Particular points may be selected by specifying the particular card number(s) for the date(s) in question. These methods will also be used to transfer certain data into other computer systems, such as the storage system.

At present, plans are to use Purdue's School of Engineering MIRACLE computer system for data storage and analysis. The main reasons for this are the proximity of the computer facility to all of the cooperating departments and the ease of access. Since remote terminals are available in several locations. However, should the size of the data files exceed the capacity of the MIRACLE system, the University's larger, off-site computer system could be used to handle the large quantities of data with very little modification to the storage and retrieval program.

8.11 Sociological Studies

The primary focus of the first sociological study to be undertaken as a portion of this project is to look at the behavior of components of sediment control in the basin. To accomplish this task, personal interviews will be conducted with all landowners (over 1000) in the watershed.

The basic objectives of these interviews are:

- (a) To determine attitudes and knowledge toward soil erosion and pollution control.
- (b) To determine knowledge of the Black Creek Project and extent of participation.
- (c) To assess the past, present and anticipated future involvement in select agricultural practices.
- (d) To determine the sources of information on pollution control and agricultural practices.
- (e) To investigate landowner involvement and contact with groups, organizations, and agencies in the study area.
- (f) To develop a database for future studies during the duration of the project to serve as a benchmark for future study.

To accomplish these objectives, a research instrument of the form of a questionnaire is being developed for collecting data from landowners. A brief description of each section of the questionnaire is included here for additional information. The questionnaire is being pretested and modifications will probably be necessary before it is applied to the watershed.

Part I contains 23 questions designed to measure general attitudes and attitudes toward pollution control. Questions are designed to look at standards and regulations of agencies and the landowner's perception of how they are being enforced. Each landowner is also asked how much he would be willing to pay in a hypothetical situation for a high rate of pollution control.

Part II shifts its emphasis from the general to attitudes specifically about the local community and county. Representative questions are designed to analyze participation and cohesiveness of community residents in solving problems and what should be done about them. Farmers, citizens, or businesses are identified as major polluters.

Part III contains questions toward water and soil resource development. Here the questions are designed to get at sources of information and an assessment of the adequacy of soil and water conservation management in the county.

Part II begins to look at specific behavior. The kind of behavior is household waste disposal as a specific source of pollution.

Specifically, the question here focuses on whether disposal by
asking about septic tank capacity, distance located from water source,
how often it is pumped out, and overall "adequacy" and use of
septic disposal for the facility.

Form 1 specifically looks at what the landowner is doing in reference to the land, possession and use. That is, number of acres, kinds of crops, wild rice zones, etc. The landowner is also asked if he has an action plan, and to what extent it has been followed. In addition, a list of farm problems and questions is provided and the landowner is asked to whom he would go for help in each situation.

Page 2 is concerned with the landowner's present knowledge and treatment of the Blind Creek incident. To establish this, it is necessary to know where the gravelled, white sand dunes are located in the wastes; what profits they bring to the landowner; the correlation of the dunes;

fact, it is the benchmark to indicate the extent of the relationship with local agencies and its membership in organizations.

Part VII deals with different tax practices that are considered to be effective methods of collusion control. The practice is reported to the taxpayer and each is asked to respond to his query, not specifically to the individual but to the practice in the tax.

Let \mathcal{L} be the space of square-integrable functions on \mathbb{R}^n . For analysis of the current, we consider the function $\psi(x)$ which is characterized by

the editorial section is under the name of the editor, and the editorial board is listed in the front of the book. The editorial board is composed of the following members:

The above information about the status of the project is being provided for informational purposes only and for the purpose of the project. The project is currently in the planning stage and is expected to be completed by the end of the year. The project is expected to be completed by the end of the year.

FIGURE 8-1 Analysis Flow Charts for Sub-Surface Drainage and Precipitation Samples

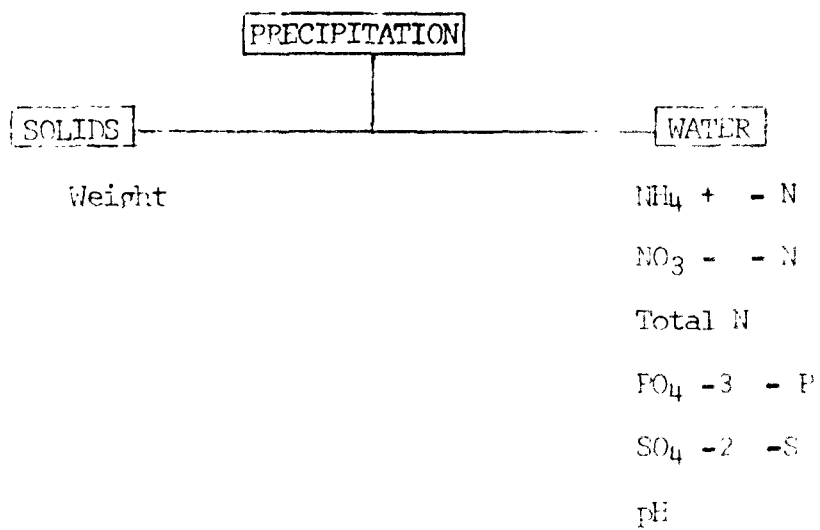
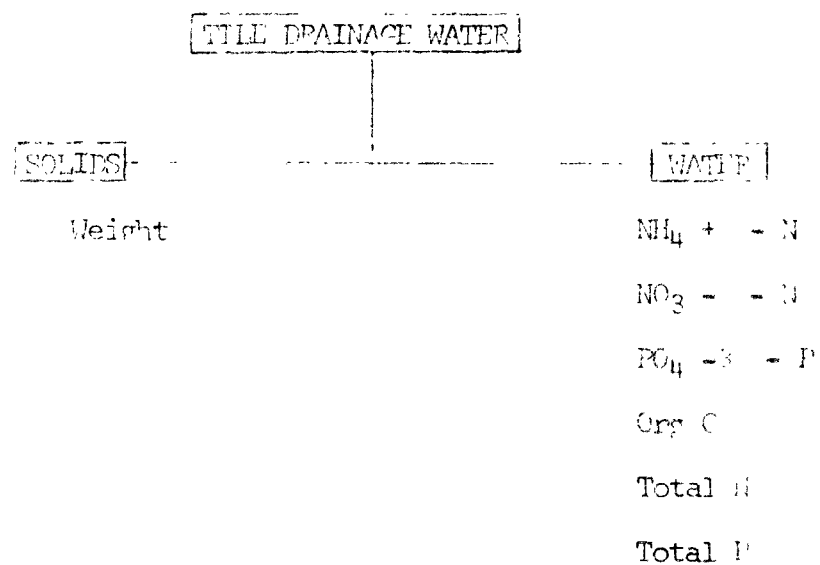


FIGURE 8-2 Flow Chart for Rainulator Samples

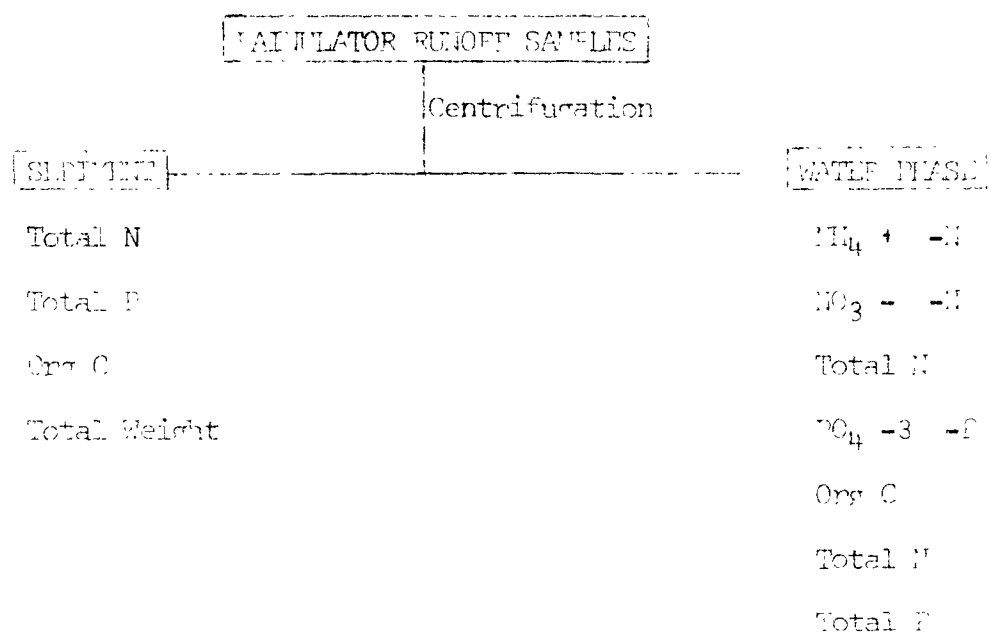
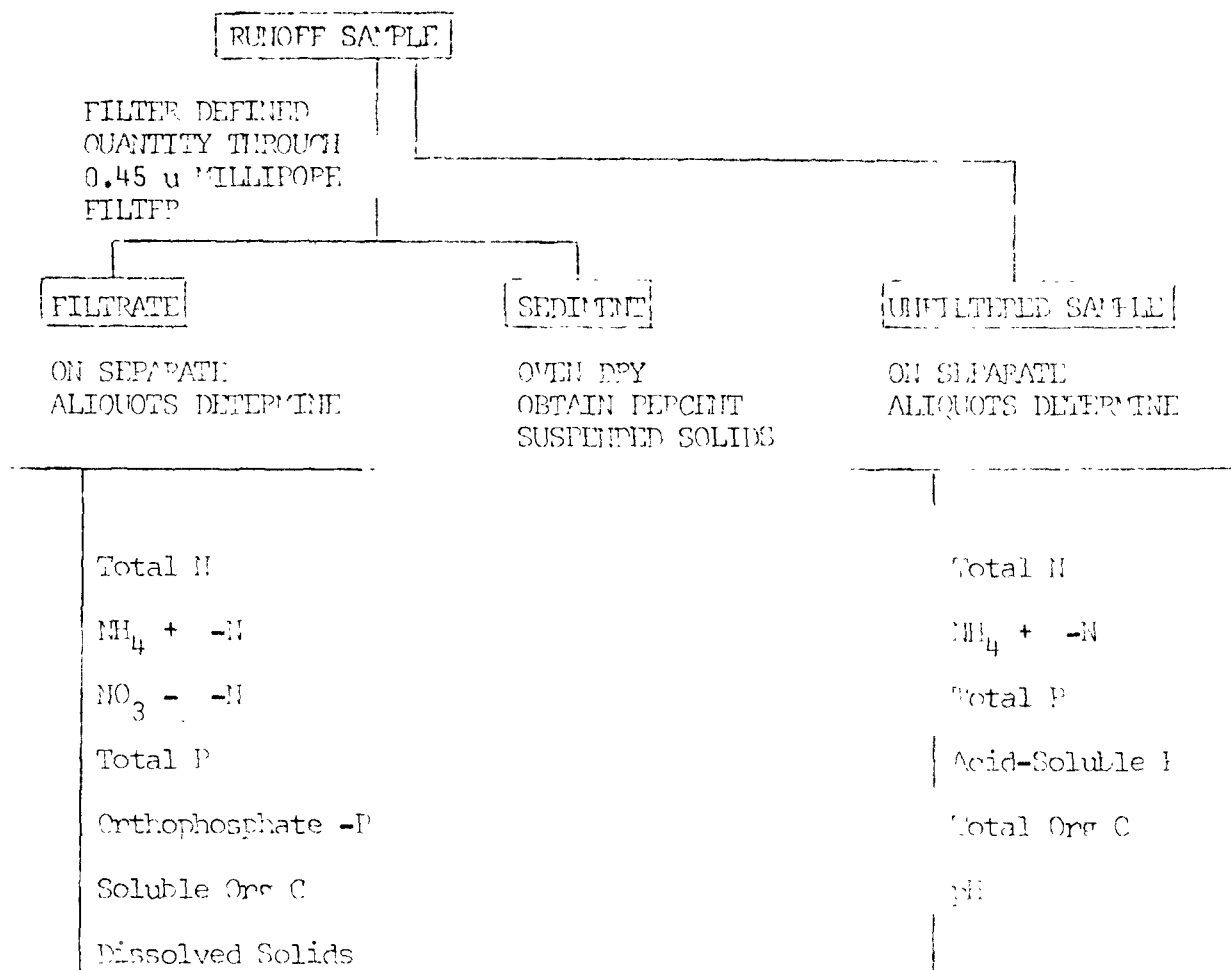


FIGURE 8-3 Fractionation Scheme for N and P in Detailed Laboratory Studies



From these data the following parameters may be obtained:

1. Soluble $\text{NH}_4 + -\text{N}$
2. Exchangeable $\text{NH}_4 + -\text{N}$ on sediment
3. Dissolved Organic N
4. Sediment Total N (suspended N)
5. Soluble $\text{NO}_3 -\text{N}$
6. Soluble orthophosphate -P
7. Soluble organic P
8. Sediment Total P (suspended P)
9. Dilute acid-soluble P in sediment
10. Dissolved organic C
11. Suspended organic C
12. pH
13. Suspended Solids
14. Dissolved Solids

COOPERATIVE AGREEMENT
between the
ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT
and the
SOIL CONSERVATION SERVICE
UNITED STATES DEPARTMENT OF AGRICULTURE

Relative to: Reduction of Sediment and Related Pollutants in the
Maumee River and Lake Erie

Authority: PL-46 - 74th Congress, 16 U.S.C. (590 a-f)

THIS AGREEMENT, made and entered into this 11 day of January,
1972, by and between the Allen County Soil and Water Conservation District,
(hereinafter referred to as the "District") and the United States of America,
acting by and through the Soil Conservation Service of the United States
Department of Agriculture (hereinafter referred to as the "Service").

THE DISTRICT is engaged in a five-year program to evaluate methods of
improving water quality in the Maumee River and Lake Erie through the reduction
of sediment, phosphate and other nutrients, and related pollutants entering
the waters of the river and lake as a result of soil erosion.

THE DISTRICT proposes to demonstrate the means of achieving significant
reductions in sediment and related pollutants through a voluntary land
treatment program involving a diverse group of persons who own or control
the land which is a source of this pollution.

THE DISTRICT, for planning and program purposes, requests certain soil
and water conservation technical assistance and information that is presently
unavailable and, within the limits of its resources, is willing to reimburse
the Service for a portion of the costs of obtaining such information required
in the conduct of the program within the period specified in this agreement.
The District is financing this program from an EPA Grant and is working in
cooperation with EPA, the Service and Purdue University.

THE SERVICE, in the conduct of its assigned responsibilities under
legislative authorities and through Memoranda of Understanding with the
District, is charged with providing technical assistance leading to the
conservation of soil, water and related resources in Allen County, Indiana.

THE SERVICE has need for technical information to develop a Work Plan
and to properly furnish technical assistance over the five-year project life.
These needs are in addition to those normally encountered in providing technical
services to the District and require additional staff resources.

THE DISTRICT AND THE SERVICE desire to cooperate on a proposal to reduce
Sediment and Related Pollutants in the Maumee River and Lake Erie.

IT IS THE intent of the parties hereto that cooperation herein shall be for their mutual benefit and the benefit of the people of Allen County, State of New York, and the United States; and,

THE WORK PLAN development, land treatment measures, and types of incentive to be accomplished and conducted under this agreement will be cooperative, planned and carried out;

NOW, THEREFORE, for and in consideration of the premises and mutual covenants herein contained, the parties hereby mutually agree with each other as follows:

1. THE DISTRICT AGREES:

1. That all information obtained under the terms of this agreement is public property and is to be used in developing and implementing a Work Plan for the Reduction of Sediment and Related Pollutants in the Niagara River and Lake Erie.
2. To reimburse the Service for a portion of the costs incurred in developing and implementing this Work Plan, to include: technical services of Service personnel - included herein are the costs of salaries, travel, allied benefits such as leave, holidays, retirement, health benefits, life insurance, and support and overhead costs. Support costs are to include cartographic services provided as needed in Work Plan preparation.
3. Reimburse the Service in an estimated amount of \$185,364.00 for the District's share of the Service's contribution in this cooperative effort. The District's share will be based on the estimated actual cost of A.P. and within the five-year schedule shown in the following table and as set forth in the District's Proposed Plan which is attached to and made a part of this agreement.

| FROM
TO | Oct '72
May '73 | May '73
Oct '73 | Oct '73
Oct '74 | Oct '74
Oct '75 | Oct '75
Oct '76 | Oct '76
Oct '77 | TOTAL |
|--|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|-----------|
| Professional
Soil Conservst
GS-9 or Above | | | | | | | |
| Man-Years | 1.0 | 0.5 | 1.5 | 1.0 | 1.0 | 0.5 | |
| Est. Cost | \$20,000 | \$10,500 | \$33,075 | \$28,350 | \$24,000 | \$13,200 | \$129,750 |
| Sub-Professional
Soil Cons Technicians
GS-6 or Above | | | | | | | |
| Man-Years | 0.0 | 0.0 | 0.5 | 0.8 | 1.0 | 1.0 | |
| Est. Cost | 0 | 0 | \$ 7,768 | \$12,970 | \$27,000 | \$27,863 | \$ 55,614 |
| Total Estimate | \$20,000 | \$10,500 | \$40,843 | \$41,320 | \$51,000 | \$41,063 | \$185,564 |

4. That the signature of the authorized representative of the District on this agreement is official notice for the Service to begin work.
 5. To provide the Service with 50 copies of the WOP Plan and 50 copies of all printed final results of the program.
 6. That technical assistance furnished to landowners and operators will meet the technical guide standards and design criteria of the Service.
3. THE SERVICE AGREES:
1. To provide the necessary technical services and on-site technical assistance normally needed to produce the results desired as set forth in the District's project proposal which is attached to and made a part of this agreement.
 2. To absorb from its own appropriations any portion of the estimated costs of providing these services not covered by the amounts to be reimbursed the Service as agreed to above.

to provide the District with a monthly progress report on the status of the program.

4. The technical assistance furnished to landowners and operators will meet the technical guide standards and design criteria of the Service.

C. 1. IS SUITABLY ADOPTED:

1. That the Work Plan will be consistent with applicable water quality standards established for the Basin pursuant to current law and will recommend means for standards maintenance and improvement.
2. That the work plan will identify the watershed area, monitoring and management techniques that will be used to implement the plan.
3. That the work plan will include a detailed sociological study that will aim to assess the attitudes of individual landowners, the extent that they agree to have coordinated and integrated water conservation program and the feasibility of having persons of the participation of owners of the land in the study, research and the principal factors that will be used to implement the plan.
4. That the date of all work under the agreement shall be completed by October 1977, and shall be subject to the terms of the agreement.
5. That the agreement shall be subject to the terms of the agreement.
6. That the agreement shall be subject to the terms of the agreement.

7. Renewals - This agreement will remain in force until the 31st, 1973. It may be affirmatively renewed each fiscal year by the parties by amendment until the purposes of the agreement are complete but not later than the end of the fiscal year in which the work is completed.
8. Modification - This agreement may be modified by amendment only, executed by authorized officials of the District and the Service, provided such modification does not extend the agreement beyond the close of the fiscal year in which the work is completed.
9. Officials Not to Benefit - No Member of or delegate to Congress or Resident Commissioner shall be admitted to any share or part of this agreement or to any benefit that may arise therefrom; but this provision shall not be construed to extend to an agreement if made with a corporation for its general benefit.

IN WITNESS WHEREOF, the District and the Service have executed this agreement as of the date first above-written.

ADAMS COUNTY
SOIL AND WATER CONSERVATION DISTRICT

The signing of this Agreement was authorized at a Meeting of the Supervisors held at Fort Wayne, Indiana, on the 8th day of November, 1972.

BY [Signature]
TITLE Chairman

BY [Signature]
Secretary

UNITED STATES DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

BY [Signature]
State Conservationist--

DATE November 10, 1972

MEMORANDUM OF AGREEMENT
between
ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT
and
PURDUE RESEARCH FOUNDATION

This agreement is entered into this 7th day of January 1973, effective October 20, 1972, between ALLEN COUNTY SOIL AND WATER CONSERVATION DISTRICT of Fort Wayne, Indiana, (hereinafter referred to as The District), and PURDUE RESEARCH FOUNDATION of Lafayette, Indiana, (hereinafter referred to as the Foundation).

WITNESSED THAT

WHEREAS, The District has been designated by the terms of Environmental Protection Agency Grant No. G-005103, to conduct a research program entitled "Reduction of Sediment and Related Pollutants in the Maumee River and Lake Erie", and

WHEREAS, The District desires to have the Foundation perform certain work or services under the terms and conditions herein set forth, said work or services being within the scope of the foresaid grant, and

WHEREAS, the Foundation has the necessary personnel and facilities to perform the work or services for The District.

NOW THEREFORE, it is agreed as follows:

1. The period of this agreement shall be October 20, 1972, through April 19, 1973.

2. The work services to be performed by the Foundation shall be under direction of Dr. William G. Boynton, Director, EPA Region 4, 2000 Pennsylvania Avenue, NW:
 - a. Assist in evaluation of sedimentation problems in the Maumee River.
 - b. Assist in the selection of a target watershed in Allen County for evaluation of land treatment.
 - c. Select sites for monitoring the effect of land treatment on erosion and sedimentation.
 - d. Review basic social and economic characteristics of residents in the target watershed and Allen County. Develop plans and guidelines for interviews of residents concerning their views towards sedimentation and on practices.
3. The total cost of the services to be performed by the Foundation shall not exceed \$25,650 of which The District shall provide \$11,044 or 44.8% of the total project cost and the Foundation agrees to contribute from non-Federal sources \$14,606 or 55.2% of the total project cost, whichever is less, to meet the cost sharing requirements of said grant.
4. Reimbursement of costs incurred under the terms of this agreement will be made quarterly by the District upon receipt of vouchers from the Foundation. The vouchers should include itemization of costs incurred by major budget category and amount of non-Federal monies contributed to this work or services by the Foundation. Copies of vouchers should be forwarded to James E. Lake, Executive Park, Suite 3, 2010 Inwood Drive, Fort Wayne, Indiana 46805.
5. The agreement shall be administered in accordance with the Interim Regulations of the Environmental Protection Agency for Grant Programs dated November 17, 1977 and subsequent revisions or amendments thereto as in force at the time of this agreement.

See attached exhibits page 100 points.

F. The presentation has to report the status of this clause including the following information: contracts for supplies and services, the status of the agreement.

Date: _____

General Manager

[illegible]

De be

WILLIAM C. SWEET, P.E.
SHERIFF

William C. Sweet, P.E. S

WILSON COUNTY SURVEYOR

WILSON COUNTY, TENNESSEE

April 11, 1951

John C. Smith, Secretary, Wilson County
Board of Education

10 Howard Drive
Fort Wayne, Indiana 46804

Dear Sir:

Re: Approval by the Wilson County Drainage Board
of your group's study project as it relates
to legume crops.

Dear Sir:

Your letter received here April 11th was then discussed with the
Wilson County Drainage Board and it happened to advise you that the
Board has received its own petition to the Wilson County Surveyor
in this matter.

The Board of Drainage is authorized the Surveyor to proceed at its
March 21st, 1951 meeting as indicated by Board Resolution # 24-51,
however at that meeting the Board requested that you furnish
additional information. Your April 11th submission meets the needs
the Board as expressed in the Resolution and I enclose a copy
of the Resolution in its original form.

We Board and the Surveyor are glad that your group has shown in start-
ing this project and if you ever can at any time render you
further assistance please let us know.

Sincerely yours,

William C. Sweet, P.E., L.S.
Wilson County Surveyor

cc - Mr.

THE UNITED STATES OF AMERICA
DO hereby certify that
the following is a true and correct
copy of the original as the same
exists in the files of the
Department of the Interior.

IN WITNESS WHEREOF, the Secretary of the Interior
has hereunto set his hand and the seal of the
Department of the Interior at Washington, D. C.
this _____ day of _____, 19____.

JOHN C. WILSON, Secretary of the Interior.
By _____, Assistant Secretary of the Interior.
The foregoing is a true and correct copy of the
original as the same exists in the files of the
Department of the Interior. The original is
on file in the _____
of the _____
at _____
The original is on file in the _____
of the _____
at _____

IN WITNESS WHEREOF, the Secretary of the Interior
has hereunto set his hand and the seal of the
Department of the Interior at Washington, D. C.
this _____ day of _____, 19____.

The foregoing is a true and correct copy of the
original as the same exists in the files of the
Department of the Interior.

Attest:

John C. Wilson

Secretary of the Interior

SOIL & WATER CONSERVATION

DATE 12/28/73

PROJECT OVERVIEW

PAGE 1

ACCOUNT NO.

TITLE

FIRST YEAR

SECOND YEAR

THIRD YEAR

FOURTH YEAR

FIFTH YEAR

*** DISTRICT ***

00-101 SALARY AND WAGES

| | | | | | |
|-----------------------|----------|----------|----------|----------|----------|
| APPROPRIATED PAYMENTS | 2,150.00 | 2,100.00 | 2,200.00 | 2,300.00 | 2,400.00 |
| COMMITMENTS | 516.50 | | | | |
| UNENCUMBERED | 1,633.50 | 2,100.00 | 2,200.00 | 2,300.00 | 2,400.00 |

00-102 FRINGE BENEFITS

| | |
|-----------------------|--------|
| APPROPRIATED PAYMENTS | 180.00 |
| COMMITMENTS | |
| UNENCUMBERED | 180.00 |

00-103 CONSULTANT SERVICES

| | |
|-----------------------|--|
| APPROPRIATED PAYMENTS | |
| COMMITMENTS | |
| UNENCUMBERED | |

00-104 EQUIPMENT

| | | | | | |
|-----------------------|--------|--------|--------|--------|--------|
| APPROPRIATED PAYMENTS | 966.00 | 500.00 | 700.00 | 700.00 | 700.00 |
| COMMITMENTS | 910.73 | | | | |
| UNENCUMBERED | 55.27 | 500.00 | 700.00 | 700.00 | 700.00 |

00-105 SUPPLIES

| | | | | | |
|-----------------------|--------|--------|--------|--------|--------|
| APPROPRIATED PAYMENTS | 175.00 | 200.00 | 200.00 | 200.00 | 200.00 |
| COMMITMENTS | 101.10 | | | | |
| UNENCUMBERED | 73.90 | 200.00 | 200.00 | 200.00 | 200.00 |

SOIL & WATER CONSERVATION

PAGE 7

DATE 10/20/73

1974
YEAR

PROJECT OVERVIEW

COUNTY TITLE

1973
YEAR

FIRST
YEAR

1974
YEAR

0-106 PAVEL

100.00

200.00

200.00

200.00

455.00

APPROPRIATED

PAYMENTS

410.00

COMMITMENTS

45.00

UNENCUMBERED

100.00

200.00

200.00

200.00

0-107 PUBLICATION COSTS

100.00

100.00

100.00

50.00

225.00

APPROPRIATED

PAYMENTS

197.08

COMMITMENTS

UNENCUMBERED

27.92

100.00

100.00

100.00

50.00

197.08

COMMITMENTS

UNENCUMBERED

27.92

0-104 OTHER - GEN. UNITS

1,200.00

1,100.00

1,000.00

1,000.00

500.00

APPROPRIATED

PAYMENTS

500.00

COMMITMENTS

UNENCUMBERED

1,200.00

1,100.00

1,000.00

1,000.00

500.00

COMMITMENTS

UNENCUMBERED

500.00

0-103 CIVILIAN ACCOUNT

APPROPRIATED

PAYMENTS

COMMITMENTS

UNENCUMBERED

DISTRICT TOTALS

4,651.00

APPROPRIATED

PAYMENTS

2,135.41

COMMITMENTS

UNENCUMBERED

2,515.59

APPROPRIATED

PAYMENTS

COMMITMENTS

UNENCUMBERED

4,700.00

4,600.00

4,400.00

4,050.00

4,651.00

APPROPRIATED

PAYMENTS

COMMITMENTS

UNENCUMBERED

4,700.00

4,600.00

4,400.00

4,050.00

2,515.59

APPROPRIATED

PAYMENTS

COMMITMENTS

UNENCUMBERED

S O I L & W A T E R C O N S E R V A T I O N

DATE 12/28/73

P R O J E C T O V E R V I E W

PAGE 3

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|---------------|-----------------------|------------|-------------|------------|-------------|------------|
| *** PURGE *** | | | | | | |
| 200-201 | SALARIES | | | | | |
| | APPROPRIATED | 45,395.00 | 21,297.00 | 84,187.00 | 27,145.00 | 87,117.00 |
| | PAYMENTS | 4,485.81 | | | | |
| | COMMITMENTS | | | | | |
| | UNENCUMBERED | 40,909.19 | 91,297.00 | 84,187.00 | 97,145.00 | 87,117.00 |
| 200-202 | FRINGE BENEFITS | | | | | |
| | APPROPRIATED | 1,249.00 | 1,801.00 | 1,846.00 | 3,632.00 | 3,725.00 |
| | PAYMENTS | 462.39 | | | | |
| | COMMITMENTS | | | | | |
| | UNENCUMBERED | 786.61 | 1,801.00 | 1,846.00 | 3,632.00 | 3,725.00 |
| 200-203 | EQUIPMENT | | | | | |
| | APPROPRIATED | 18,175.00 | 9,000.00 | | | |
| | PAYMENTS | | | | | |
| | COMMITMENTS | | | | | |
| | UNENCUMBERED | 18,175.00 | 9,000.00 | | | |
| 200-204 | SUPPLIES AND EXPENSES | | | | | |
| | APPROPRIATED | 3,700.00 | 4,200.00 | 4,200.00 | 4,200.00 | 4,200.00 |
| | PAYMENTS | 43.48 | | | | |
| | COMMITMENTS | | | | | |
| | UNENCUMBERED | 3,656.52 | 4,200.00 | 4,200.00 | 4,200.00 | 4,200.00 |
| 200-205 | TRAVEL AND PER DIA | | | | | |
| | APPROPRIATED | 12,000.00 | 14,700.00 | 14,700.00 | 14,000.00 | 12,100.00 |
| | PAYMENTS | 1,400.36 | | | | |
| | COMMITMENTS | | | | | |
| | UNENCUMBERED | 10,599.64 | 14,700.00 | 14,700.00 | 14,000.00 | 12,100.00 |

SOIL WATER CONSERVATION

12/29/73
 TIME
 PROJECT
 FIRST YEAR
 SECOND YEAR
 THIRD YEAR
 1974
 1975

CONSTRUCTION

APPROPRIATED
 PAYMENTS
 COMMITMENTS
 UNENCUMBERED

20,000.00
 20,000.00
 10,000.00
 10,000.00

OPERATIONAL COST

APPROPRIATED
 PAYMENTS
 COMMITMENTS
 UNENCUMBERED

7,870.00
 84.95
 7,785.05
 12,600.00
 12,600.00

12,300.00
 12,300.00
 9,500.00
 9,500.00

OTHER RESEARCH EXPENSES

APPROPRIATED
 PAYMENTS
 COMMITMENTS
 UNENCUMBERED

4,275.00
 4,275.00
 7,500.00
 7,500.00

7,500.00
 7,500.00
 3,000.00
 3,000.00

PROJECT COST

APPROPRIATED
 PAYMENTS
 COMMITMENTS
 UNENCUMBERED

27,695.00
 2,364.38
 24,810.62
 49,054.00
 49,054.00

52,682.00
 52,682.00
 52,145.00
 52,145.00

PROJECT TOTALS

APPROPRIATED
 PAYMENTS
 COMMITMENTS
 UNENCUMBERED

140,359.00
 9,261.37
 130,997.63
 190,152.00
 190,152.00

182,131.00
 182,131.00
 176,607.00
 176,607.00

SOIL & WATER CONSERVATION

DATE 12/28/73

PAGE 5

PROJECT OVERVIEW

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|-------|------------|-------------|------------|-------------|------------|
|-------------|-------|------------|-------------|------------|-------------|------------|

*** SOIL CONSERVATION SERVICE

300-301 PROFESSIONAL SALARY & BENEFITS

| | | | | | |
|--------------|-----------|-----------|-----------|-----------|-----------|
| APPROPRIATED | 33,200.00 | 29,075.00 | 36,650.00 | 16,500.00 | 13,025.00 |
| PAYMENTS | 21,514.02 | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | 11,685.98 | 29,075.00 | 36,650.00 | 16,500.00 | 13,025.00 |

300-302 SUB-PROFESSIONAL SALARY & BEN

| | | | | | |
|--------------|----------|-----------|-----------|-----------|--|
| APPROPRIATED | 9,500.00 | 15,536.00 | 18,641.00 | 21,437.00 | |
| PAYMENTS | 5,852.45 | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | 3,647.55 | 15,536.00 | 18,641.00 | 21,437.00 | |

300-305 CARTOGRAPHIC COST

| | | | | | |
|--------------|----------|--|--|--|--|
| APPROPRIATED | 1,500.00 | | | | |
| PAYMENTS | 914.53 | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | 585.47 | | | | |

300-306 SOIL MECHANICS TESTING COST

| | | | | | |
|--------------|----------|--|--|--|--|
| APPROPRIATED | 2,300.00 | | | | |
| PAYMENTS | | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | 2,300.00 | | | | |

300-307 OTHERS

| | | | | | |
|--------------|--|--|--|--|--|
| APPROPRIATED | | | | | |
| PAYMENTS | | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | | | | | |

| ACCOUNT NO. | TITLE | YEAR | | | |
|-------------|--------------------------------|-----------|-----------|-----------|-----------|
| 400-406 | FARMSTEAD & FEEDLOT WINDBREAKS | | | | |
| | APPROPRIATED | 1,092.00 | 1,456.00 | 1,352.00 | |
| | PAYMENTS | | | | |
| | COMMITMENTS | | | | |
| | UNENCUMBERED | 1,092.00 | 1,456.00 | 1,352.00 | |
| 00-407 | FIELD BORDER | | | | |
| | APPROPRIATED | 2,875.00 | 19,985.55 | 21,247.85 | |
| | PAYMENTS | | | | |
| | COMMITMENTS | | 441.00 | | |
| | UNENCUMBERED | 2,875.00 | 19,544.55 | 21,247.85 | |
| 00-408 | FIELD WINDBREAK | | | | |
| | APPROPRIATED | 104.00 | 138.45 | 147.55 | |
| | PAYMENTS | | | | |
| | COMMITMENTS | 80.00 | | | |
| | UNENCUMBERED | 24.00 | 138.45 | 147.55 | |
| 00-409 | GRADE STABILIZATION STRUCTURES | | | | |
| | APPROPRIATED | 10,850.00 | 28,600.00 | 38,025.00 | 42,125.00 |
| | PAYMENTS | 9,405.45 | | | |
| | COMMITMENTS | 1,006.50 | 1,638.00 | | 256.00 |
| | UNENCUMBERED | 438.05 | 26,962.00 | 38,025.00 | 41,869.00 |
| 00-410 | GRASSED WATERWAY OR OUTLET | | | | |
| | APPROPRIATED | 7,132.50 | 5,265.00 | 2,520.00 | 4,972.50 |
| | PAYMENTS | 5,512.44 | | | |
| | COMMITMENTS | | 1,510.56 | | 108.00 |
| | UNENCUMBERED | 1,620.06 | 3,754.44 | 2,520.00 | 4,864.50 |

SOIL & WATER CONSERVATION

DATE 12/28/73

PROJECT OVERVIEW

PAGE 7

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|-------|------------|-------------|------------|-------------|------------|
|-------------|-------|------------|-------------|------------|-------------|------------|

*** INCENTIVE PAYMENTS ***

400-401 CONSERVATION CROPPING SYSTEM

| | | | | | |
|-----------------------|-------|----------|----------|----------|--------|
| APPROPRIATED PAYMENTS | 85.00 | 1,928.55 | 2,570.75 | 2,148.25 | 500.00 |
| COMMITMENTS | | 459.60 | | | |
| UNENCUMBERED | 85.00 | 1,468.95 | 2,570.75 | 2,148.25 | 500.00 |

400-402 CONTOUR FARMING

| | | | | | |
|-----------------------|--|--------|--------|--------|--------|
| APPROPRIATED PAYMENTS | | 266.50 | 354.90 | 278.30 | 100.00 |
| COMMITMENTS | | | 16.00 | | 16.00 |
| UNENCUMBERED | | 266.50 | 338.90 | 278.30 | 84.00 |

400-403 CRITICAL AREA PLANTING

| | | | | | |
|-----------------------|----------|--------|----------|--------|--|
| APPROPRIATED PAYMENTS | 2,260.00 | 520.00 | 1,040.00 | 780.00 | |
| COMMITMENTS | 960.00 | | | | |
| UNENCUMBERED | 520.00 | 520.00 | 1,040.00 | 780.00 | |

400-404 CROP RESIDUE MANAGEMENT

| | | | | | |
|-----------------------|-------|----------|----------|----------|--------|
| APPROPRIATED PAYMENTS | 85.00 | 1,965.75 | 2,596.75 | 2,174.90 | 500.00 |
| COMMITMENTS | | 189.00 | 189.00 | 189.00 | 189.00 |
| UNENCUMBERED | 85.00 | 1,776.75 | 2,407.75 | 1,985.90 | 311.00 |

400-405 RIVERSIDE

| | | | | | |
|-----------------------|----------|----------|----------|----------|--|
| APPROPRIATED PAYMENTS | 1,845.00 | 2,250.00 | 4,387.50 | 4,257.50 | |
| COMMITMENTS | 1,740.00 | | | | |
| UNENCUMBERED | 105.00 | 2,250.00 | 4,387.50 | 4,257.50 | |

SOIL & WATER CONSERVATION

PAGE 6

DATE 12/28/73

PROJECT OVERVIEW

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|-------|------------|-------------|------------|-------------|------------|
|-------------|-------|------------|-------------|------------|-------------|------------|

SOIL CONSERVATION SRVC TOTALS

| | | | | | |
|--------------|-----------|-----------|-----------|-----------|-----------|
| APPROPRIATED | 46,500.00 | 44,611.00 | 55,291.00 | 37,937.00 | 13,025.00 |
| PAYMENTS | 28,281.00 | | | | |
| COMMITMENTS | | | | | |
| UNENCUMBERED | 18,219.00 | 44,611.00 | 55,291.00 | 37,937.00 | 13,025.00 |

SOIL & WATER CONSERVATION

PAGE 9

DATE 12/28/73

PROJECT TITLE FIRST YEAR SECOND YEAR THIRD YEAR FOURTH YEAR FIFTH YEAR

PROJECT 1 - 100% FUNDING TANKS

APPROPRIATION 3,640.00 7,280.00 14,560.00 14,560.00
COMMITMENTS 2,800.00
UNENCUMBERED 7,280.00 11,760.00 14,560.00

PROJECT 2 - 100% FUNDING

APPROPRIATION 3,640.00 7,280.00 14,560.00 14,560.00
COMMITMENTS 2,800.00
UNENCUMBERED 7,280.00 11,760.00 14,560.00

PROJECT 3 - 100% FUNDING

APPROPRIATION 3,235.00 6,470.00 12,940.00 12,940.00
COMMITMENTS 2,444.00
UNENCUMBERED 6,470.00 12,940.00 12,940.00

PROJECT 4 - 100% FUNDING

APPROPRIATION 760.00 1,520.00 3,040.00 3,040.00
COMMITMENTS 520.00
UNENCUMBERED 1,520.00 3,040.00 3,040.00

PROJECT 5 - 100% FUNDING

APPROPRIATION 675.00 1,350.00 2,700.00 2,700.00
COMMITMENTS 450.00
UNENCUMBERED 1,350.00 2,700.00 2,700.00

UNIT 10000000

SOIL & WATER ANALYSIS

DATE

10000000

ANALYSIS

10000000

10000000

10000000

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ANALYSIS

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ANALYSIS

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APPROPRIATES

PAYMENTS
COMMITMENTS
UNCOMMITTED

PAYMENTS
COMMITMENTS
UNCOMMITTED

PAYMENTS
COMMITMENTS
UNCOMMITTED

PAYMENTS
COMMITMENTS
UNCOMMITTED

APPROPRIATES

PAYMENTS
COMMITMENTS
UNCOMMITTED

9-500.00
1,100.00
10,390.00

275.00
275.00

275.00
275.00
1,000.00

900.00
9,900.00
1,000.00

675.00
100.00
575.00

675.00
3,800.00

675.00
3,800.00

675.00
100.00
575.00

675.00
3,800.00

675.00
3,800.00

675.00
100.00
575.00

675.00
3,800.00

675.00
3,800.00

675.00

Page 1 of 1

Account Number

Account Name

Account Type

Account Balance

Account Status

5011 L. A. L. C. R. C. O. N. S. I. D. E. R. A. T. I. O. N.

Page 1 of 1

Account Number

Account Name

Account Type

Account Balance

Account Status

Account Number

Account Name

Account Type

Account Balance

Account Status

Account Number

Account Name

Account Type

Account Balance

Account Status

Account Number

Account Name

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Account Status

Account Number

Account Name

Account Type

Account Balance

Account Status

Account Number

Account Name

Account Type

Account Balance

Account Status

Account Number

Account Name

SOIL & WATER CONSERVATION

DATE 12/28/73

PROJECT OVERVIEW

PAGE 13

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|------------------------------|------------|-------------|------------|-------------|------------|
| 400-431 | WILDLIFE HABITAT MANAGEMENT | | | | | |
| | APPROPRIATED PAYMENTS | 2,684.50 | 3,594.50 | | 3,822.00 | |
| | COMMITMENTS | 97.50 | | | | |
| | UNENCUMBERED | 2,587.00 | 3,594.50 | | 3,822.00 | |
| 400-432 | WOODLAND IMPROVED HARVESTING | | | | | |
| | APPROPRIATED PAYMENTS | 195.00 | 390.00 | 721.50 | 643.50 | |
| | COMMITMENTS | | 224.25 | | | |
| | UNENCUMBERED | 195.00 | 165.75 | 721.50 | 643.50 | |
| 400-433 | WOODLAND IMPROVEMENT | | | | | |
| | APPROPRIATED PAYMENTS | 260.00 | 1,859.00 | 2,821.00 | 2,990.00 | |
| | COMMITMENTS | | 368.00 | | | |
| | UNENCUMBERED | 260.00 | 1,491.00 | 2,821.00 | 2,990.00 | |
| 400-434 | WOODLAND PRUNING | | | | | |
| | APPROPRIATED PAYMENTS | 45.00 | 598.50 | | 331.50 | |
| | COMMITMENTS | | 552.00 | | | |
| | UNENCUMBERED | 45.00 | 46.50 | | 331.50 | |
| | INCENTIVE PAYMENTS TOTALS | | | | | |
| | APPROPRIATED PAYMENTS | 96,480.00 | 174,525.00 | 248,420.00 | 237,600.00 | 2,975.00 |
| | COMMITMENTS | 43,009.36 | 14,103.15 | 5,766.70 | 1,756.20 | 1,324.20 |
| | UNENCUMBERED | 47,041.34 | 160,421.85 | 242,653.30 | 235,843.80 | 1,650.80 |

SOIL & WATER CONSERVATION

PAGE 14

PROJECT OVERVIEW

| ACCOUNT NO. | DATE 12/28/73 | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|---------------|-------|------------|-------------|------------|-------------|------------|
|-------------|---------------|-------|------------|-------------|------------|-------------|------------|

*** TOTALS ***

999-999 RECEIPTS FROM FED. GOVERN

| | |
|--------------|-----------|
| APPROPRIATED | 95,237.24 |
| PAYMENTS | 82,787.14 |
| COMMITMENTS | |
| UNENCUMBERED | 12,450.10 |

SOIL & WATER CONSERVATION

DATE 12/28/73

PROJECT OVERVIEW

PAGE 15

| ACCOUNT NO. | TITLE | FIRST YEAR | SECOND YEAR | THIRD YEAR | FOURTH YEAR | FIFTH YEAR |
|-------------|--------------|------------|-------------|------------|-------------|------------|
| | APPROPRIATED | 287,990.00 | 413,338.00 | 483,546.00 | 462,268.00 | 197,547.00 |
| | PAYMENTS | 82,787.14 | | | | |
| | COMMITMENTS | 6,429.30 | 14,103.15 | 5,766.70 | 1,756.20 | 1,324.20 |
| | UNENCUMBERED | 198,773.56 | 399,234.85 | 477,779.30 | 460,511.80 | 196,222.80 |

OVERALL TOTALS

TOTAL IN-KIND SERVICES TO DATE THIS PERIOD \$ 13,807.71 GRANT AVAILABILITY \$ 41,423.13

| P.O. | KEY NO. | ARTICLES OR SERVICES | P.O. DATE | 1ST YEAR | 2ND YEAR | 3RD YEAR | 4TH YEAR | 5TH YEAR |
|---------|--------------------------------|----------------------|-----------|-----------|-----------|------------|------------|----------|
| 400-401 | CONSERVATION CROPPING SYSTEM | | | | | | | |
| 000 | 2701150007 | VINCE GEISTWHITE | 07/12/73 | 85.00 | 1,928.55 | 2,570.75 | 2,148.25 | 500.00 |
| 000 | 2700290004 | JOSEPH R GRABER | 08/03/73 | | 19.20 | | | |
| 000 | 2100060014 | BRUCE YERKS | 08/31/73 | | 62.40 | | | |
| 000 | 2100060003 | RICHARD YERKS | 08/31/73 | | 27.60 | | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 145.20 | | | |
| | TOTAL PAID | | | | 205.20 | | | |
| | TOTAL COMMITTED | | | | 459.60 | | | |
| | TOTAL UNENCUMBERED BALANCE | | | 85.00* | 1,458.75* | 2,570.75* | 2,148.25* | 500.00* |
| 400-402 | CONTOUR FARMING | | | | | | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 266.50 | 354.90 | 278.30 | 150.50 |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | | 16.00 | | 16.00 |
| | TOTAL PAID | | | | | | | |
| | TOTAL COMMITTED | | | | | 16.00 | | 16.00 |
| | TOTAL UNENCUMBERED BALANCE | | | | 266.50* | 336.90* | 278.30* | 64.00* |
| 400-403 | CRITICAL AREA PLANTING | | | | | | | |
| 000 | 2700150007 | VINCE GEISTWHITE | 07/12/73 | 2,260.00 | 520.00 | 1,040.00 | 730.00 | |
| | TOTAL PAID | | | 2,260.00 | | | | |
| | TOTAL COMMITTED | | | 2,260.00 | | | | |
| | TOTAL UNENCUMBERED BALANCE | | | 780.00* | 520.00* | 1,040.00* | 780.00* | * |
| 400-405 | OVERSEEDING | | | | | | | |
| 001 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | 1,845.00 | 2,250.00 | 4,387.50 | 4,257.50 | |
| 002 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | 240.00 | | | | |
| | TOTAL PAID | | | 1,740.00 | | | | |
| | TOTAL COMMITTED | | | 1,740.00 | | | | |
| | TOTAL UNENCUMBERED BALANCE | | | 105.00* | 2,250.00* | 4,387.50* | 4,257.50* | * |
| 400-407 | FIELD BORDER | | | | | | | |
| 000 | 2700290004 | JOSEPH R GRABER | 08/03/73 | 2,875.00 | 9,114.00 | 19,985.55 | 21,247.85 | |
| 000 | 2100060014 | BRUCE YERKS | 08/31/73 | | 147.00 | | | |
| 000 | 2100060003 | RICHARD YERKS | 08/31/73 | | 204.00 | | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 2,184.00 | | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | | 441.50 | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 965.00 | | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | | 199.50 | | | |
| | TOTAL PAID | | | | | | | |
| | TOTAL COMMITTED | | | | | | | |
| | TOTAL UNENCUMBERED BALANCE | | | 2,875.00* | 3,790.50 | 441.00 | | * |
| 400-408 | FIELD MINOR BREAK | | | | | | | |
| 000 | 2700150007 | VINCE GEISTWHITE | 07/12/73 | | 5,323.50* | 19,544.55* | 21,247.85* | * |
| | TOTAL PAID | | | | | | | |
| | TOTAL COMMITTED | | | | | | | |
| | TOTAL UNENCUMBERED BALANCE | | | | | | | |
| 400-409 | GRADE STABILIZATION STRUCTURES | | | | | | | |
| 000 | 2100060003 | RICHARD YERKS | 08/31/73 | 10,850.00 | 28,600.00 | 38,025.00 | 42,125.00 | |
| | TOTAL PAID | | | | | | | |
| | TOTAL COMMITTED | | | | | | | |
| | TOTAL UNENCUMBERED BALANCE | | | | | | | |

| P.O. | KEY NO. | ARTICLES OR SERVICES | P.O. DATE | 1ST YEAR | 2ND YEAR | 3RD YEAR | 4TH YEAR | 5TH YEAR |
|--|------------|----------------------|-----------|-----------|-----------|------------|------------|-----------|
| 001 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 513.00 | | | |
| 001 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | 254.50 | | | | |
| 001 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | | | 256.00 | |
| 002 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | 750.00 | | | | |
| TOTAL PAID | | | | 9,405.45 | | | | |
| TOTAL COMMITTED | | | | 1,006.50 | | | | |
| TOTAL UNRECOVERED BALANCE | | | | 438.05* | 1,638.00 | 38,025.00* | 41,869.00* | 256.00 |
| 400-410 UNRECOVERED WATERWAY DR OUTLET | | | | | | | | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | 7,132.50 | 5,265.00 | 2,520.00 | 4,972.50 | |
| 000 | 2100060007 | VIRGIL HIRSCH | 10/02/73 | | 504.00 | | | |
| 000 | 2700290004 | JOSEPH R GRABER | 12/05/73 | | 1,006.56 | | 100.00 | |
| TOTAL PAID | | | | 5,512.44 | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNRECOVERED BALANCE | | | | 1,620.06* | 1,510.56 | 2,520.00* | 4,864.50* | |
| 400-411 HOLDING FORDS & TANKS | | | | | | | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | 3,640.00 | 7,280.00 | 14,560.00 | 14,560.00 | |
| TOTAL PAID | | | | | | 2,800.00 | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNRECOVERED BALANCE | | | | 3,640.00* | 7,280.00* | 11,760.00* | 14,560.00* | |
| 400-413 LIVESTOCK EXCLUSION | | | | | | | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | 3,235.00 | 8,279.05 | 9,081.95 | 11,449.10 | |
| 000 | 2700290004 | JOSEPH R GRABER | 08/03/73 | | | 384.00 | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | 2,444.80 | 128.00 | | | |
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | 2,444.80 | 128.00 | 384.00 | | |
| TOTAL UNRECOVERED BALANCE | | | | 790.20* | 8,151.05* | 8,697.05* | 11,449.10* | |
| 400-414 LIVESTOCK WATERING FACILITY | | | | | | | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | 760.00 | 650.00 | 670.00 | 1,560.00 | |
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | 420.00 | | | | |
| TOTAL UNRECOVERED BALANCE | | | | 340.00* | 210.00 | 670.00* | 1,560.00* | |
| 400-415 UNRECOVERED WATERWAY DR OUTLET | | | | | | | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | 67.50 | 8,622.90 | 11,861.10 | 7,985.10 | 1,200.00 |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | 60.20 | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | 65.20 | | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | | 9,200.00 |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | 83.20 | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | 119.60 | | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | 115.60 | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | 119.60 | | |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | | 1,200.00 |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | | 50,000.00 |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | | 600.00 |
| 000 | 2700150007 | VINCE WEISWHITE | 07/12/73 | | | | | |

OUTSTANDING COMMITMENTS LISTING 4TH YEAR 5TH YEAR

| P.O. | KEY NO | ARTICLE'S OF SERVICES | P.O. DATE | 1ST YEAR | 2ND YEAR | 3RD YEAR | 4TH YEAR | 5TH YEAR |
|------|------------|-----------------------|-----------|----------|----------|----------|----------|----------|
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | 187.20 | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | 187.20 | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | 187.20 |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | 187.20 |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|------------------------------|---------------------|----------|--|--|--|--|--|
| 400-410 | PASTURE & HAYLAND MANAGEMENT | | | | | | | |
| 000 | 2700290004 | JOSEPH R. GRABER | 08/03/73 | | | | | |
| 001 | 2700290004 | JOSEPH R. GRABER | 08/03/73 | | | | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | | | | | |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|----------------------------|---------------------|----------|--|--|--|--|--|
| 400-417 | PASTURE & HAYLAND PLANTING | | | | | | | |
| 000 | 2700290004 | JOSEPH R. GRABER | 08/03/73 | | | | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | | | | | |

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| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|----------------------------|---------------------|----------|--|--|--|--|--|
| 400-418 | PASTURE & HAYLAND PLANTING | | | | | | | |
| 000 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | | | | | |
| 001 | 2700290004 | MR & MRS GAY MARTIN | 11/06/73 | | | | | |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|-----------------------------|---------------|----------|--|--|--|--|--|
| 400-420 | RECREATION AREA IMPROVEMENT | | | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 07/12/73 | | | | | |
| 000 | 2100000007 | RICHARD YERKS | 08/31/73 | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|-----------------------------|---------------|----------|--|--|--|--|--|
| 400-420 | RECREATION AREA IMPROVEMENT | | | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

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|---------|-----------------------------|---------------|----------|--|--|--|--|--|
| 400-420 | RECREATION AREA IMPROVEMENT | | | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |
| 000 | 2100000007 | VIRGIL HIRSCH | 10/02/73 | | | | | |

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|---------------------------|--|--|--|--|--|--|--|--|
| TOTAL PAID | | | | | | | | |
| TOTAL COMMITTED | | | | | | | | |
| TOTAL UNCOMMITTED BALANCE | | | | | | | | |

P.O. KEY NO ARTICLES OR SERVICES P.O. DATE 1ST YEAR 2ND YEAR 3RD YEAR 4TH YEAR 5TH YEAR

TOTAL PAID
TOTAL COMMITTED 175.00
TOTAL UNENCUMBERED BALANCE 790.00* 6,099.15* 8,364.20* 8,112.65* *

400-429 TILE DRAINS
000 210006007 VIRGIL HIRSCH 10/02/73 18,181.00 13,004.75 15,094.70 5,410.00
000 210006007 VIRGIL HIRSCH 10/02/73 518.00
000 210006007 VIRGIL HIRSCH 10/02/73 506.00 84.00

TOTAL PAID 15,890.77
TOTAL COMMITTED 518.00 504.00 84.00
TOTAL UNENCUMBERED BALANCE 1,772.23* 12,509.75* 15,094.70* 5,424.00* *

400-431 WILLIE L. GILFILLAN MANAGER
000 270015007 VINCE GEISTWHITE 07/12/73 2,584.50 3,564.50 3,800.00
000 270023046 MR & MRS GAY MARTIN 11/06/73 22.75 74.75

TOTAL PAID 97.50
TOTAL COMMITTED * 2,587.50* 3,594.50* 3,822.00* *
TOTAL UNENCUMBERED BALANCE

400-432 KODOLAND IMPROVED HARVESTING
000 210006003 RICHARD YERKS 08/31/73 195.00 721.50 643.50
000 210006014 BRUCE YERKS 08/31/73 195.00 29.25

TOTAL PAID 22.25
TOTAL COMMITTED 195.00* 155.75* 721.50* 643.50* *
TOTAL UNENCUMBERED BALANCE

400-433 KODOLAND IMPROVEMENT
000 210006003 RICHARD YERKS 08/31/73 260.00 1,859.00 2,821.00 2,999.00
000 210006014 BRUCE YERKS 08/31/73 320.00 49.00

TOTAL PAID 349.00
TOTAL COMMITTED 260.00* 1,491.00* 2,821.00* 2,999.00* *
TOTAL UNENCUMBERED BALANCE

400-434 KODOLAND IMPROVING
000 210006003 RICHARD YERKS 08/31/73 45.00 552.00 331.00
000 210006014 BRUCE YERKS 08/31/73 400.00 72.00

TOTAL PAID 45.00
TOTAL COMMITTED * 45.00* 552.00 331.00 *
TOTAL UNENCUMBERED BALANCE

***** CHECK WRITTEN FILE UPDATE *****

| ACCOUNT | PO NUMBER | PAYOR OF CLAIM | CHECK-AMT |
|---------|-----------|--------------------------------|-----------|
| 600-101 | 0 | TOTAL DISTRICT SALARY & WAGES | 381.20 |
| 600-101 | 0 | TOTAL DISTRICT FRINGE BENEFITS | 45.45 |
| 600-101 | 0 | TOTAL DISTRICT FRINGE BENEFITS | 42.30 |
| 600-101 | 0 | TOTAL DISTRICT SALARY & WAGES | 358.20 |
| 600-101 | 0 | TOTAL DISTRICT SALARY & WAGES | 363.10 |
| 600-101 | 0 | TOTAL DISTRICT FRINGE BENEFITS | 49.15 |
| 600-101 | 0 | TOTAL DISTRICT SALARY & WAGES | 370.00 |
| 600-101 | 0 | TOTAL DISTRICT FRINGE BENEFITS | 41.60 |
| 600-108 | 0 | 5 HRS @ \$10.05 HR | 50.25 |
| 600-201 | 0 | BROOKS-PURDUE SALARY & WAGES | 499.53 |
| 600-201 | 0 | PURDUE SALARY & WAGES | 2,609.12 |
| 600-201 | 0 | MCCAFFERTY PURDUE SALARY | 416.93 |
| 600-202 | 0 | BROOKS-PURDUE FRINGE BENEFITS | 104.49 |
| 600-202 | 0 | PURDUE FRINGE BENEFITS | 442.13 |
| 600-202 | 0 | MCCAFFERTY PURDUE FRINGE BENEF | 85.95 |
| 600-209 | 0 | BROOKS-PURDUE INDIRECT COSTS | 321.46 |
| 600-209 | 0 | PURDUE INDIRECT COSTS | 1,677.69 |
| 600-209 | 0 | MCCAFFERTY PURDUE IND COSTS | 268.09 |
| 600-409 | 0 | RAY MILLER | 80.00 |
| 600-409 | 0 | DRAINAGE ASSOC | 40.00 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 537.50 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 745.00 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 175.95 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 97.00 |

DATE 12/28/73

S O I L & W A T E R

PAGE 2

***** CHECK WRITTEN FILE UPDATE *****

| ACCT-NO | PU-NUMBER | PAYOR OF CLAIM | CHECK-AMT |
|---------|-----------|-----------------------------|-----------|
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 15.80 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 275.00 |
| 600-409 | 0 | JESTER CONSTRUCTION COMPANY | 20.00 |
| 600-410 | 0 | PAY MILLER | 64.00 |
| 600-410 | 0 | PAY MILLER | 18.00 |
| 600-410 | 0 | JESTER CONSTRUCTION COMPANY | 80.00 |
| 600-421 | 0 | JOE GRABER | 471.87 |
| 600-423 | 0 | JESTER CONSTRUCTION COMPANY | 449.00 |
| 600-424 | 0 | JESTER CONSTRUCTION COMPANY | 1,500.00 |
| 600-424 | 0 | JESTER CONSTRUCTION COMPANY | 202.50 |
| 600-424 | 0 | JESTER CONSTRUCTION COMPANY | 300.00 |
| 600-429 | 0 | PAY MILLER | 127.00 |
| 600-429 | 0 | JESTER CONSTRUCTION COMPANY | 418.50 |
| 600-429 | 0 | JESTER CONSTRUCTION COMPANY | 64.00 |

FOR TRANSACTIONS AMOUNT *****23,289.39

CURRENT TRANSACTIONS AMOUNT *****37,097.10

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

10/29/73

AND ENDING

08/30/73

FOR PERIOD BEGINNING

| ACCOUNT NO | DATE | BY WHOM RENDERED | KIND OF SERVICE AND ITEMIZATION | AMOUNT | VOUCHER |
|------------|----------|--------------------------------|---------------------------------|--------|---------|
| 600 101 | 08/31/73 | TOTAL DISTRICT SALARY & WAGES | | 381.30 | 004 |
| 600 101 | 08/31/73 | TOTAL DISTRICT FRINGE BENEFITS | | 45.45 | 004 |
| 600 101 | 09/15/73 | TOTAL DISTRICT FRINGE BENEFITS | | 42.30 | 004 |
| 600 101 | 09/15/73 | TOTAL DISTRICT SALARY & WAGES | | 369.20 | 004 |
| 600 101 | 09/30/73 | TOTAL DISTRICT SALARY & WAGES | | 363.10 | 004 |
| 600 101 | 09/30/73 | TOTAL DISTRICT FRINGE BENEFITS | | 39.15 | 004 |
| 600 101 | 10/15/73 | TOTAL DISTRICT SALARY & WAGES | | 370.00 | 004 |
| 600 101 | 10/15/73 | TOTAL DISTRICT FRINGE BENEFITS | | 41.40 | 004 |
| 600 108 | 02/01/73 | 5 HRS @ \$10.25 HR | | 50.25 | 004 |

1,701.15

REPORT OF IN-KIND MATCHING CONTRIBUTIONS

10/29/73

AND ENDING

08/30/73

FOR PERIOD BEGINNING

| ACCOUNT NO | DATE | BY WHOM RENDERED | KIND OF SERVICE AND ITEMIZATION | AMOUNT | VOUCHER |
|------------|----------|--------------------------------|---------------------------------|----------|---------|
| 600 201 | 04/30/73 | BROOKS-PURDUE SALARY & WAGES | | 493.53 | 004 |
| 600 201 | 04/30/73 | PURDUE SALARY & WAGES | | 2,609.12 | 004 |
| 600 201 | 07/31/73 | MCCAFFERTY PURDUE SALARY | | 416.93 | 004 |
| 600 202 | 04/30/73 | BROOKS-PURDUE FRINGE BENEFITS | | 104.49 | 004 |
| 600 202 | 04/30/73 | PURDUE FRINGE BENEFITS | | 442.18 | 004 |
| 600 202 | 07/31/73 | MCCAFFERTY PURDUE FRINGE BENEF | | 85.95 | 004 |
| 600 209 | 04/30/73 | BROOKS-PURDUE INDIRECT COSTS | | 221.46 | 004 |
| 600 209 | 04/30/73 | PURDUE INDIRECT COSTS | | 1,677.69 | 004 |
| 600 209 | 07/31/73 | MCCAFFERTY PURDUE IND COSTS | | 268.09 | 004 |
| | | | | 6,425.44 | |

REPORT OF MATCHING CONTRIBUTIONS

10/20/73

AND ENDING

02/20/73

FOR PERIOD BEGINNING

| ACCOUNT NO | DATE | BY WHOM RENDERED | KIND OF SERVICE AND ITEMIZATION | AMOUNT | VOUCHER |
|------------|----------|-----------------------------|---------------------------------|----------|---------|
| 600 409 | 09/14/73 | RAY MILLER | | 80.00 | 004 |
| 600 409 | 09/19/73 | DRAINAGE ASSOC | | 40.00 | 004 |
| 600 409 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 537.50 | 004 |
| 600 409 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 745.00 | 004 |
| 600 409 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 175.95 | 004 |
| 600 409 | 10/21/73 | JESTER CONSTRUCTION COMPANY | | 97.00 | 004 |
| 600 409 | 10/25/73 | JESTER CONSTRUCTION COMPANY | | 15.00 | 004 |
| 600 409 | 10/25/73 | JESTER CONSTRUCTION COMPANY | | 275.00 | 004 |
| 600 409 | 10/ 5/73 | JESTER CONSTRUCTION COMPANY | | 20.00 | 004 |
| 600 410 | 09/14/73 | RAY MILLER | | 64.00 | 004 |
| 600 410 | 09/14/73 | RAY MILLER | | 18.00 | 004 |
| 600 410 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 80.00 | 004 |
| 600 421 | 10/01/73 | JOE SPABER | | 471.87 | 004 |
| 600 423 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 447.00 | 004 |
| 600 424 | 10/01/73 | JESTER CONSTRUCTION COMPANY | | 1,530.00 | 004 |
| 600 424 | 10/21/73 | JESTER CONSTRUCTION COMPANY | | 202.50 | 004 |
| 600 424 | 10/21/73 | JESTER CONSTRUCTION COMPANY | | 300.00 | 004 |
| 600 429 | 09/14/73 | RAY MILLER | | 127.00 | 004 |
| 600 429 | 10/05/73 | JESTER CONSTRUCTION COMPANY | | 410.50 | 004 |
| 600 429 | 10/05/73 | JESTER CONSTRUCTION COMPANY | | 94.00 | 004 |
| | | | | 5,681.12 | |

STANDARD AND MATHEMATICS

FOR PERIOD BEGINNING 09/30/73 AND ENDING 10/29/73

| ACCOUNT NO | DATE | BY WHOM RENDERED | KIND OF SERVICE AND ITEMIZATION | AMOUNT |
|------------|------|------------------|---------------------------------|--------|
|------------|------|------------------|---------------------------------|--------|

| | | | | |
|--|--|--|--|-----------|
| | | | | 13,867.71 |
| | | | | 13,825.89 |

CONSERVATION PRACTICE SPECIFICATIONS

| Practice | <u>Practice Number</u> |
|--|------------------------|
| Conservation Cropping System (Acres) | 328 |
| Contour Farming (Acres) | 331 |
| Critical Area Planting (Acres) | 347 |
| Mulching (Acres) | 484 |
| Crop Residue Management (Acres) | 344 |
| Diversion (Feet) | 262 |
| Farmstead & Feedlot Windbreaks (Acres) | 280 |
| Field Border (Feet) | 386 |
| Field Windbreaks (Feet) | 391 |
| Grade Stabilization Structure (Number) | 410 |
| Grassed Waterway or Outlet (Acres) | 412 |
| Holding Ponds & Tanks (Number) | 425 |
| Land Smoothing | 451 |
| Livestock Exclusion (Acres) | 472 |
| Fencing | 382 |
| Livestock Watering Facility (Number) | 614 |
| Minimum Tillage | 478 |
| Pasture & Hayland Management (Acres) | 510 |
| Pasture & Hayland Planting (Acres) | 512 |
| Pond (Number) | 378 |
| Land Protected During Development (Number & Acres) | 629 |
| Recreation Area Improvement (Acres) | 562 |
| Sediment Control Basin (Number) | 350 |
| Stream Channel Stabilization | 584 |
| Streambank Protection (Feet) | 515 |
| Stripcropping, Contour (Acres) | 585 |
| Surface Drains (Feet) | 590 |
| Terraces, Gradient (Feet) | 600 |
| Terraces, Parallel (Feet) | 624 |
| Tile Drains (Feet) | 636 |
| Tree Planting (Acres) | 617 |
| Wildlife Wetland Habitat Management (Acres) | 644 |
| Wildlife Upland Habitat Management (Acres) | 645 |
| Woodland Improved Harvesting (Acres) | 654 |
| Woodland Improvement (Acres) | 656 |
| Woodland Pruning (Acres) | 659 |

' , , , , ,

- • • • •

(1) 1990-1991

- Note: "adequate fertility program" is one which is planned
and/or controlled, and then used with needed or suitable
equipment, fertilizer will be controlled within tolerat soil ranges.

14225. 1977

5. Intensive row cropping may be planned when:

- a. The soils are level to nearly level and erosion is not a problem, or on sloping land, erosion control is planned as indicated under Item 2 of these specifications.
 - b. The soils have good structure, with adequate drainage for the yield level planned.
 - c. Skillful management is used in applying cultural and management items. This includes fertilization, minimum tillage operations, use of crop residues and cover crops, timeliness of operations, etc.
 - d. An occasional grass-legume seeding is inserted in the cropping sequence, when satisfactory yield levels are not maintained.
6. Apply field drainage needs as designated in the Indiana Drainage Guide.
7. Waterways shall be installed in areas where there is concentrated flow.
8. Where irrigation is to be used, consult the Indiana Irrigation Guide.

Cost Sharing

Cost share, when planned and applied according to above specifications, will be 80% of the average cost of \$1.50 per acre.

Unit price = \$1.50 per acre

Cost share rate = \$1.20 per acre

Except: Where three or more years of grasses and legumes in rotation are needed and planned, initial establishment of the seedings will be cost shared on the basis of practice 512, pasture and hayland planting.

Practice will be eligible for payment after the establishment of the crop in the first year of the rotation.

330 CONTOUR FARMING (Acres)

Definition

Farming sloping cultivated land in such a way that plowing, preparing and planting, and cultivating are done on the contour. (This includes following established grades of terraces, diversions, or contour strips.)

Purpose

To reduce soil and water losses, and aid in the maintenance of other practices.

Where Applicable

On sloping cropland where other practices in the cropping system do not reduce soil and water losses to the desired level.

Specifications

1. The Universal Soil Loss Equation shall be used to determine adequacy of erosion control with contouring.
2. On terraced land or where diversions are used, the ridge will serve as a contour guide line. On contour strip cropped land, the key strip lines will serve as guides.
3. Guide lines shall be laid approximately on the contour. Deviation shall not be more than 3 percent in any 100-foot length.
4. Guide lines for soils with tight subsoils shall be established on a slight grade (0.5 to 1 percent) toward grass waterways.
5. Planting shall start on guide line and progress toward the center (between guide lines) where short rows, if any, shall be placed.
6. Existing watercourses shall be left in sod and new waterways established where needed.

Cost Sharing

Cost share, when planned and applied according to the above specifications, will be 80% of the average cost of \$2.00 per acre.

330-2

State of Texas
Department of Agriculture

Unit Price = \$2.00 per acre
Maximum Cost Share = \$1.50 per acre

Practices will be eligible for payment only after the first crop is planted, and after the first crop is planted, in the spring.

June 1973

36-2 CONSERVATION PLANTING (Form 1)

Definition

Stabilizing silt-producing and severely eroded areas by establishing vegetative cover. This includes cover plants, such as grasses, forbs or vines, and adapted masses or legumes established by seeding or sodding to provide long-term ground cover. (Do not include tree planting mainly for the production of wood products.)

Purpose

To stabilize eroded areas, to reduce siltages from eroded areas to downstream areas, improve wildlife habitat, and enhance the beauty of the countryside.

Where Applicable

On highly erodible or severely eroded areas such as denuded or gullied areas where vegetation is difficult to establish with normal seeding methods.

Specifications

A. Adapted masses and legumes seeding

1. Seedbed preparation

- a. Gullied and severely eroded area may need grading before attempting to prepare seedbed.
- b. Line to raise H₂O to level needed for species being seeded.
- c. Use the minimum amount of tillage operations to obtain adequate seedbed.
- d. Fertilize at rate of 600 lbs. 12-12-12 per acre or equivalent (minimum of 72 lbs. actual N-P-K per acre).

2. Seeding

Seeding will generally be done from March 1 to May 10 and August 10 to September 30. Mixtures with sericea lespedeza and crownvetch are best spring seeded.

June 1976

For wet seeding may be done between December 10 and February 10. Seeding, fertilizing, seedbed preparation and mulching must be done ahead of time of for wet seeding, with the seed being broadcast on top of the mulch. See specification for details.

The seed is planted to site conditions. Some suggested mixtures:

CRITICAL AREA SEEDING MIXTURES

| Species | Seeding Rate | | Suitable
pH | * Site Suitability | | |
|--|-----------------|-----------------------|----------------|--------------------|-----------------|-----|
| | lbs./
acre | lbs/1000
sq.ft. | | Brought
in | Well
Drained | Wet |
| 1. Smooth Bromegrass
plus:
Redtop or
Perennial Ryegrass | 20
5
5 | 1/2
1/8
1/8 | 5-8 | 2 | 1 | |
| x2. Tall Fescue
Crownvetch | 15-20
10 | 3/8-1/2
1/4 | 5.5-8.3 | 2 | 1 | |
| 3. Tall Fescue
Sericea Lespedeza | 20
25 | 1/2
5/8 | 4.5-8.3 | 1 | 1 | |
| x4. Tall Fescue | 30 | 3/4 | 5.5-8.3 | 2 | 1 | 2 |
| 5. Seed Canadaverass
Ladino Clover | 15
1-2 | 3/8
1/40-
1/20 | 5.5-7.5 | 2 | 1 | 1 |
| 6. Ry. Bluegrass
plus:
Redtop or
Perennial Ryegrass | 15-20
5
5 | 3/8-1/2
1/8
1/8 | 5.8-7.5 | 2 | 1 | 2 |

* 1/ Preferred; 2/ Will tolerate

- Use on pond fill and borrow areas. Mixture 6 may be used where pond fills will be frequently and closely moved.

June 1973

3. Mulch with 2 tons of straw or equivalent material. See Specifications "484 Mulching" attached.

B. Adapted tree, shrub and vine plantings

1. Follow Indiana Tree Planting Guide and Shrub Planting Guide for the proper species, spacing and the important techniques of planting and management.
2. When making plantings, particularly beneficial to wildlife, refer to the appropriate specifications as outlined in Practice 645, Wildlife Development.
3. Tree, shrub and vine plantings for critical areas and beautification.

| Purpose, Use, and
Aesthetic Value | Species | Spacing | Growth | | Tolerance | | Drainage | |
|--------------------------------------|---------|---------|------------------|--|-----------|-------|----------|------|
| | | | Rate &
Height | | Sun | Shade | Poor | Well |

SHADE AND ORNAMENTAL TREES:

Evergreen

| | | | | | | | |
|------------|-----|-------|---|--|--|---|---|
| White Pine | 65' | M-90' | X | | | 2 | 1 |
| Red Pine | 65' | M-75' | X | | | | 2 |
| Jack Pine | 40' | F-40' | X | | | 2 | 1 |

Deciduous

| | | | | | | | |
|-----------------------|-----------------------|-----|-------|---|---|---|---|
| White flowers | Black Locust | 40' | F-30' | X | | | 1 |
| Bright red coloration | Black Gum | 40' | M-50' | X | X | 2 | 1 |
| Yellow coloration | Thornless Honeylocust | 50' | F-40' | X | | | 1 |
| Yellow coloration | Europ. Bl. Alder | 40' | F-40' | X | | 2 | 1 |

SHRUBS:

| | | | | | | | |
|-------------------------|----------------------------|------------------|-------|---|---|---|---|
| White flowers-red color | Dogwood | 8'x10' | S-20' | X | X | | 1 |
| Pink flowers | Pedbud | 8'x10' | M-15' | X | | | 1 |
| Yellow flowers | Forsythia | 8'x10' | F- 8' | X | | | 1 |
| Red coloration | Suma-Smooth
or Staghorn | Clumps
2 or 3 | F-10' | X | | | 1 |
| Red fruit | Coralberry | 6'- 8' | F- 5' | X | X | 2 | 1 |
| Silver leaves-red fruit | Autumn Olive | 8'-10' | M-10' | X | | | 1 |

All growing of trees and shrubs shall be done in such a way as to show the plants' beauty, and not for any other purpose.

It is the policy of the Department of Parks and Recreation to encourage the growth of adapted species and to encourage the utilization of them.

| Ground Cover
Plant (Vine Type) | Spacing | Growth
Rate &
Height | | Tolerance
Sun Shade | | Estimated
Number
Per Acre |
|-----------------------------------|---------|----------------------------|--|------------------------|---|---------------------------------|
| | | | | | | |
| Ground "Hurtle"
(Vine Minor) | 2' | R-1/2' | | | | 1 |
| Japanese "Honeyuckle" | 6' | R-1' | | X | X | 1 |

Under "Optical Area Planting" are listed the plants which are tolerant, fertile to shade, and maintain their color.

Optical Area

When trees, shrubs, and vines are planted in the optical area, they shall be as follows:

1. The optical area shall be planted with plants of the following types, and the plants shall be planted in such a way as to show the plants' beauty, and not for any other purpose.

Planting = 100.00 per acre
Medium Cost-Same = 120.00 per acre

2. When trees, shrubs, and vines are planted in the optical area, they shall be as follows: the plants shall be planted in such a way as to show the plants' beauty, and not for any other purpose.

Planting = 800.00 per acre
Medium Cost-Same = 820.00 per acre

3. The protection from insects and diseases shall be provided for the plants in the optical area, and the plants shall be planted in such a way as to show the plants' beauty, and not for any other purpose.

484 MULCHING (Acres)

Definition

Applying plant residues or other suitable materials not produced on the site to the soil surface.

Purpose

To conserve moisture, absorb rainfall impact and prevent soil compaction and crusting, to reduce runoff and erosion, to help establish new seedlings, control weeds and improve the physical condition of the soils.

Where Applicable

On soils subject to severe erosion where a small amount of vegetation cover or crop residue is produced, such as critical areas and some orchards and vineyards; on soils that have a low infiltration rate; on soils excavated in construction, both cut and fill areas, and on new seedlings.

Specifications

Critical areas where grass and/or legumes are to be seeded.

Apply approximately 1-1/2 to 2 tons of dry material per acre or 2 bales per 1000 sq. ft. (straw, hay, etc.) to the surface after fertilizing and seeding. (Eight tons of manure will have about the same effect as two tons of straw).

When structures are completed too late for normal seeding and too early for dormant seeding to be made: apply lime, fertilizer, prepare seedbed and mulch and secure the mulch in place immediately after completion of the structure. Delay seeding until after potential for fall germination is past, then broadcast seed on the surface by some type of hand seeder.

Spread evenly over the area.

Anchor the mulching material by disking into the surface, by stakes and string, asphalt spray or paper netting.

Cost-share for mulching is included in those practices where mulching is required.

June 1973

[illegible]

...infiltration, seepage losses, and

no significant loss of volatile organ residues are produced.

... from or on a surface left on surface.

100

[illegible][illegible]

| Concentration of inhibitor (mole/l) | Rate of polymerization (mole/l·hr) |
|-------------------------------------|------------------------------------|
| 0 | 0.001 |
| 0.0001 | 0.0008 |
| 0.0002 | 0.0006 |
| 0.0004 | 0.0004 |
| 0.0006 | 0.0003 |
| 0.0008 | 0.0002 |
| 0.001 | 0.0001 |

1. The average cost of the above 1000 samples is \$11.50 per acre.

344-2

Black Creek Study Area
Standards and Specifications
Allen Co. WCD

Unit Price = \$1.50 per acre
Maximum Cost Share = \$1.05 per acre

Practice will be eligible for payment just prior to planting of the
next years crop.

362 DIVERSION (feet)

Definition

A channel with a supporting ridge on the lower side constructed across the slope.

Score

This standard covers the installation of all diversion practices for water diversion.

Purpose

The purpose of this practice is to divert water from areas where it is in excess to sites where it can be used or disposed of safely.

Conditions Where Practice Applies

This practice applies to sites where:

1. Runoff from higher lands is damaging cropland, pastureland, farmsteads, or conservation land or other structures or timber-cropland.
2. Surface and shallow subsurface flow is causing erosion damage.
3. Runoff is available for diversion and use on nearby sites.
4. Required as a part of a pollution abatement system, to control erosion and runoff on urban or developed areas and construction sites.

Diversion shall not be substituted for terraces on land requiring terracing for erosion control.

Diversion are not usually applicable below high sediment producing areas unless land treatment practices or structural measures, designed to prevent damaging accumulations of sediment in the channels, are installed with or before the diversions.

Design Criteria

General

Diversions shall be designed according to the procedures found in Chapter 9, SCS Engineering Field Manual.

Capacity

Diversions protecting agricultural land and those that are part of a pollution abatement system must have the capacity to carry the peak runoff from a 10-year-frequency storm as a minimum, with a freeboard not less than 0.3 feet. Diversions designed to protect urban areas, buildings and roads, and those designed to function in connection with other structures, shall have enough capacity to carry the peak runoff expected from a storm frequency with the hazard involved.

Cross Section

The channel may be parabolic, V-shaped, or trapezoidal. The diversion shall be designed to have stable side slopes; no steeper than 4:1 on field slopes up to 15 percent and on field slopes over 15 percent, no steeper than 2:1. The ridge height will include a minimum of 1 percent for settlement. The ridge shall have a minimum top width of 4 feet at the design elevation. The minimum cross section shall meet the specified dimensions. The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement.

Location

Diversion location shall be determined by outlet conditions, topography, land use, cultural operations, soil type, and length of slope.

A diversion in a cultivated field must be aligned so as to permit the use of modern farming equipment.

Vegetation

The channel and ridge, including front and back slopes of all diversions shall be seeded and maintained in good vegetation. Adapted grasses and fertility rates for Practice 342, Critical Area Planting, shall be used.

Protection Against Sedimentation

In addition to vegetating the ridge and channel, a filter strip above the channel not less than 20 feet wide will be established and maintained in good seed when one or more of the following conditions exist:

$$S = \frac{1}{2} \int d^4x \left(\frac{1}{2} \partial_\mu \phi \partial^\mu \phi - \frac{1}{2} m^2 \phi^2 - \frac{1}{4} F_{\mu\nu} F^{\mu\nu} - \frac{1}{2} \bar{\psi} \gamma^\mu \partial_\mu \psi - \bar{\psi} \psi \right)$$
[illegible]

Insertion of test flow in the duct outlet. The outlet may be covered externally by a protective cover, made of insulation, aluminum, and/or copper, or by a outlet. In all cases the outlet must have a roughness of a roughness of 0.15 mm will not cause damage. Test flow and test flow in the duct outlet may be used for construction, if necessary to insure installation of the outlet cover in the outlet channel.

Form and Specification.

Composition

The minimum overall section shall meet the specified overall dimensions, but the minimum thickness of the plate shall be 1/2 inch.

[illegible]

1990-1991

7. The actual cost was 7% of the actual cost not to exceed 15% of the

Unit Price = \$.60 per cubic yard
Maximum Cost Share = 45¢ per cubic yard of earth moved

2. Seeding the Diversion and Required Filter Strip

Cost share, when carried out according to the above specifications will be 75 percent of the actual cost not to exceed 75 percent of the estimated cost.

Unit Price = \$150.00 per acre
Maximum Cost Share = \$112.50 per acre

3. Underground Outlet and Inlet System

Cost share when planned and constructed according to the above specifications will be 75 percent of the actual cost not to exceed 75 percent of the estimated cost.

Unit Price = \$150.00 per inlet
Maximum Cost Share = \$112.50 per inlet

Practice will be eligible for payment when diversion is completed and seeded.

1. The "average" and "middle" of a distribution of scores is the mean. The "average" and "middle" of a distribution of scores is the mean.

Spacing of Trees and Shrubs

1. Keep trees and shrubs 8 feet or more from fences.
2. Space as follows: Evergreens - Rows 12' to 16' apart and trees 12' to 16' apart in the row.

Shrubs - Rows 12' to 12' from evergreens and 3' to 4' apart in the row.

Spacings are shown with variance in order to fit landowner cultivation equipment.

Planting and design

1. Establish windbreaks only in spring (March 15 to May 15).
2. Minimum requirement for Farmstead and Feedlot Windbreak will be 3 rows of plants, of which 2 rows must be tree species:

The following combinations are recommended:
 - A. One row shrubs on windward side and 2 rows of evergreen inside.
 - B. One row of shrubs outside and another inside with 2 rows of evergreens in the middle. (4 row windbreaks)
 - C. Three rows of evergreens.
3. Stagger spacing of evergreens in adjacent rows.

Planting Stock for Windbreaks

Trees -

White Pine - Good for windbreaks except on severely eroded sites.

Stock - Transplants - 2-2 or 2-1

Red Pine - Avoid wet sites and severe erosion areas.

Stock - Transplants - 2-1 or 2-2

American Arborvitae (Northern White-Cedar) - Good species for moist and fertile sites. When used with pines, it should be planted in outside rows.

Stock - Seedling or Transplant - 3-0 or 2-1

Mountain Pine - Suited to better soils, and slower in growth than
Pines. When planted with pines, place in windbreak row.

Stock - Transplants - 2-2

Jack Pine - Only on sandy soils where active blow erosion exists.
Use in windbreak row to protect better pines.

Stock - Seedlings - 1-0 or 2-0

Bushes

Hazelcut (Filbert) - Dry and well drained upland sites.

Seedlings - 2-0

Autumn Olive - Stands wide range of sites.

Seedlings - 2-0

Multiflora Rose - Only in areas of intensive cultivation and where
spread will be controlled. Avoid droughty sand areas.

Seedlings - 1-0

Lilacs - Used in most cases to add beauty to windbreaks. Avoid
wet sites.

Seedlings and grafted stock - 2-0 or 3-0

Gray Dogwood

Red Osier Dogwood - Moist sites.

Seedlings - 2-0

Tartarian Honeysuckle - Most common of bush honeysuckles. Suited
to planting on wide variety of sites.

Seedlings - 2-0

Amur Honeysuckle - Similar to Tartarian, will attain a greater
height and retain fruit longer into winter.

Seedlings - 2-0

Trees and shrubs selected for windbreaks must be adapted to soil and
site.

June 1973

Place order for windbreak stock in fall for next year's planting. Order 10% more plants than required. Extras to be planted in garden for later replacement stock.

Maintenance

1. Fence, where needed, to protect plants from livestock damage.
2. Protect from fire, rodents, and harmful chemical spray.
3. Replant any dead plants the following spring.
4. Cultivate for several years until plants are well established.

Cost Sharing

Cost share, when planned and applied according to the above specifications will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Unit Price = \$80.00 per acre

Maximum Cost Share = \$64.00 per acre

Where protection from livestock is needed, fencing as planned and installed will be cost shared in accordance with practice 472, Livestock Exclusion.

Practice will be eligible for payment when trees are planted and protected.

386 FIELD BORDER (Feet)

Definition

A border or strip of perennial vegetation established at the edge of a field by planting grass-legume mixtures or by converting existing vegetation or shrubs.

Purpose

To control erosion; protect edges of fields and berms that are used as "turn rows" or travel lanes for farm machinery; reduce competition from adjacent woodland; provide wildlife food and cover; or improve the environment.

Where Applicable

At field edges, especially crop fields along open drains and edge of woodlands adjacent to cropland, roads, trails, rights-of-way, and woodland openings.

Specifications

Borders developed will be a minimum of one rod in width and will not include a part of a designed waterway or streambank section. Development of field borders by either of the two following methods is acceptable:

A. Grass-Legume Planting

1. Field borders will be at least one rod in width.
2. Use adapted perennial grasses, legumes, or grass-legume mixtures. See Standard and Specifications for Pasture and Hayland Planting. If field is plowed out of meadow, leave desired width of field border.
3. Delay mowing of field borders until after August 1. Hay may be removed at that time.

B. Shrub, or Shrub and Tree, or Grass and Tree Planting

1. Plant two rows of shrubs such as gray or silk dogwood or autumn olive along woodland edges and field borders. Space shrub rows 6 to 8 feet apart with plants 6 to 8 feet apart in row.

2. Plant species of pure seed (without any admixture of other seeds) on a 12 foot spacing will be planted. Alternatively, the seed may be on a 6 foot spacing. However, if the seeds are not pure, the spacing should be increased to a minimum of 8 feet and the following should be observed:
 3. Here strict adherence of uniformity is planted on a 6 foot spacing with adjacent commercial species located on 12 foot spacings. If trees and shrubs are transplanted into established row, acceptable planting methods should be used to reduce cross competition toward the tree seedlings.
4. The area included in the field border will be a minimum of 1 rod in width.
5. Seedlings and transplants will be planted by April 30, unless planted by April 30 or October 30.

Caution

Chemicals used in performing this practice must be federally and locally registered, and must be applied strictly in accordance with authorized registered uses, directions on the label, and other federal or state policies and requirements.

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 70% of the average cost of 32 cents per lineal foot.

Unit Price = 32 cents per lineal foot

Maximum Cost-Share = 21 cents per lineal foot

Practice will be eligible for payment when seeding is completed.

392 FIELD WINDBREAKS (feet)

Definition

A strip or belt of trees or shrubs established within or adjacent to a field.

Purpose

To reduce soil blowing; control deposition; conserve moisture; protect crops and orchards.

To provide food, cover and travel lanes for wildlife in areas of intensive farming operations.

Contribute to reduction of air pollution, improve general environment and add to rural beauty.

Where Applicable

In or around open fields which need protection against wind damage to soils and crops.

Where strips of trees or shrubs increase the natural beauty of a rural community or provide additional cover and food for many species of wildlife.

Specifications

Plant generally in a north - south direction to give maximum protection from prevailing winds. Occasional east - west plantings are also needed on large areas of erosive soils, and in some specific sites.

The permanency of this practice makes it essential that rows be laid out and marked prior to planting. Careful layout will eliminate cultivation problems after planting.

The spacing between field windbreaks will vary with type of plants used in windbreak crop being protected, and erodibility of soil. Generally, the spacing of windbreaks should be a distance not greater than 15 - 20 times the effective height of materials being planted.

Plants for Windbreaks and Spacing*

| Species | Planting
Spacing
In Row Ft. | Expected
Maximum
Height Ft. | Size
Stock | Allowable Dis-
tance Between
Windbreaks Ft. |
|-----------------------|-----------------------------------|-----------------------------------|---------------|---|
| White Pine | 8 - 10 | 80 - 90 | 2-1, 2-2 | 1,000 - 1,500 |
| Red Pine | 8 - 10 | 70 - 80 | 2-1, 2-2 | 1,000 - 1,500 |
| Jack Pine | 8 - 10 | 60 - 70 | 1-0 | 800 - 1,000 |
| American Arborvitae | 6 - 8 | 30 - 40 | 3-0, 2-1 | 500 - 1,000 |
| Norway Spruce | 8 - 10 | 70 - 80 | 2-2 | 1,000 - 1,500 |
| Hazelnut (Filbert) | 3 - 4 | 8 - 10 | 2-0 | 150 - 200 |
| Autumn Olive | 3 - 4 | 12 - 14 | 2-0 | 250 - 300 |
| Multiflora Rose | 2 - 3 | 8 - 10 | 1-0 | 150 - 200 |
| Lilacs | 3 - 4 | 10 - 12 | 2-0 | 200 - 250 |
| Silkydogwood | 3 - 4 | 15 - 20 | 2-0 | 300 - 400 |
| Gray Dogwood | 3 - 4 | 15 - 20 | 2-0 | 300 - 400 |
| Red Osier Dogwood | 3 - 4 | 15 - 20 | 2-0 | 300 - 400 |
| Laurel-leaf Willow | 3 - 4 | 30 - 40 | Cuttings | 600 - 800 |
| Tall Purple Willow | 3 - 4 | 15 - 20 | Cuttings | 300 - 400 |
| Med. Purple Willow | 3 - 4 | 12 - 15 | Cuttings | 250 - 300 |
| Tartarian Honeysuckle | 3 - 4 | 12 - 15 | 2-0 | 250 - 300 |
| Amur Honeysuckle | 3 - 4 | 15 - 20 | 2-0 | 300 - 400 |

NOTE: The woodland suitability groups for mapping units places together soil units where wind erosion presents a problem. The same groups provide a good base for assignment of suitable units for use in windbreaks.

* On specialty crops a closer spacing may be needed to adequately protect young growing plants.

Planting

1. Planting time will be from March 15 to May 15.
2. Plant in 1 or 2 rows. When 2 rows are used, plant 1 row with one species, and the other row of shrubs. In a 2 row arrangement, shrubs should be located on windward side of windbreak.
3. When 2 row break is established, use height of tallest plants to determine allowable windbreak spacing.

Maintenance and Protection

1. Windbreak must be protected at all times from fire, livestock, and chemical spray damage.
2. Cultivate the windbreak at the same time as cultivating field crops.
3. Report any failure of plants the following spring.

Materials

Materials used in performing this practice must be federally and locally registered and must be applied strictly in accordance with authorized registered uses, directions on the label, and other federal or state policies and requirements.

Cost-Sharing

Cost-share will be planned and applied according to the above specifications, and will be 80% of the average cost of 5 cents per lineal foot.

Cost-share = 5 cents per lineal foot

Cost-share = 4 cents per lineal foot

If no protection from livestock is needed, fencing as planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

Practice will be eligible for payment when trees are planted and protected, if necessary.

412 GRADE STABILIZATION STRUCTURES (Class 4)

Description

A structure to stabilize the grade or to control head cutting in natural or artificial channels. (Does not include straight pipe overfall structures used in irrigation systems or structures for water control). These outlet pipes will be eligible for cost-share.

Scope

This standard applies to all types of grade stabilization structures.

Purpose

Grade stabilization structures are installed to stabilize the grade in natural or artificial channels, prevent the formation or advancement of gullies, and reduce environmental and pollution hazards.

Conditions Where Practice Applies

These structures apply where the concentration and flow velocity of water are such that structures are required to stabilize the grade in channels or to control gully erosion. Special attention will be given to stabilizing or improving habitat for fish and wildlife, where applicable.

Design Criteria

Structures

Grade stabilization structures of materials such as concrete, masonry, steel, aluminum and treated wood shall be designed in accordance with the principles outlined in the SCS Engineering Field Manual for Conservation Practices and the applicable SCS Engineering Manual.

Embankment

Earthfill embankments shall be designed as follows:

1. Embankments for class (4) structures having a height of 10 feet or less as measured from the lowest point on the original centerline profile to the crest of the embankment shall meet the Engineering Standard and Specification for Road (278).

1. The design of embankments for all structures exceeding the following in height shall be in accordance with the design of embankments for structures exceeding the following in height: 10 feet for structures exceeding 10 feet in height and 15 feet for structures exceeding 15 feet in height.
2. Structures with land-type construction shall have fill directly in front of the structure and top of the fill shall provide a stable structure for local conditions.
3. Stability of downstream channel shall be maintained for all structures except those with proper outlet. The channel shall be held to the design shall be such that velocity will not cause scour and undermine the structure. Velocity in the channel shall be determined using a 10-year recurrence rate flow and full flood if it occurs in less than 10-year recurrence flow occurs.

Permissible velocities for general soil types are:

| | |
|------------------------|--------------------|
| Gravel | 1.75 feet per sec. |
| Silt loam | 2.00 " " " |
| Silt clay, medium loam | 3.75 " " " |
| Clay loam and clay | 5.00 " " " |

Site Evaluation

Exploratory investigation shall be made at each site. Sufficient soil boring shall be taken and recorded to determine suitability of site for the proposed structure. Foundation material shall have adequate supporting strength for load to be imposed on it, resistance to piping and not be subject to uneven settlement. When a significant amount of borrow material will be used as fill, borings of borrow area shall be taken to determine suitability for fill, and if sufficient amount of borrow is available for construction.

Plans and Specifications

Plans and specifications for installation of Grade Stabilization Structures shall be in accordance with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

All trees, stumps, stumps, stumps (6 inches or larger) and other debris shall be removed from the area to be occupied by the structure and earth stabilized.

Excavation

Structure excavation shall be to the elevations as shown on the plans or as directed when change conditions are encountered. All vertical faces of overhanging banks shall be sloped to 1:1 or flatter. Excavations shall be large enough to free movement by workmen.

Concrete

All concrete shall have a compressive strength of not less than 4,000 pound per square inch at 28 days. A mixture of one part cement, two parts of clean well grade fine aggregate (sand) and three parts of clean well graded coarse aggregate (gravel or crushed stone) by weight using not more than six gallons of clean water will normally provide a concrete that will meet the above strength requirement. Coarse aggregate shall not be larger than 1-1/4 inch.

Except for aprons, cutoff walls, and toe walls under drop spillway and cradles or bedding for conduits earth shall not be used as part of the forms.

Reinforcing Steel

All bar reinforcing steel shall be standard deformed bars having a tensile strength of not less than 20,000 pound per square inch. Pipe, smooth iron bars, and scrap iron pieces shall not be used. When reinforced mesh is shown or specified on the plans standard reinforcing mesh shall be used.

Backfill and Embankments

No backfill or other load shall be placed against or on top of unsupported concrete surfaces before expiration of the minimum period after placing concrete as indicated below unless test shows require strength has been obtained in a lesser period of time.

| | |
|----------------------------------|---------|
| Walls and vertical faces | 10 days |
| Conduits (inside forms in place) | 7 days |
| Cradle or bedding | 2 days |

No rolling or hauling equipment shall be permitted to pass over the structure or closer than two (2) feet to any part thereof for a period of 14 days. Backfill shall be hand tamped all around the structure before hauling equipment is allowed to complete compaction of backfill.

Earth embankments shall have a minimum topwidth and be placed in accordance with specifications as given in Practice 378 (ponds).

All earth embankments, borrow areas and other disturbed areas shall be fertilized and seeded in accordance with Standard and Specification 342 Critical Area Planting.

The pilot was not loaded sufficiently during landing to cause the aircraft to be lifted from the runway.

Cost Sharing

... installed and backfilling

Unit Price = \$1,100.00 per structure
 Minimum Test Share = \$1,125.00 per structure

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Final Price = \$110.00 per acre
 Maximum Cost Share = \$97.50 per acre

It will be eligible for payment when the contract is completed and the seeding and mulching are completed.

4.7 GRASSED WATERWAY OR OUTLET (Acres)

Definition

A natural or constructed waterway or outlet shaped or graded and established in vegetation suitable to safely dispose runoff from a field, diversion, terrace, or other structure.

Purpose

To provide for the disposal of excess surface water from terraces, diversions, culverts, or from natural concentrations without damage by erosion or flooding.

Where Applicable

This practice applies to all sites where added capacity or vegetative protection, or both, are required to control erosion resulting from concentrated runoff and where such control can be achieved by these practices alone, or combinations with others as a necessary part of an overall conservation plan to protect the soil and water resources.

The grassed waterway practice is not applicable to watercourses where construction of a waterway would destroy important woody wildlife cover and the present watercourse is capable of hauling the concentrated runoff without serious erosion. Such situations are usually recognizable by a meandering condition, steep side slopes which are stabilized by woody plants or herbaceous vegetation, and the watercourse is without rapidly advancing overfalls.

Design Criteria

Capacity

The minimum capacity shall be that required to confine the peak runoff expected from a storm of 10-year frequency, 24 hour duration obtained by using the procedures in Chapter 2, SCS Engineering Field Manual, except that on slopes of less than 1 percent, out-of-peak flow may be permitted where such flow will not cause erosion. The minimum in such cases shall be the capacity required to carry within the channel, the runoff as determined by using the "B" drainage cover. (0.10 cfs per acre of drainage area).

Design

The design of the waterway shall be based on the estimated flow and velocities, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Flow

The design of the waterway shall be based on the estimated flow and velocities, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Design

The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Drainage

The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Construction

The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Specifications

The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

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The design of the waterway or outlet receiving water from terraces, diversion, or other tributary channels shall be based on the design flow and velocity, and shall be constructed to meet the design flow and velocity. The design shall be based on the design flow and velocity.

Where water flow will interfere with establishment of vegetation, a temporary diversion should be installed above the waterway and by spoil ridges along the sides of the waterway and retained until the seeding is established. After the waterway seeding is established, the temporary diversion is filled, smoothed and seeded.

Fills shall be compacted as needed to prevent unequal settlement, that would cause damage in the completed waterway.

In critical areas such as, sharp breaks in channel grade or where excessive velocities would cause channel scour, paper netting, jute netting or sod should be used.

Seeding

1. Apply lime as needed.
2. Apply 600 lbs. or more of 12-12-12 fertilizer (or its equivalent) per acre as soon as the waterway has been constructed.
3. Prepare a firm seedbed.
4. Seed one of the following grass mixtures:

| | |
|--------------------|---------|
| Tall Fescue | 20#/ac. |
| Redtop | 5#/ac. |
| Tall Fescue | 20#/ac. |
| Perennial Ryegrass | 5#/ac. |
| Seed Canarygrass | 15#/ac. |
| Redtop | 5#/ac. |
| Tall Fescue | 30#/ac. |
| Smooth Bromegrass | 20#/ac. |
| Redtop | 5#/ac. |

5. Use a mulch of 1-1/2 to 2 tons per acre on critical sites. Anchor the mulch by working it partly into the soil or with paper netting. Jute netting or sod may be used on critical sites instead of mulch.

Other Factors to Consider

Make seedings across the waterway to avoid rows running up and down hill. Operating a cultipacker seeder in an S curve or weaving pattern is an acceptable procedure for seeding.

Cost Sharing

Cost share, when planned and established according to the above specifications, will be 80 percent of the actual cost involved not to exceed 80 percent of the estimated cost.

Unit Price = \$.60 per cubic yard of earth moved

Maximum Cost Share = \$.48 per cubic yard of earth moved

Seeding of Waterway

Cost share when planned and established according to the above specifications will be 80 percent of the average cost of \$75.00 per acre. Cost share will be 80 percent of the average cost of \$150.00 per acre when seeded and mulched with 1-1/2 ton of straw per acre.

Maximum Cost Share = \$60.00 per acre - seed only

Maximum Cost Share = \$120.00 per acre - seed and mulch

NOTE: In addition, tile drainage as referred to in the above specification may be cost shared under Practice 606 (Tile Drainage).

Practice is eligible for payment when waterway is completed and cleared.

Practice Description

Definition

A farmstead structure or enclosure by constructing a pond, tank, or bankment or combination thereof for temporary storage of liquid or solid agricultural wastes, associated runoff and waste water. Practices include disposal lagoons.

Scope

This standard establishes the minimum acceptable quality of construction of holding ponds and tanks as part of overall waste management systems in predominantly rural or agricultural areas. For holding ponds this standard is applicable to class (a) ponds with the length of 20 feet or less.

The following practices may also be applicable to the extent that they are needed to minimize erosion and/or control runoff across or from feedlots, holding areas, etc. Such practices may include but are not limited to critical area planting (342), terraces (600), diversion (362), grassed waterways (412), drainage field ditch (590), grass stabilization structures (410), debris basins (350), drain (587), structures for water control (587), and pond (378).

Purpose

Holding ponds and tanks are constructed to store liquid and/or solid manure and polluted runoff from feed lots, barn yards and similar areas until it can be safely utilized, evaporated or otherwise disposed of.

Conditions Where Practice Applies

General

This practice applies where there is need for facilities to temporarily store liquid and/or solid manure or other agricultural wastes, reduce sources of air and water pollution, minimize health hazards and improve the environment.

State and Local Laws

All state and local laws, water quality standards, rules and regulations governing the disposal of manure or other agricultural wastes must be strictly adhered to. The owner is responsible for securing any and all

2.

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Other Facilities

Accommodations ...
...waste handling ...
...Cooperating ...
...Purdue University ...
...would be ...

Design Criteria - Holding Ponds and Lake

Location

Location of holding ponds and lake ...
...practical ...
...risk of ...
...prevailing winds ...
...holding ponds and ...
...than 500 feet ...
...1300 feet ...
...recreation ...
...holding ponds and tanks ...
...excluded ...
...diversion of ...
...at least 100 feet ...

...diverted from the ...
...exception to this ...
...water ...
...method of ...
...prevent excess water from ...

...facilities should not be located adjacent to ...
...streams, water courses, lakes, ponds, marshes, or drain ditches.

Soil and Foundation

Locals of ...
...pollution of ground water ...
...ground water ...
...shallow ...
...depth of two feet ...
...holding pond ...
...water ...

Fill

The ...
...polluted ...

Stream Pollution Control Board requires that all wash water and waste water from milk houses and milking parlors be outside the holding pond or tank or an approved septic system must be used. In order to provide required storage the pond or tank must be able to hold as a minimum the sum of the following amounts:

1. Runoff from the contributing area:

Paved - 12 inches

Earth - 6 inches

2. Animal waste - Use table below or amounts from "Waste Handling and Disposal Guidelines" by the Cooperative Extension Service, Purdue University.

| <u>Animal</u> | <u>Cu. Ft./</u>
<u>day/head</u> | <u>Cu. Ft./head/</u>
<u>30 days</u> |
|---------------------------|------------------------------------|--|
| Dairy Cattle | 1.3 | 39 |
| Beef Cattle | 1.0 | 30 |
| Feeder Pigs under 40 lbs. | 0.06 | 1.8 |
| Hogs | 0.28 | 8.4 |
| Sow and Litter | 0.55 | 16.5 |
| Sheep | 0.11 | 3.3 |
| Chickens | 0.003 | 0.09 |

3. Fountain leakage and other water wasted by hogs to 0.07 cu. ft./day/head.
4. Milk house wash water-estimated amount.

Disposal Facilities

Provisions for emptying the holding pond or tank without polluting surface waters shall be provided to insure that sufficient capacity is available between emptyings. Determination of emptying time shall be based on the chance of overflow from subsequent storm runoff, the animal waste accumulation, and capacity of the disposal areas. Excess infiltration such as to pollute ground water shall be avoided.

Facilities for emptying the holding facilities, such as farm wagons or irrigation equipment, will be provided to deliver the waste to the spreading area. The emptying of the facility will require the use of a pump with adequate capacity against the required pumping head. When irrigation type equipment is used pipe line and irrigation type sprinkler head(s) will be needed. Selection of this equipment should be according to manufacturer recommendations recognizing the presence of solids in the liquids and the corrosive nature of the waste.

1955

... and the ...

Design Criteria - Holding Area

1. The first step is to identify the problem or question that needs to be answered. This involves understanding the context and the specific requirements of the task.

Figure 1. The effect of the concentration of the *Agaricus bisporus* spores on the growth of *Agaricus bisporus* on the substrate. The concentration of the spores was 10⁴ spores/g substrate (a), 10⁵ spores/g substrate (b), 10⁶ spores/g substrate (c), 10⁷ spores/g substrate (d), 10⁸ spores/g substrate (e), 10⁹ spores/g substrate (f). The substrate was 100 g of substrate (100 g of substrate + 100 g of substrate).

6. The following table shows the results of the regression analysis for the dependent variable "Number of children in the household" (N = 1,000).

1. In order to clearing or weeding from hedges, it is
2. to take, when necessary, to install and practice the channels
3. to be used in the bottom of each ditch, and to the
4. to be used in the bottom of each ditch, and to the
5. to be used in the bottom of each ditch, and to the
6. to be used in the bottom of each ditch, and to the
7. to be used in the bottom of each ditch, and to the
8. to be used in the bottom of each ditch, and to the

Landfills shall be designed and constructed to prevent the escape of leachate from the waste mass. The design shall include a liner system consisting of a compacted clay liner or an equivalent synthetic material. The liner shall be tested for integrity by means of a leak detection system. The design shall also include a collection system for leachate and a means for its removal from the site.

Leak Detection System

Materials and Design

Landfills shall be designed to prevent the escape of leachate from the waste mass. They shall be designed to prevent failure of the liner system under internal or external pressure, including imposed surface loads and uplift pressures. All openings shall have tight fitting covers or other equally effective protective devices. The design shall include a set of plans showing design and construction details. The plans shall be signed by a qualified engineer. Standard plans developed by Purdue University or any other Land Grant College are acceptable.

Size

Tanks shall have sufficient capacity to temporarily store the liquid wastes plus any needed dilution water for the maximum period of time that such waste cannot be safely disposed of due to weather or governmental restrictions.

Appurtenant Equipment

Special liquid waste handling equipment shall be available to remove the waste removed from the tank and move it to selected method of spreading. Commercial agitators, pumps and liquid manure tanks are available. Sprinkler irrigation systems, when properly designed and operated, can safely dispose of liquid wastes, can be utilized.

Plans and Specifications

Plans and specifications for building ponds and tanks shall conform with this standard and shall describe the requirements for construction of the practice to achieve the intended purpose.

Cost Estimating

The estimated cost shall be within 50% of the estimated cost.

1. The first part of the document is a list of the names of the persons who have been appointed to the various positions of the Board of Directors of the Corporation. The names are as follows:

2. The second part of the document is a list of the names of the persons who have been appointed to the various positions of the Board of Directors of the Corporation. The names are as follows:

3. The third part of the document is a list of the names of the persons who have been appointed to the various positions of the Board of Directors of the Corporation. The names are as follows:

466 LAND SMOOTHING

Definition

Removing irregularities on the land surface by use of special equipment. This ordinarily does not require a complete grid survey. The smoothing operations ordinarily classed as rough grading. It does not include the "floating" done as a regular maintenance practice on irrigated land, or the "planning" done as the final step in a land leveling or similar job.

Purpose

The purposes of land smoothing include one or more of the following: to improve surface drainage, to provide more effective management of water, to obtain uniform planting depths, to provide for more uniform cultivation, to improve equipment operation efficiency, to improve terrace alignment, and to facilitate contour cultivation.

Conditions Where Practice Applies

This practice applies on lands where depressions, mounds, and terraces, turn rows, and other surface irregularities interfere with the application of needed soil and water conservation and management practices where more precise leveling or grading is not practical.

It is limited primarily to crop land areas having adequate slope.

Specifications

1. The ground surface must be plowed 6-8" deep and thoroughly tilled prior to smoothing operations. The surface must be free of vegetation and trash to facilitate smoothing operations.
2. The smoothed surface shall slope (either uniformly or at varying grades) into natural or constructed outlets. Grade must be no less than 0.05 per cent.
3. Field drains must be provided as needed on all smoothed fields to collect and dispose of surface runoff. These field drain collection ditches shall not be spaced more than 100 feet apart.
4. The depth of smoothing shall be controlled to prevent excessive harmful amounts of subsoil.

8. At least one pass of a land plane or leveler must be made in each of two directions, consisting of one pass along the diagonals, and one pass generally in the direction of cultivation.
9. The grade to assure drainage toward the outlets shall be made.

Working Tools and References

Drainage Planning Guide
Land Treatment for Better Surface Drainage JS-27
Drainage Lateral System JS-5
Drainage Lateral Systems JS-4
The Field Manual for Conservation Practitioners

Provisions

Costs shall be planned and established according to the above specifications, shall be 75 percent of the actual cost involved not to exceed 75 percent of the estimated cost.

Cost Limit = \$50.00 per acre
Actual Cost Limit = \$63.00 per acre

In addition, field drains as required in the above specifications may be cost-shared as a separate item under practice 130 Surface Drains.

Practices are eligible for payment when all the leveling work is completed.

472 LIVESTOCK PROTECTION (Areas)

Definition

excluding livestock from an area where grazing is not desired.

Purpose

To protect, maintain, or improve the quantity and quality of forest and animal resources; to maintain or improve cover for protection of soil; improve watersheds hydrologic condition; and to increase natural beauty. To protect, in addition to woodlands, the wildlife and recreation areas where grazing would be harmful or create a **safety** hazard.

Where Applicable

Where desired forest reproduction, soil hydrologic value, wildlife value, existing vegetation (including trees) or other things, such as aesthetic values or recreation are prevented or damaged by livestock.

Where a change of the land-use of adjacent fields is brought about, so that livestock do not have access to the area being protected.

Will not apply for units of land where no livestock is present or planned for in future.

Specifications

All classes of livestock will be excluded on a long-time basis by fencing or other means.

Cost-Sharing

Cost-sharing for fencing is limited to **permanent** fences (excluding boundary and road fences) needed to protect the area from grazing.

Cost-sharing, when established according to the attached specifications, 382 Fencing, will be 80% of the actual cost involved not to exceed 80% of the estimated cost.

Unit Price = \$8.00 per rod

Maximum Cost-Share = \$6.40 per rod

Practice is eligible for payment when the fencing is completed.

1.2 FENCING (Cont)

Definition

Fencing is any line or area of land with a suitably permanent structure that serves as a barrier to live stock. (Does not include electric or other types of fences).

Purpose

To exclude livestock from areas that should be reserved for crop and/or protect new seedlings and plantings from grazing.

Where Applicable

On any area where livestock exclusion is needed.

Materials

Woven wire, woven wire and wire netting fencing shall conform to the requirements of Federal Specifications PP-1-221 for the specified types and styles of fencing. Wire shall have Class 1 zinc coating unless otherwise specified. Woven wire fence will be type 1047-B-11. Barbed wire will be 17-11 fence. Woven wire will include two barbs on each top. Barbed wire fence will have a minimum of five strands of twisted wire.

Wood posts shall be of black locust, red cedar, or white pine (if a local, eastern, pressure treated pine or other wood of equal life or strength. It shall have the character or discolor dimension of red cedar or white pine. Posts shall be in best wood. The posts shall be round, or, free from knots, and all knots shall be removed or banded with the rope. They shall be substantially straight throughout their length.

Corner posts and end posts shall be of the same material and construction as the line posts, they shall be pressure treated.

Wire, posts, gates and braces shall conform to the requirements of Federal Specification PP-1-221. Tests with regard to wire for testing are to be as specified in the above.

Wire shall be of the specified types, sizes, and quality and shall comply with the following. The fittings shall consist of staples, end caps, and latches or galvanized chain or other type of fitting. All fittings shall be equivalent to the state and Federal specifications.

Wire gates shall be the type shown on the drawings, constructed in accordance with these specifications at the location and to the dimensions shown on the drawings. The materials shall conform to the kinds, grades, and sizes specified for new fence, and shall include the necessary fittings and stays.

Setting Posts

Concrete or wood posts shall be set in holes and backfilled with earth except where otherwise specified. Steel posts shall be driven unless otherwise specified.

Post holes shall be at least 6 inches larger than the diameter or side dimensions of the posts.

Earth backfill around posts shall be thoroughly tamped in layers not thicker than 4 inches and shall completely fill the post hole up to the ground surface.

Corner Assembly

Unless otherwise specified, corner assemblies shall be installed at all points where the fence alignment changes 15 degrees or more.

End Panels

End panels shall be built at gates and fence ends.

Pull Post Assembly

Pull post assemblies shall be installed at the following locations:

- a. In straight fence sections, at intervals of no more than 660 feet.
- b. At any point where the vertical angle described by two adjacent reaches of wire is upward and exceeds 10 degrees (except as provided in Section 9 of this specification).
- c. At the beginning and end of each curve.

Attaching Fencing to Posts

The fencing shall be stretched and attached to posts as follows:

- a. The fencing shall be placed on the side of the post opposite the area being protected, except on curves.
- b. The fencing shall be placed on the outside of the curves.
- c. The fencing shall be fastened to each end post, corner post and pull post by wrapping each horizontal strand around the post and tying it back on itself with not less than three tightly wound wraps.
- d. The fencing shall be fastened to wooden line posts by means of staples. Woven wire fencing shall be attached at alternate horizontal strands. Each strand of barbed wire shall be attached to each post. Staples shall not be driven so tightly as to bind the wire against the post.
- e. The fencing shall be fastened to steel line posts with either two turns of 14 gage galvanized steel or iron wire or the post manufacturer's special wire clips.
- f. Wire shall be spliced by means of Western Union splice having not less than 8 wraps of each end about the other. All wraps shall be tightly wound and closely spaced.

Crossings at Depressions and Watercourses

Where fencing is installed across the small depressions or watercourses, either of the following methods of installation shall be used.

- a. If the fence wire is installed parallel to the ground surface, the line posts subject to upward pull shall be anchored by means of extra embedment or by special anchors.
- b. If the wire fence is installed with the top wire straight and parallel to the ground surface on either side of the depression, extra length posts shall be used to allow normal post embedment. Unless otherwise specified, excess space between the bottom of the fence and the ground shall be closed with extra strands of barbed wire.

614 LIVESTOCK WATERING FACILITY (harbor)

Definition

A trough or tank with needed devices for water control and waste water disposal installed to provide drinking water for livestock.

Scope

This standard covers all trough or tank installation to provide livestock watering facilities supplied from a spring, reservoir, well or other sources.

Purpose

To provide watering facilities at selected locations which will bring about the desired protection of vegetation cover through proper distribution of grazing or better grassland management.

Conditions Where Practice Applies

This practice applies where there is a need for new or improved watering places to permit the desired level of grassland management and reduce health hazards to livestock.

Design Criteria Trough or Tank

The trough or tank shall have adequate capacity to meet the water requirements of the livestock it is to serve. This will include the storage volume necessary to carry over between periods of replenishment. The site shall be well drained and areas adjacent to the trough or tank that will be trampled by livestock shall be graveled, paved or otherwise treated to provide firm footing. Automatic water level control and overflow facilities shall be provided. Overflow shall be piped to a desirable point of release. The quality and durability of all materials shall be in keeping with the planned useful life of the installation.

Design Criteria Livestock Watering Ramp

The livestock watering ramp will be located on a flowing stream or a pond with water of satisfactory quality and quantity for the number of livestock

to be watered during the season of use. The minimum width will be 10 feet and the maximum slope will be 4:1. The watering ramp shall be fenced in such a manner to keep livestock from the stream or pond proper. All construction will be done in a manner that will reduce erosion to a minimum during and after construction. The ramp and all areas that livestock have access to will be graveled or paved or otherwise treated to provide firm footing. All other disturbed areas will be seeded.

Specifications

Specifications shall be in keeping with the preceding standard, shall describe the requirements for proper installation of the practice to achieve its intended purpose, and shall include consideration of the following items:

The foundation area shall be cleared of all material not suitable for the subgrade.

The foundation area in the immediately surrounding area shall be smoothed and graded to permit free drainage of surface water.

All materials, placement, anchoring, proportioning, and protection shall be as shown on the plans.

All backfill for underground pipes shall be compacted to the degree required to prevent caving subsequent to construction.

All construction shall be performed in a workmanlike manner and the job shall have a neat appearance when finished.

Cost-Sharing

Cost-share when planned and installed according to the above specifications will be as follows:

1. Trough or Tank

Cost-share will be 70 percent of the actual cost not to exceed 70 percent of the estimated cost.

2. Watering Pump

Cost-share will be 70 percent of the actual material and installation costs not to exceed 70 percent of the estimated cost.

614-3

Black Creek Study Area
Standards and Specifications
Alien Cost Share

Unit Price = \$300.00 per installation

Maximum Cost Share = \$210.00 per installation

Practice will be eligible for payment when the watering facility is completed.

June 1973

478 MINIMUM TILLAGE

Definition

Limiting the number of cultural operations to those that are properly timed and essential to produce a crop and prevent soil damage.

Purpose

To improve soil structure, reduce soil compaction, erosion and production costs and make possible timely field operations for planting and harvesting a crop.

Where Applicable

On all cropland.

Specifications

The land involved must be protected by winter cover, or crop residue, or other permitted management methods from fall harvest through the winter to the time of authorized tillage in the spring.

Eligible tillage operations are:

1. Zero-tillage, slot planting, and no-till (includes planting into sod).
2. Strip tillage
3. Till-plant
4. Chisel tillage
5. Combinations of no-plow systems

Cost share payment will not be made on acreage where a moldboard plow is used.

All tillage operations must be performed as nearly as practicable on the contour or parallel to terraces where feasible and needed.

June 1973

Directly or indirectly examine this practice and determine if it is locally feasible and if it is applied strictly in accordance with the authorized crop, row, and direction of the label, or other local or state or federal requirements.

Summary

1. Zero Tillage (Flat Planting) and No-Till (Direct Planting or Seed)

Crop residue is left on the surface from the prior crop. It may be shredded in the fall, winter, or spring prior to planting. In some instances, it may be left unshredded.

The seedbed is prepared by breaking the soil with a coulters, single chisel, or similar tool. Seedbed preparation and planting are done in one operation.

A protective cover of crop residue is left on the soil surface between the crop rows during the growing season.

The quantity of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation ("C" factor for the cover).

There is no more than one cultivation. (No cultivation should be used unless weeds are a problem).

2. Strip Tillage

Crop residue is left on the soil surface from the prior crop. It may be shredded in fall, winter, or spring prior to planting. In some instances, it may be left unshredded.

A seedbed is prepared by a rotary tool or similar type equipment that mixes the soil and residue in an area not to exceed 1/3 the width between the crop rows. The remainder of the area is left untilled. Seedbed preparation and planting are accomplished in one operation.

A protective cover of crop residue is left on the surface of the untilled area during the growing season.

The quantity of residue needed on the soil surface is determined by use of the Universal Soil Loss Equation ("C" factor for the cover).

There is no more than one cultivation. (No cultivation should be used unless weeds are a problem).

Contouring is necessary on slopes that normally require contouring with conventional tillage.

3. Soil

Soil is the natural body of material which is composed of the mineral and organic matter which is found in the soil.

The soil is the natural body of material which is composed of the mineral and organic matter which is found in the soil.

Soil is the natural body of material which is composed of the mineral and organic matter which is found in the soil.

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Soil is the natural body of material which is composed of the mineral and organic matter which is found in the soil.

4. Soil Conservation

Soil conservation is the practice of using the soil surface and the soil itself in such a way as to prevent the soil from being washed away by water or blown away by wind.

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Soil conservation is the practice of using the soil surface and the soil itself in such a way as to prevent the soil from being washed away by water or blown away by wind.

5. Any combination of no-plow systems which leaves 2/3 of the surface rough and with residue cover until July 1, and if planted on contour if required conventionally. Soil loss is limited to the limit required by the Universal Soil Loss Equation.

Guidelines for use of Conservation Tillage Systems

1. Zero tillage and rotary strip tillage (where all crop residues are left on the soil surface and no primary tillage is done) are not recommended to be used on less than well drained soils. In the northern 1/3 of Indiana these practices are better suited to coarse and moderately coarse textured soils that are somewhat excessively to excessively drained than to medium textured, well drained soils.
2. The till-plant system is not recommended to be used on undulating soils where contouring is not feasible. Till planting work best in a performed ridge.
3. A disk should not be used in the fall as a primary tillage tool on bean ground. If bean ground is disked, it should only be done in the spring.
4. The no-plow tillage systems are not recommended to be used where Johnsongrass is a problem.
5. Where cultivation is done, rolling or disk hiller type cultivation will be needed for zero tillage, strip tillage, and till planting, and may be needed for chisel tillage if stocks are not chisled.
6. Assistance of the Cooperative Extension Service should be secured in the use of herbicides and insecticides and for fertilizer recommendations.

Cost-Sharing

Cost-share, when planned and applied according to the above recommendations, will be 80% of the average cost of \$6.50 per acre.

Unit Price = \$6.50 per acre

Maximum Cost-Share = \$5.20 per acre

Practice will be eligible for payment on August 1, (after the 1st of July is too late to be cultivated).

510 PASTURE AND HAYLAND MANAGEMENT (Acres)

Definition

proper treatment and use of pastureland or hayland.

Purpose

1. Prolong the life of desirable species.
2. Maintain or improve the quantity and quality of forage.
3. Provide soil protection and reduce water loss.
4. Provide for the needs and desires of the landowner for forage production and economic return.

Where Applicable

On all pastureland and hayland.

Specifications

Pastureland

1. Grazing at the proper time.
 - a. Heavy grazing in the spring until the soil is firm and the forage attains proper growth stage. Heavy grazing may be started:
 - When Bluegrass is 4"-5", tall and soil is firm.
 - When orchardgrass or tall fescue is 6 inches tall.
 - When smooth bromegrass or timothy is 6 inches tall and before jointing or between early head and full head.
 - When birdfoot trefoil is 4-8 inches tall.
 - When alfalfa is in full bloom.

Grazing will be initiated when grasses are grazed down to 3 inches or higher.

Under extensive grazing systems (continuous grazing) the number of acres will not be grazed closer than an average of 3 inches.

2. Grazing with the proper amount of livestock,
 - a. The number of livestock grazed is in keeping with the yield of the field.
 - b. Refer to Agronomy Technical Notes 2 and 3 for guidelines on grazing with the proper amount of livestock.
3. Treating with Needed Soil Amendments to Maintain Stand and Obtain Desired Production.
 - a. Liming and Fertilizing - apply according to results of soil test.
 - b. Mow, as needed, to control weeds and brush and to provide more uniform regrowth and grazing.

Havland

1. Cutting at Proper Growth Stage - refer to Agronomy Technical Note 3 for guidelines.
2. Treating with Needed Soil Amendments to Maintain Stand and Obtain Desired Production.
 - a. Liming and fertilizing - apply according to results of soil test.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 65% of the average cost of \$18.00 per acre.

Unit Price = \$18.00 per acre

Maximum Cost-Share = \$11.70 per acre

Practice is eligible for payment after any needed lime and fert is applied and grazing height has been inspected.

June 1973

112 PASTURE AND HAYLAND PLANNING (Acres)

Definition

Establishing and re-establishing long-term stands of adapted species of perennial, biennial or reseeding forage plants. (Includes Pasture and Hayland Renovation, does not include Irrigated Waterway or Outlet or Cropland).

Purpose

To serve as ground cover for soil protection, produce high quality forage and to adjust land use.

Where Applicable

On existing pasture and hayland or on land that is converted from other uses.

Specifications

1. On sloping land with a serious erosion potential use mulch seeding methods and perform all fitting and seeding operations on the contour. Where necessary to eliminate present cover competition when preparing a mulch seedbed, start seedbed preparation in late summer for spring seeding, and in early spring for fall seedings.
2. On fairly level land conventional seedbed preparation can be used.
3. The seedbed should be firm, containing enough fine soil particles for uniform shallow coverage of the seed.

Liming, Fertilizing and Seeding

1. Apply lime and fertilizer according to needs determined by soil test.
2. For spring seeding, seed as early as possible. Make fall seedings during August. In some instances it may be advisable to use one bushel of oats as a companion crop to help control erosion and weed growth in spring seedings.

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3. Cover the seed 1/4 to 1/2 inch deep by hand seed, use of hand wheels, use of a cultipacker seeder or by cultipacker and after seeding.
4. Use seeding mixtures, rates and dates for different soil groups as shown in the following table on the separate sheet of seeding mixtures adapted to this work.

Management of the seedling year

1. Mow or graze the companion crop when 10 inches in height to reduce competition with the new seedling.
2. If necessary to control weeds, mow or graze to a height of 6-8 inches. Do not graze during period 8 weeks prior to first hard frost nor during the dormant period in following the seedling year.

Directions for selecting mixtures from the seed mixture chart:

In any vertical column use all amounts which are not in parenthesis. When parenthesized figures are listed, add only one parenthesized amount.

Mixtures 8 and 11 are well adapted for horse pastures.

Mix. 10 is adapted to special situations where spring seeding is done prior to start of current year harvest. Applies only to fairly new or very sites with a very high management level.

Mix. 12 is adapted for hay pasture to be used on level land only.

Grass alone would generally be used in special situations: tall fescue for winter pasture, any grass where a large amount of nitrogen is produced, or in a poultry operation.

When use of a mixture is in question, check plant adaptation on the chart following this chart.

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Instructions for use of the chart below:

The figure 1 indicates the plant is well adapted, 2 indicates the plant can be used but is less well adapted and a blank space indicates that it is not adapted or not suggested for use.

Birdsfoot trefoil is well adapted.

Smooth bromegrass is well adapted.

| | Pasture | | Hay | Site Adaption | | | Suitable pH |
|-------------------|------------------|--------------------|-----|---------------|--------------|----------------|-------------|
| | Rotation Grazing | Continuous Grazing | | Droughty | Well Drained | Poorly Drained | |
| Alfalfa | 1 | | 1 | 1 | 1 | | 6.2-7.5 |
| Alsike Clover | 1 | 2 | 1 | 2 | 1 | 1 | 5.5-7.5 |
| Birdsfoot Trefoil | 1 | 2 | 1 | 2 | 1 | 2 | 5.5-7.0 |
| Ladino Clover | 1 | 1 | 2 | | 1 | 1 | 5.6-7.0 |
| Korean Lespedeza | 1 | 1 | 2 | 1 | 1 | | 4.5-6.5 |
| Red Clover | 1 | 2 | 1 | 2 | 1 | 2 | 6.0-7.5 |
| Sericea Lespedeza | 1 | 2 | 2 | 1 | 1 | | 4.5-6.5 |
| White Clover | 1 | 1 | | | 1 | 1 | 5.6-7.0 |
| | | | | | | | |
| Ky. Bluegrass | 1 | 1 | | 2 | 1 | 2 | 5.5-7.0 |
| Orchardgrass | 1 | 1 | 1 | 2 | 1 | 2 | 5.5-7.5 |
| Reed Canarygrass | 1 | 2 | 2 | 1 | 1 | 1 | 5.0-7.5 |
| Smooth Bromegrass | | 2 | 1 | 1 | 1 | | 5.5-8.0 |
| Tall Fescue | 1 | 1 | 2 | 2 | 1 | 2 | 5.0-8.0 |
| Timothy | 1 | 2 | 1 | | 1 | 2 | 4.5-8.0 |

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Black Creek State Park
Standards and Specifications
Allen Co., Ohio

378 POND (Number)

Definition

A water impoundment made by constructing a dam or embankment. An excavated pond will be acceptable only when the primary use is for stock water.

Purpose

Ponds are constructed to provide water for livestock, flood water detention and sediment control.

Pond Size Minimums

All ponds will have a minimum of 1/2 acre surface area. The dam or embankment will have minimum height of four feet above the present ground level. The watershed will be a minimum of 5 acres. All ponds with a watershed between five and ten acres will be constructed with a 6" trickle tube. A minimum of one foot of storage, between flowline of trickle tube and flowline of emergency spillway, will be required. Ponds with over 10 acres of watershed will be designed according to Engineering Form #7.

Scope

This standard establishes the minimum acceptable quality for the design and construction of class (a) ponds located in predominantly rural or agricultural areas when:

1. Failure of the structure would not result in loss of life, or damage to homes, commercial or industrial buildings, main highways, or railroads, or in interruption of the use of service of public utilities.
2. The product of the storage times the effective height of the dam does not exceed 3,000 where the storage is defined as the original volume (acre-foot) in the reservoir at the elevation of the crest of the emergency spillway and the effective height of the dam is defined as the difference in elevation (feet) between the emergency spillway crest and the lowest point in the cross section taken along the centerlines of the dam.

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7. The horizontal distance between the lowest point along the crest of the dam and the crest of the emergency spillway shall be at least 100 feet.
8. The storage in the reservoir at the elevation of the emergency spillway does not exceed 100 acre-feet; or
9. The storage area does not exceed 30 acres.
10. The ratio of pond area to drainage area shall within the following guidelines:
 - a. For slowly permeable soils having slopes greater than seven (7) percent (such as Fairmount, St. Albans and other Hydrologic Group C&D Soils) not less than one (1) to one (1) or more than 1:20.
 - b. For moderately permeable soils (such as the Fairmount, Delta and other Hydrologic Group B Soils) not less than one (1) to one (1) or more than 1:15.
 - c. For highly permeable soils with less than seven (7) percent slope not less than 1:5 or more than 1:10.
 - d. For pervious soils, (such as Bloomfield, Fairmount and other Hydrologic Group A Soils) not less than one (1) to one (1) or more than 1:10.

Plans exceeding the scope of this standard shall be approved in accordance with latest design criteria and approved by the District to approve the size of the dam and the spillway. Plans exceeding the scope of this standard shall be submitted to the landowner for submission to the District for its approval before its approval by the District.

Conditions Where Required

Emergency Spillway

The spillway shall be such that the design flood, which is expected to occur once in 25 years can be safely passed over the spillway. The spillway shall be constructed emergency spillway, or (2) a permanent spillway, or (3) a structural spillway and an emergency spillway, which shall be used for emergency spillway may be used for emergency spillway.

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at least fifty (50) percent cover. For any part of the pond area in the pondland it shall be protected by a dam to prevent practices to hold soil losses within the allowable soil loss.

Ponds shall be protected from contaminations from herbicides, pesticides or other sources when soil contaminations would be in conflict with the planned use.

Depth

The topography and soils of the site shall permit storage of water at a depth and volume which will insure a dependable supply for beneficial use, sedimentation, season of use, and evaporation/seepage losses.

Minimum depth shall be 8 feet over at least 25 percent of the pit area at permanent water level, or where maximum depth is less than excavation to that depth, a minimum of 6 feet over at least 25 percent of the area.

When the primary purpose is for fish production, at least 25 percent of the shoreline shall be steepened to a slope of 3:1 or steeper to a depth of 3 feet below permanent pool level. Excess excavated material may be used to construct earth fishing piers into the pond.

Foundation

The area on which a dam is to be placed shall consist of material that has sufficient bearing strength to support the dam without excessive consolidation. The foundation must consist of or be underlain by relatively impervious material which will prevent excessive passage of water.

Reservoir Area

Where surface runoff is the primary source of water for a pond, the soils shall be impervious enough to prevent excessive seepage losses, or shall be of a type that sealing is practicable.

Ponds shall have a minimum surface area of 0.5 acres. Ponds may be stocked with two or more species of fish.

Depth and Foundation Investigation

Investigation shall be made of the fill site, pool area, and borrow areas to determine if the requirements listed above under depth. Foundation, and Reservoir Areas can be met.

In addition to the above, investigation shall be in sufficient detail to determine that adequate borrow is available, that the emergency spillway can be excavated as planned, and that the mechanical spillway foundation is suitable.

Vegetation

On Embankment Ponds, a protective cover of vegetation shall be established on all exposed surfaces of the embankment, spillway, borrow, and spill areas. Provide a strip of permanent vegetation extending 50 feet from the waterline on the sides of the pond and 100 feet on the upstream end where physically possible on Embankment Ponds. On Excavated Ponds, provide an adjacent area equal to two times the areas of the water surface. Develop these areas with plantings compatible to wildlife including both woody and herbaceous plants suggested in specification "Recreation Area Planting" (342), "Recreation Area Planting" (367), and "Wildlife Upland Habitat Management" (645). Fencing should be restricted to 10% of the grassy area, thereby providing varied types of food and cover throughout the year.

Fencing

General

Fields shall be adequately fenced when necessary to prevent damage. Fencing will be done according to the following:

Excavated Ponds

The fence shall be at least 10 feet from the waterline. The fence shall be 4 feet high for livestock water. If the fence is directly on the water, the fence shall be 4 feet high.

Embankment Ponds

If the fence is for livestock water, the entire fill, spillway, and pool areas shall be fenced to exclude livestock. The fence shall be 4 feet high for water and 10 feet high for livestock. The fence shall be 10 feet from the waterline on each side of the pond. The fence shall be 10 feet from the waterline on each side of the pond.

Clearing

Part of the pool area may be left uncleared for fish and wildlife habitat.

EMBANKMENT PONDS

Design CriteriaGeneral

Design criteria for ponds depend on such factors as drainage area, height of dam, depth of water to be impounded, surface area of pond and hazard to life and property in case of failure.

Design Hydrology

The minimum frequency design shall be selected from the standards outlined in Engineering Memorandum - INDIANA-7. Peak discharges and runoff volumes shall be determined by methods outlined in the SCS Engineering Field Manual.

Foundation Cutoff

A cutoff of relatively impervious material shall be provided under the dam. The cutoff shall extend along the centerline of the dam and its abutments as required and be deep enough to extend into a relatively impervious layer. Where the foundation consists of relatively impervious material, a minimum cutoff trench of 2 foot depth shall be excavated. Where the possibility of drain tile exists the cutoff should be deep enough to intercept them.

The cutoff shall have a bottom width of not less than 8 feet and side slopes of 1:1 or flatter. Wider bottom widths to accommodate the equipment used for excavation, backfill, and compaction operations may be used. The most impervious material available shall be used to backfill the cutoff trench and to construct the core of the dam.

Top Width

The minimum top width of the dam shall be 10 feet.

Side Slopes

The combined upstream and downstream side slopes of the settled embankment shall not be less than 5 horizontal to 1 vertical. The front slope never steeper than 2-1/2:1, and the back slope never steeper than 2:1.

Top of the dam

The top of the dam shall be from 12 to 18 inches above the surface of the ground at the crest of the dam.

Minimum height of dam

The minimum height of the dam shall be from 12 to 18 inches above the surface of the ground at the crest of the dam.

Flow of water

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Pipe Materials

The following materials are acceptable: Cast-iron, wrought iron, steel, corrugated metal, asbestos-cement, concrete, and rubber bucket vitrified clay. All pipe joints shall be made watertight by the use of watertight couplings or gaskets or by welding or caulking. Asbestos-cement, concrete, and vitrified clay pipe shall be laid in a concrete bedding. All pipe shall be capable of withstanding the external loading.

Risers or Inlets

Risers or inlets for pipe conduits may be reinforced concrete, concrete blocks, concrete culvert pipe, vitrified clay pipe, steel pipe or corrugated metal pipe. All risers will be equipped with anti-vortex baffles. Hooded inlets may also be used. When round risers are used, an 18-inch diameter riser shall be used for 12-inch diameter and smaller conduit, and 21-inch diameter riser used for 15-inch diameter conduit.

Risers shall have a height adequate to insure full pipe flow in the barrel. Concrete culvert pipe risers shall have the bell or groove end of the pipe up. All pipe risers shall have an extra foot of length below the invert of the conduit and be filled with concrete to invert of conduit. When concrete or vitrified clay pipe is used for the conduit, concrete shall also be placed around the outside of the riser enclosing the first joint of the conduit.

Outlets

The outlet for pipe conduits may be a propped outlet or a reinforced concrete outlet. The outlet section shall be a minimum of 20 feet long. The prop should be 8 feet from outlet end. An exception may be made when the pipe is not more than one (1) foot above the grade of the original channel bottom, and is supported by a compacted berm extending to within four (4) feet of the end of the pipe.

A concrete outlet will not be used unless it has been determined that the grade below the outlet is stable and will not scour.

Anti-seep Collars

Anti-seep collars shall be installed around all pipe conduits within the normal saturation zone.

The anti-seep collars and their connections to the pipe shall be watertight. The maximum spacing shall be approximately 14 times the minimum projection of the collar, measured perpendicular to the pipe. The first anti-seep collar to be placed approximately between the centerline of the fill and the upstream edge of the top of the fill but not more than 20 feet downstream from the pipe inlet.

Component Parts

Constructed spillways shall have an inlet channel and an exit channel.

Upstream from the control section the inlet channel shall be level for the distance needed to protect and maintain the crest elevation of the spillway. The inlet channel may be curved to fit existing topography.

The grade of the exit channel if a constructed spillway shall fall within the range established by discharge requirements and permissible velocities. It shall terminate at a point well removed from any part of the embankment where the design flow may be discharged without damage to the earth embankment.

EXCAVATED PONDS

Design CriteriaGeneral

This type of reservoir is generally constructed in flat land areas where an Embankment Pond is not feasible. The water supply is obtained from underground seepage, high water table, springs, tile lines or surface runoff. An adequate water supply which will maintain desired water level in pond must be assured. When used for livestock water, the water level shall not be more than four feet below surface of ground.

Depth

An exception to the depth requirements shown on page 3 may be made if the water supply is derived from seeps or spring flows. In this case the pit must have a depth of at least 4 feet over 25 percent of the pit area.

Side Slopes

Side slopes of excavated ponds shall be such that they will be stable. No slope shall be steeper than the minimum side slopes shown on table following. Where livestock will water directly from the pond, a watering ramp with a minimum width of 10 feet shall be provided. The ramp shall extend to the anticipated low water elevation at a uniform slope no steeper than 4:1.

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| TYPE OF SOIL | MINIMUM SIDE SLOPE |
|------------------------|--------------------|
| Peat and Buck | 1:1 |
| Fine Sand | 2-1/2:1 |
| Coarse Sand and Gravel | 2:1 |
| Silt loam | 2:1 |
| Sandy loam | 2:1 |
| Clay loam | 1-1/2:1 |

Inlet Protection

Where surface water enters the pond in a natural or artificial ditch, the slope of the pond shall be protected against erosion.

Placement of Excavated Material

The material excavated from the pond shall be placed in the following ways so that its weight will not endanger the pond. The material shall be placed in the following ways so that it will not be a hazard to the pond.

1. Uniformly spread to a height not exceeding 1 foot and placed to a continuous slope away from the pond.
2. Uniformly placed or placed reasonably well with the natural angle of repose for the excavated material.
3. Used for low embankment and leveling.
4. Placed down.

Diagram and Specifications

Plans and specifications for installation of ponds shall be prepared by the engineer and shall describe the required construction and the method to achieve its intended purpose. The plans shall be considered in development of specifications.

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1. Ponds

1. Earth moving, clearing, and materials and installation of mechanical spillways, stock watering systems and fences.

Cost share, when planned and constructed according to the above specifications will be 60 percent of the actual costs of the pond not to exceed 60 percent of the specified maximum cost of \$3,000.00 per pond.

When the pond is constructed after September 30 - a dormant seeding or a spring seeding is required. All disturbed areas will be mulched with straw at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

For a dormant seeding, seed will be applied sometime between December 10 - and February 28. Lime, fertilizer and mulch will be applied after construction and before seeding.

For a spring seeding the area will be reworked by disking and the seed applied. Additional mulch will be applied at the rate of 1-1/2 ton per acre or 2 bales per 1000 sq. ft.

Cost share rate = \$1,800 per pond

2. Seeding disturbed areas.

Cost share, when planned and carried out according to the above specifications, will be 50 percent of the actual cost not to exceed 50 percent of the specified maximum cost of \$150.00 per acre. All seedings will be mulched with 1-1/2 ton of straw per acre or 2 bales per 1000 sq. ft.

Cost share rate = \$75.00 per acre

NOTE: Cost share will not be allowed for single purpose recreation or wildlife excavated ponds.

Practice will be eligible for cost share when the pond and seeding is completed.

Construction Note

The drop inlet pipe shall be installed as the dam is being constructed. As the dam is being constructed the fill shall not exceed the planned top elevation of the conduit before the pipe is installed. The fill will then be compacted around the tube and antiseep collar(s) at least 2 feet, either by hand or mechanical compaction and then proceed with final fill. No compaction or backfilling shall be done with frozen material.

Cost Sharing

1. Earth moving, clearing, and materials and installation of mechanical spillways, stock watering systems and fences.

Cost share, when planned and constructed according to the above specifications will be 60 percent of the actual costs of the pond not to exceed 60 percent of the estimated cost.

Unit Price = \$3,000.00 per pond
Maximum Cost Share = \$1,800.00 per pond

2. Seeding disturbed areas

When the pond is constructed after September 30 - a dormant seeding or a spring seeding is required. All disturbed areas will be mulched with straw at the rate of 1-1 1/2 ton per acre or 2 bales per 1000 sq. ft.

For a dormant seeding, seed will be applied sometime between December 10, and February 28. Lime, fertilizer and mulch will be applied after construction and before seeding.

For a spring seeding the area will be reworked by disking and the seed applied. Additional mulch will be applied at the rate of 1-1 1/2 ton per acre or 2 bales per 1000 sq. ft.

All seedings will be mulched with 1-1 1/2 ton of straw per acre or 2 bales per 1000 sq. ft.

Cost share, when planned and carried out according to the above specifications, will be 50 percent of the actual cost not to exceed 50 percent of the estimated cost.

Unit Price = \$150.00 per acre
Maximum Cost Share = \$75.00 per acre

NOTE: Cost share will not be allowed for single purpose recreation or wildlife excavated ponds.

Practice will be eligible for cost share when the pond and seeding is completed.

689 LAND PROTECTED DURING DEVELOPMENT (Number & Acres)

Definition

Treatment based on a plan to control erosion and sediment during development for residential, commercial - industrial, community services, transportation, routes or utility uses.

Purpose

To reduce erosion and sedimentation during the period of land development. This practice includes timely installation of single or a combination of temporary or permanent vegetative or mechanical conservation measures.

Where Applicable

Land protection measures include: Diversions, interceptor berms, swale grading, sediment or debris basins, blind surface inlets (french drains), critical area protection, mulching, etc.

Specifications

An individual plan will be prepared indicating the seasonal period when development land is to receive cut-fill operations, vegetative stripping, swale grading operations, etc. All land thus disturbed or otherwise exposed to weather will be treated (or seasonal modifications to this plan made) according to the attached guide.

This practice may involve a combination of temporary and permanent practices. For individual practice specifications refer to: Critical Area Planting (342); Diversions (362); Grade Stabilization Structures (410); Grass Waterway (412); Land Smoothing (466); Recreation Area Improvement (562); Sediment Control Basin (350); Streambank Protection (580); Surface Drains (590); Terraces (604); Tile Drains (606); and Woodland Improvement (666).

Cost Sharing

Individual conservation practices as listed above under "specifications" will be cost shared as a unit under this practice.

Cost share, when needed measures are planned and carried out in the proper season, and in accordance with the standards and specifications for the

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individual practices, will be 75% of the actual cost not to exceed
75% of the estimated cost.

Unit Price = \$100.00 per acre

Maximum Cost Share = \$75.00 per acre

Practice is eligible for payment when all necessary work has been
completed.

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562 RECREATION AREA IMPROVEMENT (Acres)

Definition

Establishing grasses, legumes, vines, shrubs, trees, or other plants or selectively reducing stand density and trimming woody plants to improve an area for recreation.

Purpose

To increase the attractiveness and usefullness of recreation areas and protect the soil and plant resources.

Planting of vegetative materials for wind protection, shade screens, ornamentation, and resistance to heavy human traffic, including secondary benefits of wildlife food and cover.

Thinning and pruning of natural or planted shrubs and trees to provide space for recreational activities, allow air and sun penetration, remove hazardous materials and yet keep aesthetically valuable trees or shrubs.

Where Applicable

On any area planned for recreational or recreation-wildlife use.

Specifications

I. Establishing Plants:

- A. Grasses and Legumes - applicable only in open and partially shaded areas.

Seedbed Preparation

1. Shallow plow or use heavy disk, field cultivator or similiar type tool.
2. Where trees are present, care should be taken to not cut too deep and cause tree root injury.
3. Prepare a firm seedbed, containing enough fine soil particles for uniform shallow coverage of the seed.

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Liming, Fertilizing and Seeding

1. Apply lime and fertilizer according to needs determined by a soil test. Without a soil test, use a minimum of 500 pounds 12-12-12 fertilizer, or equivalent, per acre.
2. Cover seed about 1/4 to 1/2 inch deep in a compact seedbed. Shallow depth (1/4 inch) is better for bluegrass.
3. For spring seedings, seed as early as a seedbed can be prepared (March, April). Make fall seedings during August, or to September 10.
4. On areas where vegetation is difficult to establish or subject to erosion, straw mulch at 1-1/2 tons per acre (70 pounds per 1,000 square feet) may be necessary to insure satisfactory stand establishment and early soil protection.

TABLE I - Recreation Area Seeding Guide

| Primary Use of Area | Species | Seeding Rate | | Suitable
pH | * Site Suitability | | |
|---|---|--------------|-------------------|----------------|--------------------|-----------------|-----|
| | | Lbs/
Acre | Lbs/
1000 S.F. | | Droughty | Well
Drained | Wet |
| Parking Lots (Unsurfaced) | Tall Fescue | 40 | 1 | 5.4-7.5 | 2 | 1 | 2 |
| Land Sports (Athletic fields,
playgrounds, hard-use areas) | Tall Fescue | 40 | 1 | 5.4-7.5 | 2 | 1 | 2 |
| | Tall Fescue
Ky. Bluegrass | 25
15 | 5/8
3/8 | 5.8-7.5 | | 1 | 2 |
| Recreation areas surrounding
heavy use areas | Tall Fescue | 25 | 5/8 | 5.4-7.5 | 2 | 1 | 2 |
| Golf Courses (fairways, roughs) | | | | | | | |
| Picnic, camp & scenic areas | Ky. Bluegrass | 30-40 | 3/4-1 | 5.8-7.5 | | 1 | 2 |
| Open Sunlight | Tall Fescue | 15-20 | 3/8-1/2 | 5.8-7.5 | | 1 | 2 |
| | Ky. Bluegrass | 15-20 | 3/8-1/2 | | | | |
| Partial Shade | Tall Fescue | 15-20 | 3/8-1/2 | 5.5-7.5 | 2 | 1 | |
| | Creeping Red Fescue | 15-20 | 3/8-1/2 | | | | |
| | Ky. Bluegrass | 15-20 | 3/8-1/2 | 5.8-7.5 | 2 | 1 | |
| | Creeping Red Fescue | 15-20 | 3/8-1/2 | | | | |
| Lawns and Lawn-type areas | Bluegrass Blends | | 2 | 5.8-7.5 | 2 | 1 | 2 |
| | Bluegrass Blends 90%
Redtop 10% | | 2 | 5.8-7.5 | 2 | 1 | 2 |
| Partial Shade | Creeping Red Fescue
Ky. Bluegrass or
Bluegrass Blends | | 2 | 5.8-7.5 | 2 | 1 | |
| Temporary lawn cover (to be
destroyed and re-seeded later) | Ryegrass 90%
Redtop 10% | | 2-3 | 5.5-7.5 | 2 | 1 | 2 |

* 1/ Preferred; 2/ Will tolerate

I. A. (Cont'd.)

Maintenance

1. To maintain vigorous cover, make an annual application of fertilizer high in nitrogen.
2. Re-seed or sod areas of high intensity use to maintain adequate cover as the need arises.
3. Frequency and height of mowing will depend upon use of the area.

B. Trees, Shrubs, and Vines to be used for:

1. Windbreaks on north and/or west sides of area.
2. Erosion control plantings.
3. Screens to hide unsightly views and serve as sound barriers.
4. Barriers to separate various uses, and help direct foot traffic.
5. Provide additional shade and ornamental species.
6. Introduction of plants to attract song birds and other forms of wildlife.

Planting Materials

1. All "bare rooted" plants should be planted in spring, as early as the condition of the soil will allow, March, April and before May 15 unless stock has been held back in cold storage. Balled-burlaped stock may also be planted in fall during October, November and early December.
2. Woody planting materials may be seedlings, transplants, rooted cuttings, or balled-burlaped stock.

Adapted Species for recreation areas are listed in Table II as follows:

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TABLE II - Recreation Area Tree and Shrub Planting Guide a/

| Purpose, Use, and Aesthetic Value | Species | Spacing | Growth Rate b/
Height | Tolerance
Sun - Shade | Drainage Requirements c/ | |
|---------------------------------------|------------------------------|------------------------------|--------------------------|--------------------------|--------------------------|-----------------|
| | | | | | Poorly
Drained | Well
Drained |
| SHADE AND ORNAMENTAL
Evergreen | Trees: | | | | | |
| | White Pine | 65' | M 90' | x | | 1 |
| | Red Pine | 65' | M 75' | x | | 2 |
| | Norway Spruce | 4/ac. | S 80' | x | 1 | 2 |
| | Blue Spruce | 2/ac. | VS 60' | x | | 1 |
| | Sugar Maple | 65' | S 70' | x | | 1 |
| | Pin Oak | 65' | M 75' | x | 1 | 2 |
| | Red Oak | 65' | M 65' | x | | 2 |
| | Bur Oak | 65' | S 75' | x | 1 | 2 |
| | White Oak | 65' | M 90' | x | | 1 |
| Deciduous | Hickory | 65' | S 75' | x | | 1 |
| | Black Gum | 65' | M 55' | x | | 2 |
| | Tulip Poplar | 65' | M 100' | x | | 2 |
| | Thornless Honey-
locust | 65' | F 75' | x | 2 | 2 |
| | Sycamore | 65' | F 90' | x | 1 | 2 |
| | Bald Cypress | 65' | M 90' | x | 1 | 2 |
| | Ginko (male only) | 65' | F 60' | x | | 1 |
| | White Birch | 1 & 2' in
clump of
3-4 | M 40' | x | 2 | 1 |
| | Shrubs and trees: | | | | | |
| | Yew | varied | VS 4-10' | x | | 1 |
| ORNAMENTAL & WILDLIFE
Evergreen d/ | Hemlock | varied | S 4-10' | x | 2 | 1 |
| | Juniper | varied | F 4-6' | x | | 1 |
| | Arborvitae | varied | M 5-15' | x | 1 | 2 |
| | Dogwood | varied | S 20-25' | x | | 1 |
| | Redbud | varied | S 15-20' | x | | 1 |
| Flowering | Flowering Crab | varied | " 20-30' | x | | 1 |
| | Sumac: Smooth
or Staghorn | 6-8' | F 10-30' | x | | 1 |
| Clump color red | | | | | | 2 |

TABLE II (Cont'd.)

| Purpose, Use, and
Aesthetic Value | Species | Spacing | Growth
Rate b/
Height | Tolerance
Sun-Shade | Drainage Requirements c/ | | |
|--|----------------------------------|---------|-----------------------------|------------------------|--------------------------|-----------------|----------|
| | | | | | Poorly
Drained | Well
Drained | Droughty |
| Fruiting | Crabapple | Varied | S 20-30' | x | | 1 | |
| | Blackhaw | Varied | S 15-20' | x | | 1 | 2 |
| | Cranberry, highbush | Varied | F 6-10' | x | | 1 | 2 |
| | Autumn Olive | Varied | M 8-14' | x | | 1 | 2 |
| | Honeysuckle, bush | Varied | M 6-16' | x | | 1 | |
| VEGETATIVE BARRIER
AND WILDLIFE | Multiflora Rose | 1' | M 6-10' | x | 2 | 1 | |
| | | | | | | | |
| SCREENS AND BORDERS
Evergreen d/ | White Pine | 6-8' | M Top and | x | | 1 | 2 |
| | Virginia Pine | 6-8' | F shear | x | | 1 | 2 |
| | Red Pine | 6-8' | M at | x | | 2 | 1 |
| | Hemlock | 2-3' | S desired | x | 2 | 1 | |
| | Yew | 2-3' | VS height. | x | | 1 | 2 |
| GROUND COVER
Semi evergreen
(broad leaf) | Autumn Olive | 4' | M 8-14' | x | | 1 | 2 |
| | Cranberry,
highbush | 3-4' | F 6-10' | x | | 1 | 2 |
| | Lespedeza, bicolor
var. Natob | 1½-2' | F 4-8' | x | 2 | 1 | 2 |
| | Multiflora Rose | 1' | M 6-10' | x | 2 | 1 | |
| | privet, sp. | 2' | F 6-10' | x | | | |
| | Honeysuckle, bush | 3-4' | M 6-16' | x | | | |
| | Hawthorne,
Washington | 4-6' | M 6-16' | x | | 1 | 2 |
| | Euonymus Winter-
creeper | 2-3' | F 2' lx
3' w | x | 2 | 1 | |
| | Ground Myrtle | 2' | F ½' | x | | 1 | |
| | Jap. Honeysuckle | 3-6' | F 1'
(climbing) | x | 2 | 1 | 2 |

- a/ On sites with severe erosion hazards see practice #342 Critical Area Planting.
- b/ Growth rate symbols: F = fast; M = medium; S = slow; VS = very slow.
- c/ Drainage 1/ = preferred; 2/ = will tolerate.
- d/ The evergreen species should be topped and shaped as required when planted for "Ornamentals" or "Screens and Borders."

II. Thinning and Pruning in Natural or Planted Stands of Wood Material for Recreation Area Improvement.

A. Thinning

1. On intensive use areas, leave about 10 to 15 larger (10" + DBH) sound trees per acre for shade.
2. Favor for retention the deep rooted species such as red oak, bur oak, white oak, sugar maples, hickory, black gum, tulip poplar, etc.
3. Retain some flowering and wildlife food plants such as dogwood, redbud, serviceberry, pawpaw, persimmon, etc.
4. Occasionally there will be portions of a recreational area, where a part of woody cover should be left unthinned, such as odd corners not needed for intensive use, where natural cover makes a screen, and on steep escarpments or erosive areas.
5. Removal of woody materials should be accomplished by cutting flush with the ground line. This will leave topsoil in place, and not injure roots of trees or shrubs being retained.

B. Pruning

1. Intensive use area trees should have lower limbs removed to a minimum height of 12 feet, so as to provide space for recreation activities and save on cost of maintenance operations.
2. Pruning cuts should be made as close to the tree trunk or main stem as possible. All large limbs should be cut in a method that will not strip or tear bark on remaining part of tree. (See job sheet "Taking Care of Your Trees.")

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2. Where recreation pressure is not heavy and growing space is ample, a few specimen trees should be left unpruned to add natural beauty. (e.g. Pin Oak, Spruces, White Pine, Red Cedar, etc.).

III. Maintenance

- A. To prevent sprouting, chemically treat stumps immediately after cutting.
- B. Poisonous plants like poison ivy should be chemically sprayed and eliminated from recreation areas.
- C. Maintain open areas by periodic mowing and/or spraying to prevent the encroachment of undesirable vegetation.

Caution: Chemicals used must be Federally and locally registered and must be applied strictly in accordance with authorized registered uses, directions on the label, and other Federal or State policies and requirements.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 50% of actual costs involved not to exceed 50% of the estimated cost.

Unit Price = \$200.00 per acre

Maximum Cost-Share = \$100.00 per acre

Practice is eligible for payment when seeding and other required work is completed.

350 SEDIMENT CONTROL BASIN (Number)

Definition

A barrier or dam constructed across a waterway or at other suitable locations to form a silt or sediment basin.

Purpose

To preserve the capacity of reservoirs, ditches, canals, diversions, waterways, and streams; to prevent undesirable deposition on bottomlands and developed areas; to trap sediment originating from construction sites; and to **reduce** or **abate** pollution by providing basins for depositions, and storage of silt, sand, gravel, stone, agricultural wastes, and other debris.

Conditions Where Practice Applies

This practice applies where physical **condition** or land ownership preclude the treatment of the sediment source by the installation of erosion control measures to keep soil and other material in place, or a basin offers the most practical solution to the problem.

Design Criteria

Sediment control basins shall be designed by a qualified engineer. A geologist and/or soil scientist shall be consulted to estimate rate of production **and** volume of sediment to be expected. The applicable portions of standards and specifications 378 Ponds, shall be followed except as indicated below.

The basin shall have an estimated life of not less than 15 years based on estimated rate of sediment, etc., that would be produced.

The design of dams, spillways, and drainage facilities shall be in accordance with the standards for Ponds, Grade Stabilization Structures or Engineering Memorandum No. 27, as appropriate for the class and kind of structure being considered.

Safety measures to protect the public from the hazards of soft sediment and floodwater are to be established as conditions dictate.

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Plans and Specifications

Plans and specifications for installation of basin shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

The applicable portions of standards and specifications 378 Pond shall be followed.

Cost-Sharing

1. Earth moving; cleaning; and materials and installation of mechanical spillways, and fences.

Cost-share, when planned and constructed according to the above specifications will be 70 percent of the actual cost of the structure not to exceed 70 percent of the estimated cost.

Unit Price = \$6,000.00 per structure

Maximum cost-share rate = \$4,200.00 per structure

2. Seeding disturbed areas

Cost-share, when planned and carried out according to the above specifications will be 70 percent of the actual cost not to exceed 70% of the estimated cost.

Unit Price = \$150.00 per acre

Maximum Cost-Share Rate = \$105.00 per acre

Seeding and mulching requirements for Sediment Control Basins built after September 30, are the same as those for practice 378 Pond.

The practice is eligible for payment when the basin is constructed and the seeding is completed.

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584 STREAM CHANNEL STABILIZATION (Feet)

Definition

Stabilizing the channel of a stream with suitable structures.

Scope

This standard covers the structural work done to control aggradation or degradation in a stream channel. It does not include work done to prevent bank cutting or meander.

Conditions Where Practice Applies

This practice applies to stream channels undergoing damaging aggradation or degradation that cannot be feasibly controlled by clearing or snagging, by the establishment of vegetative protection, or by the installation of upstream water control facilities, and which require the application of structural measures.

Design Criteria

It is recognized that channels may aggrade or degrade during a given storm or over short periods of time. A channel is considered stable if, over long periods of time, the channel bottom remains essentially at the same elevation.

In the design of a channel for stability, consideration shall be given to the following points:

1. The character of the materials comprising the channel bottom.
2. The quantity and character of the sediments entering the reach of channel under consideration. This shall be analyzed on a basis of both present conditions and projected changes caused by changes in land use or land treatment and upstream improvements or structural measures.
3. Streamflow peaks, velocities, and volumes at various flow frequencies.
4. The effects of changes in velocity of the stream produced by the structural measures.

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Structures installed to stabilize stream channels shall be designed and installed to meet Soil Conservation Service standards for the particular structure and type of construction involved.

Plans and Specifications

Plans and specifications for installation of stream channel stabilization shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose. Specifications for each streambank stabilization measure will be prepared to meet on-site conditions by the responsible engineer.

Disturbed areas shall be seeded and maintained in good vegetation. Vegetation will be established according to specification 342, Critical Area Planting.

Cost-Sharing

Stream channels considered under "1/ Stream Channel Stabilization," Table 4-10, Black Creek Study, require fencing as a major input for maintaining a stabilized channel and controlling erosion and sedimentation.

1. Fencing to Exclude Livestock

Where protection from livestock is necessary, fencing is planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

2. Structural Practices

a. "1/ Stream channel stabilization," Table 4-10, Black Creek Study, require extensive installation of rip-rap.

Cost-share, when planned and carried out in accordance with the above specifications, will be 50% of the actual costs incurred up to a maximum of 80% of the estimated cost.

Unit Price = \$12.00 per ton - machine placed
Maximum Cost-Share Rate = 50% per ton

1. Stabilization Structure

Cost share, when planned and carried out in accordance with the above specifications, will be 80% of the actual costs incurred up to a maximum of 80% of the estimated cost.

Unit Price = \$1,000.00 per structure
Maximum Cost-Share Rate = 80% per structure installed

3. Establishing Protective Vegetation on Disturbed Areas

Cost share for establishing protective vegetation on disturbed areas will be made in accordance with that provided for practice 342, Critical Area Planting.

Practice will be eligible for payment when all work is completed.

580 STREAMBANK PROTECTION (Feet)

Definition

Stabilizing and protecting banks of streams or excavated channels against scour and erosion by vegetative or structural means.

Scope

This standard covers the structural means used to stabilize and protect the banks of natural streams and excavated channels.

Purpose

Streambank protection is established to stabilize or protect streambanks for one or more of the following purposes:

1. To prevent the loss of land or damage to utilities, roads, buildings, or other facilities adjacent to the channel.
2. To maintain the capacity of the channel.
3. To control channel meander which would adversely affect downstream facilities.
4. To reduce sediment loads causing downstream damages and pollution or to improve the stream for recreational use or as a habitat for fish and wildlife.

Conditions Where Practice Applies

This practice applies to natural or excavated channels where the streambanks are subject to erosion from the action of water, ice, or debris or to damage from livestock or vehicular traffic.

Design Criteria

Since each reach of channel is unique, measures for streambank protection must be installed according to a plan and adapted to the specific site. Designs shall be developed in accordance with the following principles:

1. Protective measures to be applied shall be compatible with improvements planned or being carried out by others.
2. The grade must be controlled, either by natural or artificial means, before any permanent type of bank protection can be considered feasible unless the protection can be safely and economically constructed to a depth well below the anticipated lowest depth of bottom scour.
3. Streambank protection shall be started at a stabilized or controlled point and ended at a stabilized or controlled point on the stream.
4. Needed channel clearing to remove stumps, fallen trees, debris, and bars which force the streamflow into the streambank shall be an initial element of the work.
5. Changes in channel alignment shall be made only after an evaluation of the effect on the land use, interdependent water disposal systems, hydraulic characteristics, and existing structures.
6. Structural measures must be effective for the design flow and be able to withstand greater floods without serious damage.
7. Vegetative protection shall be considered on the upper portions of eroding banks, and especially on those areas which are subject to infrequent inundation.

Streambank Protection Measures

The following is a partial list of elements which may be involved in a plan for streambank protection.

Obstruction Removal - The removal of fallen trees, stumps, debris, minor ledge outcroppings, and sand and gravel bars that may cause local current turbulence and deflection.

Vegetation - Establishing protective vegetation on streambanks by seeding, planting, and mulching to control erosion and sedimentation.

Banksloping - The reduction of the slope of streambanks to provide a suitable condition for vegetative protection or for the installation of structural bank protection.

Rip-Rap - Placed or dumped heavy stone, properly armor-lined with a filter blanket when necessary, to provide armor protection for streambanks.

Fish and Wildlife

Special attention will be given to maintaining or improving habitat for fish and wildlife.

Local Requirements

All work planned and constructed must comply with applicable state laws.

Plans and Specifications

Plans and specifications for installation of streambank protection shall be in keeping with this standard and shall describe the requirements for application of the practice to achieve its intended purpose.

Specifications for each planned streambank protection measure will be prepared to meet on-site condition by the responsible engineer.

Streambanks and the disturbed areas shall be seeded and maintained in good vegetation. Vegetation will be established according to specification 242, Critical Area Planting.

Cost-Sharing

Cost-share, when planned and carried out according to the above specifications, will be 70% of the actual cost involved not to exceed 70% of the estimated cost.

Unit Price = \$2.50 per lineal foot

Maximum Cost-Share Rate = \$1.75 per lineal foot

Note: Cost-sharing involving major structure repairs, including extensive installation of rip-rap, will be made under practice 534, Stream Channel Stabilization.

Practice will be eligible for payment when all work is completed.

585 STRIPCROPPING, CONTOUR (Acres)

Definition

Growing crops in a systematic arrangement of strips or bands on the contour to reduce water erosion. The crops are arranged so that a strip of grass or close-growing crop is alternated with a strip of clean-tilled crop or fallow; or a strip of grass is alternated with a close-growing crop.

Purpose

To reduce soil and water losses.

Where Applicable

On sloping cropland where the topography is sufficiently uniform to permit practical tillage and harvesting operations, and where the cropping system needs the support of the strip arrangement to effectively reduce soil and water losses.

Specifications

1. The Universal Soil Loss Equation will be used to determine adequacy of erosion control with contour stripcropping.
2. Strip boundaries will be laid out on the contour with a maximum allowable deviation of 3 percent for distance of 100 feet or less. Where diversions are used to break the slope, they will be used as guidelines.
3. Guidelines for soils with moderate or slower permeability shall be established on a slight grade of 0.5 to 1 percent toward drainageways.
4. Planting of crops and tillage operations shall usually be parallel to strip boundaries with short rows in the middle of the tilled strips. Where this is not acceptable, planting may be started at the top of the tilled strip, leaving any short rows at the bottom of the strip.
5. By careful attention to field layout and starting at the critical part of the slope, it is often possible to maintain uniform width strips (parallel sides).

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6. Strips shall be established according to the following widths, within slope percent groups. Make needed adjustments in strip widths to fit equipment where strips have parallel sides.

| <u>Percent Slope</u> | <u>Strip in Width in Feet</u> |
|----------------------|-------------------------------|
| 2-6 | 131-88 |
| 7-12 | 83-74 |
| 13-18 | 74-60 |

(10 percent deviation in width may be allowed to adjust for a difference in slope on some fields.)

7. Natural and constructed waterways are to be maintained in sod.

Cost-Sharing

Cost-sharing, when planned and applied according to the above specifications, will be 50% of the average cost of \$5.00 per acre.

Unit Price = \$5.00 per acre
Maximum Cost-Share Rate = \$4.00 per acre

Practices will be eligible for payment when contour strips have been laid out and the first years crops have been planted.

590 SURFACE DRAINS (Feet)

Definition

A graded ditch for collecting excess water within a field. This does not include Drainage Main or Lateral, or Grassed Waterway or Outlet.

Purpose

Surface drains are installed to:

1. Drain surface depressions
2. Collect or intercept excess surface water such as sheet flow from natural and graded land surface or channel flow from furrows for removal to an outlet.
3. Collect or intercept excess subsurface water for removal to an outlet.

Conditions Where Practice Applies

Applicable sites are flat or nearly flat lands that:

1. Have soils of low permeability or shallowness over barriers, such as rock or clay, which hold or prevent ready percolation of water to a deep stratum.
2. Have surface depressions or barriers which trap rainfall.
3. Have insufficient land slope for ready movement of runoff across the surface.
4. Receive excess runoff or seepage from uplands.
5. Require removal of excess irrigation water.
6. Require control of the groundwater table.
7. Have adequate outlets available for disposal of drainage water by gravity flow or pumping.

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Design Criteria

Surface drains shall be planned as integral parts of a drainage system for the field served and shall collect, intercept, and remove water to an outlet with continuity and without ponding.

The SCS Engineering Field Manual for Conservation Practices shall be used as guide in the planning and design.

Investigations

An adequate investigation shall be made of all sites. Soils to be drained shall be suitable for agricultural use.

Location

Ditches shall be established, insofar as topography and property boundaries permit, in straight or nearly straight courses. Random alignment may be used to follow depressions and isolated wet areas of irregular or undulating topography. Excessive cuts, and the creation of small irregular fields shall be avoided.

On extensive areas of uniform topography, collection or interception ditches shall be installed as required for effective drainage.

Design

The size, depth, side slopes, and cross section area shall:

1. Be adequate to provide the required drainage for the site and the crop to be grown.
 - a. The minimum design capacity of the ditch will accommodate the runoff computed by using the "C" curve for open ditch design in flat areas for field crops. A minimum design accommodating the runoff using the "B" curve will be used for areas on which truck crops are to be grown. A minimum depth of 9 inches and a minimum cross sectional area of 5 square feet for single ditches and 6 square feet for each ditch of a double ditch or (v) ditch will be used.
 - b. In a Cross Slope Ditch System, which is planned and designed for the purpose of providing erosion control and surface drainage, the length and cross section of

the channels will be sufficiently large to carry the peak rate of runoff produced, by a 10-inch frequency rain. The minimum depth will be 6 inches for trapezoidal sections with a 6 feet bottom width and 8:1 side slopes. For a "V" section the minimum depth will be 9 inches with 10:1 side slopes.

2. Permit free entry of water from adjacent land surfaces without causing excessive erosion.
3. Provide effective disposal or reuse of excess irrigation water (where applicable).
4. Conduct flow without excessive erosion. The maximum velocity will be in accordance with those shown on page 14-26 of the SCS Engineering Field Manual for Conservation Practices. A roughness coefficient of "n" = 0.04 will be used in computing velocities.
5. Provide stable side slopes based on soil characteristics.
6. Where crossings with farm equipment a side slope of 8:1 or flatter will be used. A side slope of 2:1 and preferably 4:1 or flatter may be used where farm operations are parallel to the ditch.
7. Permit construction and maintenance with available equipment.
8. Tile or other suitable subsurface drainage measures shall be provided for on the design for sites having high watertable or seepage problems.

Plans and Specifications

Plans and specifications for construction of Drainage Field Ditches shall be in keeping with this standard and shall describe the requirements for proper installation of the practice to achieve its intended purpose.

Construction

Areas to be excavated and areas to be occupied by spoil shall be cleared of trees, brush, stones, or other debris.

Ditches shall be constructed to a continuous bottom grade toward the outlet. Finished sections shall be uniform and smooth.

Spoil shall be placed or graded in such a manner that with necessary inlets provided, surface water may move freely into the ditch.

Maintenance

Field ditches will be maintained to permit them to function properly. Field outlets and collection ditches should be cleaned and reopened periodically as required to permit them to function properly. Small deposits of silt will greatly reduce capacities and cause partial or complete failure of the system. After each heavy rain the ditches should be inspected and silt deposits or other obstructions removed.

Working Tools and References

Job Sheet #1
Indiana Farm Drainage Guide
SCS Engineering Field Manual for Conservation Practices

Cost-Sharing

Cost-share, when planned and constructed according to the above specifications will be 70 percent of the actual costs of the surface drains not to exceed 70 percent of the estimated cost.

Unit Price = \$.50 per lineal foot

Maximum Cost-Share Rate = \$.35 per lineal foot

Note: In addition, tile drains as required in the above specifications may be cost-shared as a separate item under practice 600 Tile Drains.

Practice is eligible for payment when the surface drains are completed and the tile are installed, if needed.

600 TERRACES, GRADIENT (Feet)

Definition

An earth embankment or ridge and channel constructed across the slope at suitable spacing and with an acceptable grade.

This standard does not apply to Diversions.

Purpose

Gradient terraces are constructed to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a non-erosive velocity.

Conditions Where Practice Applies

Gradient terraces normally are limited to cropland having a water erosion problem. They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. The topography must be such farmable terraces can be constructed. Gradient terraces may be used only where suitable outlets are or will be made available.

Design Criteria

Spacing 1/ (Graded)

VERTICAL INTERVAL = $0.7s + 2*$ (s = predominant slope of land above length of terrace.)

| FIELD SLOPE - % | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11* | 12* |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Vertical Interval | 2.7 | 3.4 | 4.1 | 4.8 | 5.5 | 6.2 | 6.9 | 7.6 | 8.3 | 9.0 | 9.7 | 10.4 |
| Horizontal Interval | 270 | 170 | 134 | 120 | 110 | 103 | 98 | 95 | 93 | 90 | 88 | 86 |
| Feet Per Acre | 161 | 257 | 325 | 363 | 397 | 424 | 445 | 459 | 474 | 485 | 496 | 507 |
| Acres Per 1000 Feet | 6.21 | 3.89 | 3.07 | 2.67 | 2.52 | 2.36 | 2.52 | 2.18 | 2.11 | 2.06 | 2.02 | 1.97 |

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* On slopes steeper than 10% a horizontal interval of 80 feet may be used.

1/ Terrace spacing may be adjusted by applying the Universal Equation for predicting soil loss. The maximum horizontal spacing shall not exceed the slope length for the allowable soil loss determined by using contour cultivation, the most intensive use possible for the land and the expected level of management. The most intensive use possible will be considered continuous row crops unless thoroughly justified.

Vertical spacings determined by either of the above charts may be increased as much as 10 percent of 0.5 foot to provide better alignment or location, to miss obstacles in the field, to adjust for farm machinery, or to reach a satisfactory outlet.

The drainage area above the top terraces shall not exceed the area that would be drained by a terrace or equal length with normal spacing.

Alignment

Terraces in a system shall be made as nearly parallel as practicable. Land smoothing, a moderate amount of cutting and filling along the terrace line, use of multiple outlets, variations in grades, and other methods shall be used as needed to improve alignment.

Capacity

The terrace shall have enough capacity to handle the peak runoff expected from a 10-year-frequency storm without overtopping.

Cross Section

The terrace cross section shall be proportioned to fit the land slope, the crops grown, and the farm machinery used. The ridge height shall include a reasonable settlement factor. The ridge shall have a minimum top width of 3 feet at the design height. The minimum cross-section area of the terrace channel shall be 8 square feet for land slopes of 5 percent or less, 7 square feet for slopes from 5 to 8 percent, and 6 square feet for slopes steeper than 8 percent.

Terraces must have a minimum channel cross section of 8 square feet for terraces up to 500 feet in length, 10 square feet for terraces from 500 to 1000 feet in length, 12 square feet for terraces over 1000 feet in length, and with an overall grade of 0.4 percent. For short distances, terrace grade may vary from 0.2 percent to 0.6 percent to improve alignment. The base must be broad enough to be maintained and farmed on the contour with equipment common to the area. For storage type terraces, grades may be varied to improve alignment. Steep grades may be permitted near outlets because stored water will lower the water surface grade.

Spacing of terrace and effective ridge height (measured from top of settled ridge to bottom of channel) shall conform to the table below.

| GRADED TERRACE CHANNEL DIMENSIONS
Trapezoidal Cross Section | | | | | | |
|--|--|-----|-----|-----|------|--|
| Field
slope
(percent) | Needed Terrace Ridge Height
in Feet | | | | | May vary + or - 10
Percent horizontal
interval in feet |
| Length in Feet | 200 | 400 | 600 | 800 | 1000 | |
| 1 | 0.8 | 0.9 | 1.0 | 1.2 | 1.2 | 260 |
| 2 | 0.8 | 0.9 | 1.0 | 1.2 | 1.2 | 160 |
| 3 | 0.7 | 0.9 | 1.0 | 1.1 | 1.2 | 127 |
| 4 | 0.7 | 0.9 | 1.0 | 1.1 | 1.1 | 110 |
| 5 | 0.7 | 0.9 | 1.0 | 1.1 | 1.1 | 100 |
| 6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 93 |
| 7 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 89 |
| 8 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 85 |
| 9 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 82 |
| 10 | 0.6 | 0.8 | 0.9 | 1.0 | 1.0 | 80 |

Figures are settled ridge height and are based on a channel with a 6 foot bottom on a 0.4 percent grade. The same height should be used for a 0.6 percent grade. The height should be increased 0.1 foot for a grade of 0.2 percent. A top width of at least 3 feet should be provided.

| CROSS SECTIONAL AREA OF TERRACE CHANNELS | |
|--|-----------------------------|
| <u>Length of Terrace</u> | <u>Cross-Sectional Area</u> |
| Feet | Square Feet |
| 500 | 8 |
| 500-1000 | 10 |
| Over 1000 | 12 |

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Channel Grade

Channel grades may be either uniform or variable from 0.2 foot per 100' to a minimum grade of 0.6 foot per 100 feet of length. For short distance, terrace grades may be increased to improve alignment. The channel velocity shall not exceed that in chart below.

| Type of Vegetation | Feet Per Second |
|--------------------|-----------------|
| Bare Channel: | |
| Sand and Silts | 1.5 |
| Other | 2.0 |
| Poor | 3.0 |
| | 4.0 |
| Good | 5.0 |

Outlet

All gradient terraces must have an adequate outlet. Such an outlet may be a natural crossed waterway, a vegetated area, or underground conduit. In all cases, the outlet must convey runoff from the terrace or terrace system to a point where the outflow will not cause damage. Terrace outlets shall be installed before terrace construction, if needed to insure vegetative cover in the outlet channel or settlement of fill around underground conduit.

The design elevation of the water surface in the terrace shall not be lower than the design elevation of the water surface in the outlet, at their junction, when both are operating at design flow.

Specifications

Specifications will be in keeping with the preceding standard and will include consideration of the following items:

All dead furrows, ditches, or culleys to be crossed shall be filled before construction begins or as part of construction. All old terraces, fence rows, and other obstructions that will interfere with the successful operation of the system shall be removed.

The minimum constructed cross section shall meet the design dimensions.

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The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement. The opening at the outlet end of the terraces shall have a cross section equal to that specified for the terrace channel.

The finished channel shall contain no depressional areas which would cease ponding of water damaging to crops.

All tillage operations shall be parallel to the terraces.

Storage type terraces with underground conduits shall be designed in accordance with design procedures in the SCS Engineering Field Manual for Conservation Practices.

Consideration shall be given in terrace and outlet layout to machinery operation needs and field terraces.

Cost-Sharing

1. Underground outlet and inlet system

Cost-share, when planned and constructed according to the above specifications will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

Unit Price = \$150.00 per system

Maximum Cost-Share Rate = \$120.00 per system

2. Terrace construction

Cost-share, when planned and carried out according to the above specifications, will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

Unit Price = \$.25 per lineal foot

Maximum Cost-Share Rate = \$.20 per lineal foot

Practice will be eligible for payment when terraces are completed.

604 TERRACE, PARALLEL (Feet)

Definition

An earth embankment or a ridge and channel constructed across the slope at a suitable spacing and with an acceptable grade.

Purpose

Parallel terraces are constructed to reduce erosion damage by intercepting surface runoff and conducting it to a stable outlet at a nonerosive velocity. To reduce point rows and permit easier planting, cultivation and harvesting of crops.

Where Applicable

Parallel terraces normally are limited to cropland having a water erosion problem. They shall not be constructed on deep sands or on soils that are too stony, steep, or shallow to permit practical and economical installation and maintenance. The topography must be such that farmable terraces can be constructed. Parallel terraces may be used only where suitable outlets are or will be made available.

Design Criteria

Spacing 1/ (Graded)

VERTICAL INTERVAL = $0.7s + 2*$ (s = predominant slope of land above length of terrace).

| FIELD SLOPE - % | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11* | 12* |
|---------------------|------|------|------|------|------|------|------|------|------|------|------|------|
| Vertical Inlet | 2.7 | 3.4 | 4.1 | 4.8 | 5.5 | 6.2 | 6.9 | 7.6 | 8.3 | 9.0 | 9.7 | 10.4 |
| Horizontal Interval | 270 | 170 | 134 | 120 | 110 | 103 | 98 | 95 | 92 | 90 | 88 | 86 |
| Feet Per Acre | 161 | 257 | 325 | 363 | 397 | 424 | 445 | 459 | 474 | 485 | 496 | 507 |
| Acres Per 1000 Feet | 6.21 | 3.89 | 3.07 | 2.76 | 2.52 | 2.36 | 2.25 | 2.18 | 2.11 | 2.05 | 2.02 | 1.97 |

*On slopes steeper than 10% a horizontal interval of 80 feet may be used.

1/ Terrace spacings may be adjusted by applying the Universal Equation for predicting soil loss. The maximum horizontal spacing shall not exceed the slope length for the allowable soil loss determined by using contour cultivation, the most intensive use possible for the land and the expected level of management. The most intensive use possible will be considered continuous row crops unless thoroughly justified.

Vertical spacings determined by either of the above charts may be increased as much as 10 percent or 0.5 feet to provide better alignment or location, to miss obstacles in the field, to adjust for farm machinery, or to reach a satisfactory outlet.

The drainage area above the top terrace shall not exceed the area that would be drained by a terrace of equal length with normal spacing.

Alignment

Terraces in a system shall be constructed, insofar as is possible, parallel to each other. Varying channel grade and depth of cuts in various sections of a terrace and in adjoining terraces will be utilized to improve alignment. Land smoothing and use of multiple outlets or other methods should be used to improve alignment.

Capacity

The terrace shall have enough capacity to handle the peak runoff expected from a 10-year frequency storm without overtopping.

Cross Section

The terrace cross section shall be proportioned to fit the land slope, the crops grown, and the farm machinery used. The ridge height shall include a reasonable settlement factor. The ridge shall have a minimum top width of 3 feet at the design height. The minimum cross-sectional area of the terrace channel shall be 8 square feet for land slopes of 5 percent or less, 7 square feet for slopes from 5 to 8 percent, and 6 square feet for slopes steeper than 8 percent.

Terraces must have a minimum channel cross-section of 8 square feet for terraces up to 500 feet in length, 10 square feet for terraces from 500 to 1000 feet in length, 12 square feet for terraces over 1000 feet in length, and with an overall grade of 0.4 percent. For short distances, terrace grade may vary from 0.2 percent to 0.6 percent to improve alignment. The base must be broad enough to be maintained and farmed on the contour with equipment common to the area. For storage type terraces, grades may be varied to improve alignment. Steeper grades may be permitted near outlets because water storage will reduce the water surface grade.

Spacing of terrace and effective ridge height (measured from top of settled ridge to bottom of channel) shall conform to the table below.

| GRADED TERRACE CHANNEL DIMENSIONS
Trapezoidal Cross Section | | | | | | |
|--|--|-----|-----|-----|------|--|
| Field
Slope
(percent) | Needed Terrace Ridge Height
in Feet | | | | | May vary + or - 10
Percent horizontal
interval in feet |
| Length in Feet | 200 | 400 | 600 | 800 | 1000 | |
| 1 | 0.8 | 0.9 | 1.0 | 1.2 | 1.2 | 260 |
| 2 | 0.8 | 0.9 | 1.0 | 1.2 | 1.2 | 160 |
| 3 | 0.7 | 0.9 | 1.0 | 1.2 | 1.2 | 127 |
| 4 | 0.7 | 0.9 | 1.0 | 1.1 | 1.1 | 110 |
| 5 | 0.7 | 0.9 | 1.0 | 1.1 | 1.1 | 100 |
| 6 | 0.7 | 0.8 | 0.9 | 1.0 | 1.1 | 93 |
| 7 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 89 |
| 8 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 85 |
| 9 | 0.7 | 0.8 | 0.9 | 1.0 | 1.0 | 82 |
| 10 | 0.6 | 0.8 | 0.9 | 1.0 | 1.0 | 80 |

Figures are settled ridge height and are based on a channel with a 6 foot bottom on a 0.4 percent grade. The same height should be used for a 0.6 percent grade. The height should be increased 0.1 foot for a grade of 0.2 percent. A top width of at least 3 feet should be provided.

| CROSS SECTIONAL AREA OF TERRACE CHANNELS | |
|--|-----------------------------|
| <u>Length of Terrace</u> | <u>Cross-Sectional Area</u> |
| Feet | Square Feet |
| 500 | 8 |
| 500-1000 | 10 |
| Over 1000 | 12 |

Channel Grade

Channel grade may be either uniform or variable from 0.2 foot per 100 to a maximum grade of 0.6 foot per 100 feet of length. For short distances, terrace grades may be increased to improve alinement. The channel velocity shall not exceed that in chart below.

| Type of Vegetation | Feet Per Second |
|--------------------|-----------------|
| Bare channel: | |
| Sand and silts | 1.5 |
| other | 2.0 |
| Poor | 3.0 |
| Fair | 4.0 |
| Good | 5.0 |

Outlet

All parallel terraces must have an adequate outlet. Such an outlet may be a natural grassed waterway, a vegetated area, or underground conduit. In all cases, the outlet must convey runoff from the terrace or terrace system to a point where the outflow will not cause damage. Terrace outlets shall be installed before terrace construction, if needed, to insure vegetative cover in the outlet channel.

The design elevation of the water surface in the terrace shall not be lower than the design elevation of the water surface in the outlet, at their junction, when both are operating at design flow.

Specifications

Specifications will be in keeping with the preceding standard and will include consideration of the following items:

All dead furrows, ditches, or fullies to be crossed shall be filled before construction begins or as a part of construction. All old terraces, fence rows, and other obstructions that will interfere with the successful operation of the system shall be removed.

The minimum constructed cross section shall meet the design dimensions.

The top of the constructed ridge shall not be lower at any point than the design elevation plus the specified overfill for settlement. The opening at the outlet end of the terraces shall have a cross section equal to that specified for the terrace channel.

The finished channel shall contain no depressional areas which would cause ponding of water damaging to crops.

All tillage operations shall be parallel to the terraces.

Consideration shall be given in terraces and outlet layout to machinery operation needs and field terraces.

Storage type terraces with underground conduits shall be designed in accordance with design procedures in the SCS Engineering Field Manual for Conservation Practices.

Cost Sharing

1. Underground outlet and inlet system

Cost share, when planned and constructed according to the above specifications will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

Unit Price = \$150.00 per inlet

Maximum Cost Share = \$120.00 per inlet

2. Terrace Construction

Cost share, when planned and carried out according to the above specifications, will be 80 percent of the actual cost not to exceed 80 percent of the estimated cost.

Unit Price = \$.60 per lineal foot

Maximum Cost Share = \$.48 per lineal foot

Practice will be eligible for payment when terraces are completed.

000 TILE DRAINS (Feet)

Definition

A conduit, such as tile, pipe, or tubing, installed beneath the ground surface and which collects and/or conveys drainage water.

Purpose

A drain may serve one or more of the following purposes:

1. Provide drainage for waterways, surface drains, and grass lined swales to protect their erosion control capability.
2. Intercept and prevent water movement into a wet area.
3. Relieve artesian pressures.
4. Remove surface runoff.
5. Serve as an outlet for other drains.

Conditions Where Practice Applies

Drains are used in areas having a high watertable where benefits of lowering or controlling groundwater or surface runoff justify the installation of such a system.

All lands to be drained shall be suitable for agricultural use within their capabilities after installation of required drainage and other conservation practices. The soil shall have enough depth and permeability to permit installation of an effective and economically feasible system.

An outlet for the drainage system shall be available, either by gravity flow or by pumping. The outlet shall be adequate for the quantity and quality of effluent to be disposed of with consideration of possible damages above or below the point of discharge that might involve legal actions under State Laws.

Design Criteria

The design and installation shall be based on adequate surveys and investigations. The Indiana Farm Drainage Guide, Table 1, "Drainage Recommendations for Indiana Soils" shall be followed.

Required Capacity of Drains

The required capacity shall be determined by one or more of the following:

1. The system shall have sufficient capacity to drain all area in the watershed needing drainage.
2. A suitable drainage coefficient including capacity required to dispose of surface water entering through inlets.
3. Survey and comparison of the site with other similar sites where subsurface drain yields have been measured.
4. Measurement of the rate of subsurface flow at the site.
5. Estimates of lateral or artesian subsurface flow.
6. Drainage Field Ditches should be used to remove surface water from the land where feasible for the most economical and satisfactory results.

When an existing main is to be used for an outlet the following shall apply.

CASE I - For areas to be drained that are five (5) acres or less.

This will apply principally to small systems and random lines where complete extensive systems are not needed.

An investigation shall be made of the outlet tile to determine that:

1. It is in good physical condition based on observation of the outlet tile at point of junction.
2. It has adequate capacity based on general observations made in the field. A survey or instrument check of the tile main downstream a distance of 200 to 300 feet from the junction is advisable to determine grade. It will be necessary to continue this check to the outlet unless observations indicate the advisability of such survey.

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3. It has sufficient depth to provide minimum cover for all new lines to be installed.
4. The existing tile outlet is adequate, if readily available and nearby.

CASE II - For areas to be drained in excess of five (5) acres.

The investigation shall include the following:

1. A physical inspection of the existing tile to determine that the tile is operative, free from breakdown, and has an adequate outlet.

The existing tile will be considered adequate if the capacity of the tile, as determined in Step 2, is equal to, or greater than 80% of the required capacity, and if the existing tile is not deteriorated because of holes, quartering, root or subsidence of the outlet, except where such damages are repaired, and/or corrected.

2. Determining the capacity of the existing tile by checking the grades and sizes of the critical areas, particularly the flat reaches.

Definition of Physical Inspection

The physical inspection will constitute the observing of the physical condition of the tile for the following conditions. The physical inspection shall extend from the outlet upward.

1. Breakdowns in the tile line which are usually accompanied by holes in the land over and along the line.
2. Fractured tile, such as quartering of tile (fractures at the quarter points which result in an egg-type cross-section).
3. Penetration of soil into the tile line. If seen, the inspector, as soon as possible, shall dig to determine the cause and plan for correction.
4. Physical deterioration of the tile rated as that which seriously subject it to failure, due to high salt content, soil acidity, or alkalinity, etc.

If the outlet tile is a drain of record (record drain), and the information available from the record, and the above physical inspection is sufficient to determine that the outlet is adequate.

Size of Drain

The size of drains shall be computed by applying Manning's formula. The required capacity shall be determined as provided above and the size computed based on one of the following assumptions:

1. Hydraulic grade line parallel to the bottom grade of the drain with the drain flowing full at design flow.
2. The drain flowing part full where a steep grade or other condition requires excess capacity.
3. Drain flowing under pressure with hydraulic grade line set by site conditions on a grade which differs from that of the drain. This procedure shall be used only where surface water inlets or nearness of the drain to outlets with fixed water elevations permit satisfactory estimates of hydraulic pressure and flows under design conditions.

The size may be determined from Standard Drawing Number ES-714 (Exhibit 14-11, SCS Engineering Field Manual) or from the "Tile Drain Design Chart" in the Indiana Drainage Guide).

The minimum size of drain shall be four (4) inches in diameter except as follows. The minimum size of drain shall be six (6) inches in diameter for deep organic soils (drainage group 19), and five (5) inches in diameter for sandy soils (drainage group 13) except when drain lengths of thirty (30) feet or longer are used.

Depth, Spacing, and Location

The depth, spacing, and location of the drain shall be based on site conditions including soils, topography, groundwater conditions, crops and outlets.

The minimum depth of cover over subsurface drains in mineral soils shall be 24 inches. This minimum depth shall apply to normal field levels and may exclude sections of line near the outlet, or sections laid through minor depressions where the drain is not subject to damage by frost action or equipment travel, and where site conditions justify specifying other depths.

The minimum depth of cover subsurface soils shall be 30 inches for normal field levels as defined above, after initial subsidence.

Structural measures shall be installed where feasible to control the water table level in organic soils within the optimum range of depths.

The Indiana Drainage Guide, "Drainage Recommendations for Indiana Soils" shall be used as a guide for making determinations of depth, spacing and location.

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Minimum Velocity and Grade

Where it is determined that a silting hazard exists, a velocity of not less than 1.4 feet per second shall be used to establish the minimum grades on the Indiana Drainage Guide, "Drainage Recommendations for Indiana Soils" may be used, if site conditions permit. Provisions shall be made, for prevention of siltation by filters as recommended in the Indiana Drainage Guide, and collection and removal of silt by use of silt traps when specified in the plans.

In areas with no rapid siltation hazard the minimum grade will be as follows, except where tile is also used for subsurface irrigation or unusual site conditions exist:

| | |
|---------------------------|-------|
| 4 inch diameter | 0.10% |
| 5,6,7 inch diameter | 0.07% |
| 8,10 inch diameter | 0.06% |
| 12 inch diameter and over | 0.05% |

Maximum Grade and Protection

On sites where topographic conditions require the use of drain lines on grades steeper than two percent or where design velocities will be greater than indicated in the table below, special measures shall be used to protect the drain. These measures shall be specified for each job based on the particular conditions of the job site. The protective measures shall be specified for each job based on the particular conditions of the job site. The protective measures shall include one or more of the following:

1. Use only drains that are uniform in size and shape and with smooth ends.
2. Lay the drain so as to secure a tight fit with the inside diameter of one section matching that of the adjoining sections.
3. Wrap open joints with tar impregnated paper, burlap, or special filter material such as plastic or fiber-glass fabrics.
4. Select the least erodible soil available for blinding.
5. Tarp blinding material carefully around the drain before backfilling.
6. Seal joints or use a watertight pipe.

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7. For continuous pipe or tubing with perforations, completely enclose the pipe with filter material of plastic, fiber glass, or properly graded sand and gravel.

Maximum Acceptable Velocity in Drains Without Protective Measures

| <u>SOIL FILTER</u> | <u>VELOCITY-FT./SEC.</u> |
|-----------------------|--------------------------|
| Sand and Sandy Loam | 3.5 |
| Silt and Silt Loam | 5.0 |
| Silty Clay Loam | 6.0 |
| Clay and Clay Loam | 7.0 |
| Grassy Sand or Gravel | 9.0 |

Materials for Drains

"Drains" include all units of clay, concrete, bituminized fiber, metal plastic, or other materials of acceptable quality.

The product shall meet **strength and durability** requirements of the city. Current specifications as listed below or as included in the specifications guide shall be used in determining the quality of product.

The minimum standards shall be those currently established for "Standard Drain Tile" by ASTM.

The following specifications cover the products currently acceptable for use or basis of for use in determining quality of materials used in drains in installation:

| <u>TYPE</u> | <u>SPECIFICATION</u> |
|---|-----------------------------|
| Clay, drain tile | ASTM C 4 |
| Clay, drain tile, perforated | ASTM C 403 |
| Clay, drain tile, standard strength | ASTM C 13 |
| Clay tile, extra strength | ASTM C 200 |
| Clay pipe, perforated, standard and extra strength | ASTM C 211 |
| Clay pipe, testing | ASTM C 301 |
| Concrete drain tile | ASTM C 412 |
| Concrete pipe for installation of drainage | ASTM C 119 |
| Concrete pipe or tile, determining physical properties of | ASTM C 407 |
| Concrete sewer, storm drain, and culvert pipe | ASTM C 14 |
| Reinforced concrete culvert, storm drain and sewer pipe | ASTM C 76 |
| Perforated concrete pipe | ASTM C 444 |
| Cast iron pipe | ASTM C 150 |
| Concrete sewer pipe | ASTM C 428 |
| Reinforced concrete underdrain pipe | ASTM C 503 |
| Reinforced concrete pipe, testing | ASTM C 308 |
| Bituminized fiber, perforated drainage pipe | Federal Spec. 2
D-7-3581 |

¹American Society for Testing and Materials, 1916 Race Street
Philadelphia, Pennsylvania 19103

²Superintendent of Documents, U.S. Government Printing Office,
Washington, D.C. 20402

| <u>TYPE</u> | <u>SPECIFICATIONS</u> |
|---|---|
| Homogeneous perforated bituminized fiber
pipe for general drainage | ASTM D 2311 |
| Homogeneous bituminized fiber pipe, testing | ASTM D 2314 |
| Laminated-wall bituminized fiber perforated
pipe for agricultural, land, and general
drainage | ASTM D 2417 |
| Laminated-wall bituminized fiber pipe,
physical testing of | ASTM D 2315 |
| Plastic drain and sewer pipe, styrene
rubber | Commercial
Standard ² |
| Perforations, if needed, are to be as
specified in Fed. Spec. SS-P-358a | CS-228 |
| Plastic drainage tubing, corrugated | refer to Specifi-
cation Guide,
page 606-12 |
| Pipe, corrugated, aluminum alloy | Federal Spec.
WW-P-402a |
| Pipe, corrugated, iron or steel, zinc coated | Federal Spec.
WW-P-00405 |

Concrete Tile - The use of concrete tile under acid and sulfate conditions shall be in accord with the following guides:

ACID SOILS

| Class of tile | <u>Lower Permissible Limits of pH Values³</u> | |
|--------------------------|--|------------------------------------|
| | Organic and Sandy
Soils | Medium and Heavy
Textured Soils |
| ASTM C 412: | | |
| Standard Quality | 6.5 | 6.0 |
| Extra Quality | 6.0 | 5.5 |
| Special Quality | 5.5 | 5.0 |
| ASTM C 114, C 118, C 444 | 5.5 | 5.0 |

Figures given represent lowest reading of pH values for soil water or soil at tile depth.

Other Clay and Concrete Pipe - Bell and spigot, tongue and groove, and otherwise which meets the strength, absorption, and other requirements of clay or concrete tile as covered above, except for minor imperfections in the bell, the spigot tongue or the groove, and ordinarily classed by the industry as "seconds" may be used for drainage conduits provided the pipe is otherwise adequate for the job.

Foundation Requirements

Soft or yielding foundations shall be stabilized where required and lines protected from settlement by adding gravel or other material to the trench, placing the conduit on plank or other rigid supports, or using long sections of perforated or watertight pipe.

Loading

The allowable loads on drain conduits shall be based on the trench and bedding conditions specified for the job. A factor of safety of not less than 1.5 shall be used in computing the maximum allowable depth of cover for a particular type of conduit. Loading requirements shall be specified in accordance with the specifications guide. To determine maximum trench depths Table 14-6 of the "Manual Concerning Field Manual of Table 4 of the Indiana Drainage Manual" may be used.

Filters and Filter Material

Portable filters shall be used around drains where recommended in the Indiana Drainage Guide, "Drainage Design Manual for Indiana Soils," to prevent sediment accumulation in the conduits.

Not less than three inches of filter material shall be used for sand-gravel filters. A recommended method of installation is to place filter material to a depth of three inches under the bedding, to cover the drain and filter with a sheet of plastic. The filter shall be designed to prevent the material from being washed into the drain from entering the drain. Not more than one inch of filter material shall be placed above.

Where filter less filter material is used, it shall be a factor of one-half the size of the material and the manufacturer of the material shall certify that it is suitable for underground use. The filter shall be of a size, with one inch of filter material, to prevent the material from being washed into the drain. The material shall be of a size to prevent the material from being washed into the drain.

Blinding Material

Top soil shaved from the side of the trench or equally friable soil shall be used to blind the ends for those soils that filters are not recommended.

Envelopes and Envelope Material

Envelopes shall be used around drains where required for proper bedding of the conduit, or where necessary to improve the characteristics of flow of ground water into the conduit.

Materials used for envelopes do not need to meet the gradation requirements of filters, but they shall not contain materials which will cause an accumulation of sediment in the conduit or render the envelope unsuitable for bedding of the conduit.

Auxiliary Structures and Drain Protection

The outlet shall be protected against erosion and undermining of the drain, against damaging periods of submergence, and against entry of rodents or other animals into the drain. A continuous section of pipe without open joints or perforations shall be used at the outlet end of the line and shall outlet above the normal elevation of low flow in the outlet ditch.

The pipe and its installation shall conform to the following requirements:

1. Where there is a hazard of burning to vegetation on the outlet ditch bank, the material from which the outlet pipe is fabricated shall be fire resistant. Where the hazard of burning is high, the outlet pipe shall be fireproof.
2. Two-thirds of the pipe shall be buried in the ditch bank and the cantilevered section shall extend beyond the toe of the ditch side slope or the side slope shall be protected from erosion. The minimum length of pipe shall be ten feet.
3. Where ice or floating debris may damage the outlet pipe, the outlet shall be recessed to the extent that the cantilevered portion of the pipe will be protected from the current in the ditch.
4. Headwalls which are used for drain outlets shall be adequate in strength and design to avoid washouts and other failures.

Conduits under roadways shall be designed to withstand the expected loads. Shallow drains through depressional areas and near outlets shall be protected against hazards of farm and other equipment, and freezing and thawing.

Function boxes shall be used where more than two main lines join.

Where surface water is to be admitted to drains, inlets shall be designed to exclude debris and prevent sediment from entering the conduit. Main lines flowing under pressure shall be designed to withstand the resulting pressures and velocity of flow. Auxiliary surface waters shall be used where feasible.

Installation

Specifications shall be in keeping with the preceding standard, shall describe the requirements for proper installation of the practice to achieve its intended purpose, and shall include consideration of the following items:

Inspection and Handling of Material

Material for drains shall be given a rigid inspection before installation. Where applicable, clay and concrete tile shall be checked for damage from freezing and thawing prior to installation. Bituminized fiber and plastic pipe and tubing shall be protected from hazards causing deformation or warping. All material shall be satisfactory for its intended use and shall meet applicable specifications and requirements.

Placement

All drains, both flexible as plastic tubing and non-flexible as clay and concrete tile, shall be laid to line and grade and covered with approved blinding, envelope, or filter material to a depth of not less than three (3) inches over the top of the drain the same day that the drain is laid. Either of the two methods below may be used.

1. Except as provided in Method 2 below, the bottom of the excavated trench shall be shaped or grooved. Flexible type drains, when placed, shall be embedded in undisturbed soil for approximately 60 degrees of their circumference. After placement of all types of drains, friable material taken from the trench spoil or cut from the trench side walls shall be placed around the drain in such a manner that it will completely surround and support the drain and fill the trench to a depth of three inches over the top of the drain. To be suitable, materials surrounding the drain must contain no hard clods, rocks, or fine materials which would cause a silting hazard in the drain.
2. When special shaping or grooving of the trench bottom is not provided to embed the drain when placed, the drain shall be laid directly upon the flat, unshaped bottom and both sides

covered with an envelope material of sufficient quantity to fill the trench to a depth of three inches over the top of the drain. Envelope material shall consist of sand-gravel material, all of which shall pass a 1-1/2 inch sieve, 90 to 100 percent shall pass the 3/4 inch sieve, and not more than 10 percent shall pass the no. 60 sieve.

When a filter is required, all openings in the drain shall be covered by the filter, or approximately the lower half of the drain is to be covered by the filter and the rest of the drain covered by a sheet of impervious plastic. No portion of the drain containing openings is to be left exposed under conditions which require the use of a filter.

When sand-gravel filter material is used, the trench shall be over excavated three inches and backfilled to grade with filter material. After placement of the drain upon the filter material, additional filter material shall be placed over the drain to fill the trench to a depth of three inches over the drain. A plastic sheet and friable soil can be used in lieu of filter material as the backfill over the drain when specified. The sand-gravel filter material shall be a mixture of sand and gravel within the limits required by the base material in the trench.

The gap between tile or other drain pipe joints shall not exceed 1/4 inch for mineral soils or 1/2 inch for organic soils. Openings wider than these, occurring on the outer side of a curve in a tile line or due to tile irregularity, shall be permitted if they are covered with broken tile, fiber glass, or other suitable material.

The upper end of each drain tile shall be capped with concrete or other durable material unless connected to a structure.

Earth backfill material shall be placed in the trench in such a manner that displacement of the drain will not occur and so that the filter and bedding material, after backfilling, will meet the requirements of the plans and specifications.

No reversals in grade of the conduit shall be permitted.

Where the conduit is to be laid in a rock trench, or where rock is exposed at the bottom of the trench, the rock shall be removed below grade enough that the trench may be backfilled, compacted, and bedded; and when completed, the conduit shall not be less than two inches from rock.

Materials specifications

All materials currently acceptable for installation as Drains are listed in the standard. The specifications for use in determination of

the physical requirements and testing of all the physical requirements and testing of all of the approved materials on pages 606-667.

Specifications for corrugated plastic drainage may be obtained from the State Conservation Engineer.

General

The installing contractor shall name the source of materials used and complete IN-229 Tile Installation Report, where applicable.

Working Tools and References

Working tools and references are to be used as guides along with local experience in planning and installing drains, except when the working of this standard indicates that they shall be used, in those cases, the specific table, figure or part referred to becomes a part of this standard.

SCS Engineering Field Manual for Conservation Practices, SCS National Engineering Handbook, Chapter 16; Drainage Farm Drainage - USDA Farmers Bulletin 2046, Subsidence of Muck Soil in Northern Indiana, SCS-366, Purdue Indiana Farm Draining Guide - Bureau.

Cost Sharing

Cost share, when planned and carried out according to the above specifications, will be 70 percent of the actual cost not to exceed 70% of the estimated cost.

Unit Price = \$.40 per lineal foot

Maximum Cost Share = \$.28 per lineal foot

Tile breathers and relief wells will be eligible for cost share when their need is certified by the responsible SCS technician. Cost share will be 70% of the actual cost not to exceed 70% of the estimated cost.

Unit Price = \$20.00 per installation

Maximum Cost Share = \$14.00 per installation

Practice is eligible for cost share when an underdrain, surface drain, or grass swale is completed and tile is installed.

NCT2: For diversion and terrace outlet systems, see Appendix 362 (Diversion) 606 and 604 (Terraces, Trenches & Gradient).

612 TREE PLANTING (Acres)

Definition

Planting tree seedlings or cuttings.

Purpose

To establish or reinforce a stand of trees to conserve soil and moisture; beautify an area; protect a watershed; or produce wood crops.

Where Applicable

In open fields, in understocked woodland, beneath less desirable tree species, or on other areas suitable for producing wood crops; where erosion control or watershed protection is needed; where greater natural beauty is wanted; or where a combination of these is desired.

Specifications

1. Plant best adapted species for a given soil and site condition to accomplish the owners planting objective.
2. Site preparation is required only on areas where very heavy sod cover is established. When planting in heavy grass areas of fescue or bluegrass, plow shallow furrows, on contour where erosion is a hazard, and plant trees in the furrows. On tree planting machines equipped with a scalper, plowing is unnecessary.
3. Areas selected for planting must be at least one-half acre in size.
4. Plantings must be protected from fire and grazing.
5. Chemicals used in performing this practice must be federally and locally registered and must be applied strictly in accordance with authorized registered uses directions on the label, and other federal or state policies and requirements.
6. Spacings for plantings:
 - a. Bare erosion and gully areas 6' x 6', 1210 per acre.

- b. Non-active erosion areas, reinforcement plantings, under-plantings for stand conversion, and reforestation of open field where weed and grass control will not be carried out. 8' x 8', 681 per acre.
- c. Hardwood plantings where grass and weed control will be carried out by use of farm machinery and/or chemicals.

| | |
|-----------|--------------------|
| 10' - 10' | 436 trees per acre |
| 12' - 12' | 304 trees per acre |
| 14' - 14' | 222 trees per acre |
| 16' - 16' | 170 trees per acre |

This variation in spacing is allowed so that trees can be spaced to fit equipment planned for use in cultivation, maintenance, etc.

- 7. This practice will further allow the addition of approved shrubs or trees to regular planting for beautification and wildlife improvement. The allowable inclusion of shrubs in plantings shall be a maximum of 100 shrub-type plants per acre of planting.

- a. Shrubs must be planted in outside rows of plantation, or along planned access roads or firebreaks through the plantation.
- b. The following trees and shrubs, in addition to those named in the "State Tree Planting Guide", are approved for Indiana use:

| | |
|----------------------|------------------|
| Dogwoods | Bush Honeysuckle |
| Redbud | Serviceberry |
| Flowering Crabapples | Bush Lespedeza |

- c. Spacing of trees and shrubs added for beautification should be 8' x 8' to allow better flowering and fruit development.
- 8. All planting of trees and shrubs in Indiana will be done in the spring of the year, preferably March, April and early May.
- 9. Any deviation of species from the attached, Tree Planting Guide or approved list for beautification must have approval of responsible technician, prior to being eligible for cost sharing.

TREE PLANTING GUIDE - Black Creek Project

| <u>Planting Groups</u> | <u>Slopes Facing NE N & E Slopes</u> | | <u>S & W Slopes</u> | | <u>S & W Slopes</u> | | <u>Windbreaks</u> |
|--|--|---|--|---|------------------------------------|------------------------------------|--|
| | <u>None to Moderate Erosion</u> | <u>Severe Erosion</u> | <u>None to Moderate Erosion</u> | <u>Severe Erosion</u> | <u>Subsoil and Parent Material</u> | <u>Subsoil and Parent Material</u> | |
| foamy soils with good root, air and water relationship. No planting restrictions except percent of slope, aspect, and erosion. (Woodland Suitability Groups 1, 2, 3, 4, & 8) | White Pine
Red Pine
Black Walnut 1/
Black Locust 2/
Tulip Tree 1/
White Ash | Red Pine
Black Locust 2/
Shortleaf Pine 1/
Scotch Pine 3/
Tupip Tree 1/
Black Walnut
White Ash 1/ | Red Pine
Black Locust 2/
White Pine
Shortleaf Pine
Tupip Tree 1/
Black Walnut
White Ash 1/ | Virginia Pine
Black Locust 2/
Jack Pine
Scotch Pine 3/
Austrian Pine 3/
E. Black Alder | | | White Pine
Norway Spruce
Red Pine
Autumn Olive
Amur Honeysuckle
Black Haw
Lilacs
Mockorange |

Examples: Miami, Ockley,
Russeli, Negley, Hennepin,
Genesee, Eel, Pope, etc.

| <u>Planting Groups</u> | <u>Slopes Facing NE N & E Slopes</u> | | <u>S & W Slopes</u> | | <u>S & W Slopes</u> | | <u>Windbreaks</u> |
|--|--|--|--|---|------------------------------------|------------------------------------|--|
| | <u>None to Moderate Erosion</u> | <u>Severe Erosion</u> | <u>None to Moderate Erosion</u> | <u>Severe Erosion</u> | <u>Subsoil and Parent Material</u> | <u>Subsoil and Parent Material</u> | |
| Soil ranging from somewhat poorly to poorly drained. Occasional ponding or over-flow and all have seasonal high water tables. (Woodland Suitability Groups 5, 11 and 13) | White Pine
Sycamore 1/
Red Maple 1/
over-White Ash 1/
Cottonwood 1/
Loblolly Pine
Bald Cypress
Sweet Gum 1/
E. Black Alder | Same throughout as slope and erosion of minor importance | Red Pine
Black Locust 2/
White Pine
Shortleaf Pine
Tupip Tree 1/
Black Walnut
White Ash 1/ | Virginia Pine
Black Locust 2/
Jack Pine
Scotch Pine 3/
Austrian Pine 3/
E. Black Alder | | | White Pine
Norway Spruce
Arborvitae
Laurel Leaf Willow
Medium Purple Willow
Gray Dogwood
Silky Dogwood |

Examples: Avonbura, Crosby,
Brookston, Clermont,
Sloan, Stendal, Wakeland, etc.

| Planting Groups | Slopes Facing NE
None to Moderate
Erosion, Some
Topsoil | N & E Slopes
Severe Erosion
Subsoil and
Parent Material | S & W Slopes
None to Mod-
erate Erosion,
Some Topsoil | S & W Slopes
Severe Erosion,
Subsoil and
Parent Material | Windbreaks
Farmstead and
Field Plantings |
|--|---|--|---|---|---|
| Sandy soils with very
low water holding cap-
acity and having a haz-
ard of wind erosion.
(Woodland Suitability
Group 17) | White Pine
Red Pine
Jack Pine
Scotch Pine 3/
Austrian Pine 3/ | Red Pine
Jack Pine | Red Pine
White Pine
Jack Pine
Scotch Pine 3/
Austrian Pine 3/ | Jack Pine
Red Pine | White Pine
Red Pine
Jack Pine
Hazelnut
Autumn Olive |

Examples: Bronson, Brems,
Centomo, Plainfield,
Tracy, Tyner, etc.

Sites consisting of
miscellaneous land
types, such as strip
mines, strip spoils,
and dumps, clay pits,
and other disturbed
lands.
(Woodland Suitability
Group 16)

Erosion cannot be mapped on these sites and
exposure is of only minor importance. Plantings
will therefore be based on pH ratings of sites:

| | | |
|---|--|--|
| pH 5.5-7.0 | pH 4.0-5.5 | pH below 4.0 |
| Sweet Gum
Tulip Tree
Black Walnut
Sycamore
Cottonwood
White Pine
U. Black Alder
Bald Cypress | Sweet Gum
E. Black Alder
Sycamore
River Birch
Jack Pine
Virginia Pine
Pitch Pine
White Pine
Bald Cypress | No planting
Delay until
leaching causes
a rise in pH
to 4.0 or
better |

White Pine
Jack Pine
Virginia Pine
(based on pH)
Autumn Olive
Amor Hureysuckle

1/ Hardwoods are recommended for undisturbed sites in wooded areas or for wide-spaced plantings in old fields where wood control can be accomplished.

2/ Fence post production only.

3/ For Christmas tree production only.

Cost-Sharing

Cost-share, when planned and established according to the above specifications, will be 30% of the actual cost involved not to exceed 30% of the estimated cost.

Where production from livestock is needed, fencing as planned and installed will be cost-shared in accordance with practice 472, Livestock Exclusion.

Plantings of over 1200 trees will be referred to the Service Forester, Division of Forestry, Indiana Department of Natural Resources for technical assistance. All hardwood tree planting request will be referred to the Service Forester.

Unit Price = \$80.00 per acre

Maximum Cost-Share Rate = \$24.00 per acre

Practice is eligible for payment when trees are planted, and protected if necessary.

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644 WILDLIFE WETLAND HABITAT MANAGEMENT (Acres)

Definition

Retaining, creating, or managing wetland habitat for wildlife.

Purpose

To preserve, create, or improve habitat for waterfowl, furbearers or other wildlife.

Where Applicable

On existing wetlands and on lands where water can be impounded or regulated by diking, ditching, or flooding.

SpecificationsFurbearers

1. Impoundments with water control structures.
 - a. Construct a water control structure that will permit water levels to be controlled from 12-36 inches.
 - b. Maintain water level at about 12 inches during the growing season to encourage the growth of cattails, bulrush, sedges, bur reed, arrowhead, and other aquatic plants useful as muskrat food.
 - c. Gradually raise water level to maximum depths, starting September 1 to make these food plants available to furbearers and prevent winter freeze out.
 - d. For types and sizes of structures required use applicable service specifications. Stop-log type of structures are recommended.
2. Impoundments without water control structures.

Construct an earth fill dam without a mechanical spillway. These are less effective than the structures described above. On such areas at freezeup time a depth of 36 inches shall cover at least 20 percent of the area. Additional shallow pits may be constructed in the

shallower parts of the impoundment. Such pits will have a minimum water depth of 36 inches.

Waterfowl

1. Shallow Water Development

Construct dikes or levees on relatively level land according to Standards and Specifications for Class III Dikes. (See Engineering Specifications - 356 for design criteria). Install a water level control which will permit sufficient drainage for crop production and permit flooding from 1 to 15 inches. A source of water shall be sufficient to maintain desired water levels.

a. Open Areas

Plant to duck food plants such as browntop millet, buckwheat, Japanese millet, soybeans, smartweeds, or corn; or utilize crop fields after harvest. Flood to a depth of 1 to 15 inches when fall duck migration begins.

b. Woodland

Create greentree reservoirs by diking wooded areas where oaks are the dominant species (pin oak is the most desirable species). Flood to a depth of 1 to 15 inches from the middle of October until March. Woodlands must be drained during the growing season to prevent injury to trees.

2. Development or Preservation of Existing Marshes or Impoundment Without Controlled Water Levels.

To provide open water areas for ducks, depth of water must be at least 3-1/2 feet deep over at least 25 percent of the area (maximum of 75 percent) to control emergent vegetation. One or more of the following methods may be used to improve water levels and provide open water.

a. Where possible in existing marshes, construct a low level dam or water control structure to impound water at least 3-1/2 feet deep over at least 25 percent of the area. See Engineering Specifications 587 and 356.

b. Construct pits or dypouts by blasting, with dragline, or by other means at rate of one to each 1 to 5 acres of marsh.

(1) Where runoff water is lacking, pits must be located where water table is normally within 2 feet of the ground surface.

- (2) Pits dependent upon runoff water shall be constructed in watersheds which will maintain desired water levels.
- (3) Construct pits with a minimum surface area of 500 sq. ft. and a maximum of 5,000 sq. ft. Depth shall be at least 3-1/2 ft. over at least 75% of the area.
- (4) Twenty-five percent of shoreline shall have a slope of 5:1 or flatter.

c. Construct level ditches according to the following specifications:

- (1) Ditches will be constructed without grade where ground water levels will permit maintaining a water depth of 3-1/2 to 4 feet.
- (2) Ditches will have a minimum bottom width of 4 feet with side slopes no flatter than 2:1. Side slopes of 1:1 will be permissible in peat or muck soils.
- (3) Ditches should be parallel and, if possible, at right angles to prevailing wind. Parallel ditches will be spaced from 100 - 400 feet apart with optimum spacing of 200 feet.
- (4) Excavated material will be deposited on alternate sides of the ditch, staggering the spoil bank at approximately 50 feet intervals. The spoil bank will not be leveled. A berm at least 10 feet in width shall be left between the edge of the ditch and the toe of the spoil. Spoil and berm will be seeded to adapted grasses and legumes. See Standard of Critical Area Planting.

d. Where none of these methods is practicable, maintain existing wetlands by:

- (1) Protecting from fire or grazing.
- (2) Control unwanted woody or other vegetation by mowing, cutting, use of herbicides or other means.

3. Islands for loafing, nesting, resting, or duck blinds.

May be constructed at rate of 1 island per 7 to 8 acres of ponded area.

- a. Minimum size - 20 feet diameter with a vertical height no less than 2 feet above the water level.
- b. Seed to adapted grasses and legumes. See Standard of Critical Area Planting.

- c. Twenty-five percent of shorelines will be sloped 5:1 or flatter.

4. Loafing sites

Three sites per surface acre of water are recommended. In shallow water, provide firm objects such as rocks or bales of hay or straw. In deep water, anchored floating logs or rafts (4'x4') may be used.

Cost Sharing

Cost sharing when the practice is planned and established according to the above specifications will be as follows:

a. Impoundments for furbearers

(1) Impoundments with water control structures:

Cost share will be 70 percent of the actual cost of earth moving and structural measures not to exceed 70% of the estimated cost. Design and installation must meet the technical approval of both the engineer and biologist.

Unit Price = \$800.00 per acre

Maximum Cost Share = \$560.00 per acre of impounded area

(2) Impoundments without water control structures

Cost share will be 70 percent of the actual cost of construction not to exceed 70 percent of the estimated cost. Design and installation must meet the technical approval of the engineer and biologist.

Unit Price = \$400.00 per acre

Maximum Cost Share = \$280.00 per acre of impounded surface area

b. Development for waterfowl

(1) Shallow water development

a. Earth moving and structural works

Cost share will be 70 percent of the actual cost of earth moving and structural measures not to exceed 70 percent of the estimated cost.

Unit Price = \$800.00 per acre

Maximum Cost Share = \$560.00 per acre

b. Food planting following water development

Cost share for wildlife food plantings following water development will be 70 percent of the average cost of \$50.00 per acre.

Unit Price = \$50.00 per acre

Maximum Cost Share = \$35.00 per acre

(2) Development or preservation of existing marshes or impoundments without controlled water levels

Cost share will be 70 percent of the actual cost not to exceed 70 percent of the estimated cost.

Unit Price = \$300.00 per acre

Maximum Cost Share = \$210.00 per acre of marshland developed or impounded

(3) Islands

Islands will be cost shared at 70 percent of the actual cost involved not to exceed 70 percent of the estimated cost.

Unit Price = \$50.00 per acre

Maximum Cost Share = \$35.00 per acre of ponded area served

Practices are eligible for payment when the work is completed.

645 QUALITY PLAN - CROWN WATERSHED (Acres)

Definition

Retaining, creating, or enhancing wildlife habitat other than wetland.

Purpose

To preserve, establish or improve habitat for desired kinds of wildlife. Wildlife includes both game and non-game species.

Where Applicable

On sites (other than wetland) that are suitable for desired kinds of wildlife food or cover plants and that can be protected from fire and grazing. Wetland wildlife habitat management may be applicable on any capability subclass depending upon the decision of the land use decision maker. It will include one or more of the following, but is not limited to:

1. The 4' foot border of wetland next to open areas such as fields, highways, and open water areas. The grazing of wetland borders or borders lands.
2. Field corners, field edges, wind breaks, escape routes, small pieces of land that cannot be completely covered, inaccessible odd areas, roadways, road ditches, water courses, open drainage ditches and laterals, utility, and in other areas. Habitat will be crop and field borders may be grazed less than after August, or earlier grazing not oftener than one year out of three.
3. Areas adjacent to water bodies, wetlands, forested areas, etc., along ditch lines, roads, and other areas.
4. Conversion of cropland to wildlife habitat as a result of land-use change from cropland.

Grasslands

1. Cottonwood, willow, blackberry, and sedge beds

1.1. For the purpose of this plan:

- 1.1.1. Cottonwood, willow, blackberry, and sedge beds are considered as wetlands for the purpose of this plan.

Nesting cover especially needed in land resource areas which are predominately cultivated or forest woodland.

- b. Use any adapted mixture of grasses and/or legumes and allow some native species to volunteer. A timothy-clover mixture is recommended if site is suitable. Follow establishment procedures in Pasture and Hayland Planting Specifications or Critical Area Planting Specifications. Mow about one-third (1/3) of the sod areas each year. Rotate so total area is covered every three years. Mow after August 1 to control brush, and to provide both short and tall herbaceous cover for fall and winter use.

2. Woody Cover and Travel Lanes

- a. Retain existing brushy areas and hedgerows on up to 20 percent of the total land area. Such woody cover can be improved by cutting trees over two (2) inches in diameter and retaining shrubs, briars, and vines.
- b. In established woodlands leave trees, shrubs or vines within the 40-foot border of the woodland next to open land except mature merchantable trees. When mature trees are harvested, leave tops and limbs to form a loose brush pile.
- c. Establish single or double row of shrubs at field edges or divisions along ditch banks or wherever travel lanes are needed. Use to divide fields 40 acres in size or larger. Plant adapted shrubs. See specifications for Hedgerow Planting for species and spacing.
- d. Plant clumps of conifers or shrubs in fence corners, odd areas, around ponds, or adjacent to food or nesting cover. (For the tree, shrub, and soils information, see Woodland Technical Note #6 - Planting Guide for Trees and Shrubs for Outdoor Living).
- e. Food

Waste grain from croplands located near suitable cover usually supply needed food. Otherwise, establish food plots or strips near woody cover at least 1/8 acre in size using corn, wheat, sorghum, sorghum, millet, buckwheat, or mixture of these. Rotate food plots and allow to lie fallow and seed again with adapted, overseed with berries or other small seed plants.

3. Converting Cropland to Wildlife Land

- a. Prepare a surface seeded and lime and fertilize as needed.
- b. Establish alternate strips of short and tall herbaceous cover laid out across the slope on or near the contour. Strips of short cover should be about 50 to 100 feet wide, and tall cover about 25 to 50 feet wide. Use grass-legume mixtures where possible, and allow some native species to volunteer.
- c. Mow selectively only as needed to control noxious weeds and unwanted woody species. Flushing strips may be mown annually for hunting. Avoid mowing all the field at one cutting. Mow only as needed and then alternating strips on a two or three year interval.
- d. Larger fields should include some strips of row crops such as corn or sorghum for summer loafing, dusting, and drying; and for winter food.
- e. Some woody cover should be available or established in the form of clumps, blocks, hedgerows, fencerows or woodland edge.

B. Songbirds

The Item A. specifications above are good for songbird habitat in a rural landscape. Songbirds can be attracted to homesites by tree and shrub plantings. Plan a diversity of plant forms, food producers, and shelter plants. Small lawns may limit choice to single specimen plants to get the variety preferred by birds. Locate some food producers where they can be observed from a window, patio, or terrace. Choose a variety of plants including some reported to have medium or higher "bird use" for best results. Also choose a few for length of "months in fruit." Some attractive food producers are grouped below by rate of "bird use", and secondly they are listed (within groups) according to their availability from nurseries.

| <u>SHRUB NAME</u> | <u>MONTHS IN FRUIT</u> | <u>BIRD USE</u> |
|-----------------------|------------------------|-----------------|
| Cardinal Autumn Olive | Sept. - Feb. (6) | Heavy |
| Gray-Stemmed Dogwood | Aug. - Nov. (4) | Heavy |
| Flowering Dogwood | Sept. - Feb. (6) | heavy |
| Elderberry | Aug. - Oct. (3) | Heavy (very) |
| Crabapple | Sept. - Apr. (8) | Medium |
| Washington Hawthorne | Sept. - May (9) | Medium |
| Black Haw | Aug. - Mar. (8) | Medium |
| Highbush Cranberry | Sept. - May. (9) | Light |
| Firethorn | Sept. - May. (9) | Light |
| Sumac | Sept. - May. (9) | Light |

C. Pinniped, White-throated and Marbled Partridge

1. Nesting cover

Use as specified above, except a clover-prairie-alfalfa mixture is recommended where soils are suitable.

2. Winter Cover and Travel Lanes

Retain existing brushy areas, marshlands, and existing hedgerows. Establish a single or double row of shrubs or conifers in field edges, along ditch banks, or whenever winter cover or travel lanes are needed. See specification for Hedgerow Planting for spacing. Use adapted species such as red pine, white pine, red cedar, Norway spruce, gray or silky dogwood, autumn olive, japonica lespedeza, or arbutus honeysuckle. Multiflora rose is a good wildlife plant and may be used when surrounded by intensively managed lands such as cropland and where the plant will be managed to control volunteer plants.

3. Food

Plant food plots near winter cover at least 1/4 acre in size using corn, wheat, sorghum, buckwheat, millet, or soybeans. Food plots may lie fallow 2nd and 3rd year. Use appropriate cultural practices in seedbed preparation and seeding.

D. White-tailed Deer and Ruffed Grouse

1. Cover

Deer and Grouse are considered woodland species. Normal woodland practices such as harvest cutting on a rotation basis, fire protection and livestock exclusion usually provide adequate cover.

2. Food

a. Manage woodlands to favor oaks and fruit-bearing trees, shrubs and vines such as dogwood, persimmon, crabapple, hawthorne, viburnums, smilax, and wild grape. Encourage shoot and sprout growth in woodland edges.

b. Plant trails and openings to ladino clover, Korean lespedeza, or other adapted legumes; or encourage and maintain native grasses and forbs.

c. Leave corn unharvested or plant corn or food plots at least 1/4 acre in size near woody cover.

3. Water

Develop springs or seeps; or build water holes or small ponds. See specification for Wildlife Watering Facility.

E. Squirrels

1. Food

Manage woodlands to favor oaks, hickories, beech, and other fruit or mast producing trees and shrubs. Leave unharvested corn or plant corn in food plots at least 1/4 acre in size near woodland edges or fencerows. This is especially important in years of poor mast production.

2. Den Sites

Where den sites are not available, place den boxes in trees at a height of at least 20 feet above the ground to furnish 2-3 dens per acre of woodland. Use natural material such as slabwood.

F. Other Factors to Consider

1. Strive for interspersed, edge, and diversity.
2. The greater the diversity of the environment and the more stable the ecosystem.
3. Most other native upland birds and mammals, respond favorably to the practices described above.

Cost Sharing

Cost share, when established according to the above specifications, will be as follows:

1. Nesting Cover - Herbaceous

Cost share for establishing grassy and/or herbaceous cover on lands planned for wildlife use for nesting cover will be 65% of the estimated average cost of \$70.00 per acre for the net acres seeded.

Unit Price = \$70.00 per acre

Maximum Cost-Share Rate = \$45.50 per acre

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2. Woody Cover and Travel Lanes

Cost share for establishing a single or double row of shrubs will be 50% of the actual cost involved not to exceed 65% of the estimated cost.

Unit Price = \$80.00 per acre

Maximum Cost Share = \$52.00 per acre

3. Clump Plantings

Cost share for clump plantings of conifers or shrubs will be 65% of the actual cost involved not to exceed 65% of the estimated cost.

Unit Price = \$80.00 per net acres planted

Maximum Cost Share = \$52.00 per acre

4. Food Plots

Cost share for establishing food plots will be 65% of the average cost of \$70.00 per acre. Cost share will be based on net acres of food plots established.

Unit Price = \$70.00 per acre

Maximum Cost Share = \$45.50 per acre

5. Converting Cropland to Wildlife Land

Cost share will be 80% of the estimated average cost of \$70.00 per acre.

Unit Price = \$70.00 per acre

Maximum Cost Share = \$56.00 per acre

When protection from livestock is needed for lands planned for wildlife use, fencing as planned and installed will be cost shared in accordance with practice 472 Livestock Exclusion.

Practice will be eligible for payment when area is seeded or trees and shrubs are planted and protected, where needed.

to the forest land.

Selection

Systematically removing some of the merchantable trees from the stand in such a way as to encourage the regeneration of desirable species.

Harvest

harvesting mature crop trees in such a way as to encourage the regeneration of desirable species.

to harvest some of the merchantable trees from the mature stand in such a way as to improve the conditions for forest growth and/or harvest trees in such a manner that encourages the regeneration and normal development of a new stand.

cutting in immature plantation in such a way as to improve the growing conditions for remaining trees.

When Applicable

Where the size, size, species, and condition of the forest land make it feasible for planned and systematic harvesting in such a way as to encourage the regeneration of desirable species and/or to improve the growth and/or harvest of trees in the stand.

where adequate protection from fire and insect damage can be provided for remaining trees and future regeneration.

Restrictions

This practice will not be used in such a way as to cause damage to the forest land or to the health of the forest.

This practice will not be used in such a way as to cause damage to the forest land or to the health of the forest.

A copy of this plan should be kept in the office of the Forest Ranger for the district in which the land is located.

Study Area
Specifications
SWCI

to
of

the following:

most species

the type of material would be of a
type for permanent use, and cross-
the material

the following:

the type of material, or veneer, log size.

the type of material, or veneer, log size.

the type of material, or veneer, log size.

4. the type of material, or veneer, log size.

a. the type of material, or veneer, log size.

b. the type of material, or veneer, log size.

the type of material, or veneer, log size.

i. the type of material, or veneer, log size.

ii. the type of material, or veneer, log size.

the type of material, or veneer, log size.

the type of material, or veneer, log size.

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656 WOODLAND IMPROVEMENT (Trees)

Definition

Improving woodland by removing unmerchantable or unwanted trees, shrubs, or vines.

Purpose

To fully use the potential of a site; to maintain plant cover for soil protection; to improve stand composition by leaving the best trees, spaced for best growth; or to improve the natural beauty, wildlife, or recreation values of the area.

Where Applicable

In a woodland where a stand of trees is overstocked or where desirable trees are being crowded by less desirable trees, shrubs or vines; to improve future crop tree quality and maintain maximum growth rate; to maintain the natural beauty, wildlife, aesthetic, or hydrologic values of an area.

This practice should be applied only on sites of known, high potential for woods crop production. (Site - index of over 70.)

Specifications

Remove or deaden the hollow, deformed, fire-damaged, natural over-mature or undesirable trees, shrubs or vines. (This may be accomplished by cutting, girdling, or use of chemicals. Chemicals used in performing this practice must be federally and locally registered and must be applied strictly in accordance with authorized registered use, directions on the label, and other federal or state policies and requirements.)

This practice also includes the removal of low value species to favor high quality trees. Commercial value and local abundance of what species are considered of low value will vary by region.

In locating thinning plots, a 40-foot by 40-foot area should be located in fields, meadows, or open water areas to determine the need for woodland improvement. This area will provide a basis for determining the best

the woodland; serve as an excellent food and shelter for wildlife, and contribute to the beauty of the community. Plants such as dogwood, redbud, viburnums, black curr, sugar maple, serviceberry, cassiafras, sumac, virginia creeper, bittersweet, etc., should be encouraged in the woods border area.

The cutting or killing of vines should be accomplished where vines are interfering with growth of trees having commercial value. Some vines have high wildlife value and should not be removed from dead, cull trees, and ones being chemically killed.

This practice may also include the removal of heavy shrub cover in present woodland openings or in openings created by harvest cutting, when the shrubs seriously compete with desirable reproduction. This involves species such as hawthorne, spice bush, paw-paw, prickly ash, hercules club, etc.

Caution:

If herbicides are handled or applied improperly or if unused portions are not disposed of safely, they may be injurious to humans, domestic animals, desirable plants, fish, or other wildlife, and they may contaminate nearby crops, and other vegetation. Follow directions and heed all precautions listed on the container label.

Cost-Sharing

Cost-sharing will be 80 percent of the average cost of \$20.00 per acre when performed according to the above specifications and according to the recommendation of the Service Forester, Division of Forestry, Indiana Department of Natural Resources.

Unit Price = \$20.00 per acre

Maximum Cost-Share Rate = \$16.00 per acre

Practice is eligible for cost-share when all recommended T.S.I. work is completed.

660 WOODLAND PRUNING (Acres)

Definition

Removing all or parts of selected branches from trees.

Purpose

To improve the quality of the wood product or the appearance of trees.

Where Applicable

On lands growing trees where the quality of the final product and the potential of the site justify the cost.

Specifications

A. Pruning to improve quality of butt logs.

1. Species

- a. Black walnut, white pine, and red pine should be pruned when grown in natural stands of plantations.
- b. Tulip poplar, shortleaf, and loblolly pine in fully stocked stands do a good job of natural pruning, and should not be recommended for this practice.
- c. Pole-size quality hardwoods may be approved for pruning by the Service Forester.

2. Tree Pruning

- a. Do not prune all trees. Select straightest and tallest crop trees with 3 to 7 inches D.B.H.
- b. At first pruning, remove branches from the lower 1/2 of the tree.
- c. After initial pruning, do not remove over 1/3 of live crown in any subsequent operation. Continue at 2 to 3 year intervals until 17 foot of clear length has been pruned.

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- d. All limbs removed should be cut with a saw, and cut made flush with trunk.
- e. Pruning on pines can be performed at any time of the year without damage to the tree. Recommended time is October, November, and early December, as market exists for boughs at this time.

Cost Sharing

Cost sharing, will be 80% of the actual cost not to exceed 80% of the estimated cost, when performed according to the above specifications and according to recommendations of the Service Forester.

Unit Price = \$30.00 per acre

Maximum Cost Share = \$24.00 per acre

Practice is eligible when all recommended pruning work is completed.

June 1973

SOIL AND WATER CONSERVATION RESEARCH WITH THE RAINULATOR*

by

L. Donald Meyer and Jerry W. Wannerline**

The development of runoff and erosion control principles and techniques requires an understanding of many relevant factors such as soil, slope, crops and management. The rainulator, a field-plot rainfall simulator, is a research tool which is used to supplement soil and water conservation investigations with natural rainfall.

Background

Current erosion control methods for agricultural lands are largely based on research results from runoff plots and watersheds. Treatments are subjected to natural rainfall for periods of sufficient length to obtain representative samplings of rainfall patterns. Such studies have affected major advances toward a better understanding and evaluation of the soil and water conservation features of many land-use conditions. Many other conditions for which information is needed have not been studied because of the cost and time involved and the unlikelihood that conclusive results could be obtained for less than 10 to 20 years after initiation.

With rainfall simulators, runoff and erosion research information can be obtained more rapidly and efficiently. Various types have been developed (see discussion in References 3 and 4), but most were developed primarily for infiltration studies. No readily portable designs were found which were well suited for conventional-sized runoff plots and capable of producing drop characteristics closely approaching those of intense natural rainfall. The rainulator resulted from an investigation to develop an apparatus with the above properties plus other features which are desirable for soil and water conservation research.

Rainulator Design

The design of the rainulator was preceded by an extensive investigation of past rainfall simulators and tests of various types of possible methods and equipment, (2). The selected method for producing simulated raindrops includes flat-type spray nozzles which spray downward from a height of 8 feet as they move across the plots. The flow of water to

* Contribution from the Soil and Water Conservation Research Division, Agricultural Research Service, U.S. Department of Agriculture, in cooperation with the Purdue Agricultural Experiment Station, Journal Series Paper No. 1619.

** Agricultural Engineer and Soil Scientist, respectively, ARS, Lafayette, Indiana.

number of nozzles which spray intermittently is controlled by a solid piston. The valves are activated by a system of relays and solenoids and are powered by an automobile battery. The intensity and duration of the simulated rain may be varied by changing the portion of the time the nozzles are sprayed or the size of nozzle used. The present design applies intensities of approximately 2" or 3 inches per hour at approximately 80 percent of the kinetic energy of intense natural rainfall. Accurate reproducibility of simulated storms is possible. Moderate wind velocities do not seriously affect rainulator characteristics.

The rainulator was designed in units so that the number and length of plots covered simultaneously could be varied. Plots which are most commonly used are 15 or 12 feet wide by 35 or 75 feet long with borders between plots which are 6 to 8 feet wide. A small irrigation pump supplies water through portable aluminum pipe to the rainulator with a pressure of 40 psi at the flow rate required.

The rainulator does not embody the mechanical simplicity which was initially anticipated for it. Necessarily, some relatively complex components were used rather than sacrifice desired characteristics. Also, intermittent spraying of the nozzles was necessary in preference to much lower rates of kinetic energy or much greater application intensities. Close observation of this intermittency of application has not indicated undesirable effects.

All rainulator components were designed for rapid assembly and ease of transportation. Weight and corrosion were minimized by using aluminum wherever possible. Associated equipment is also completely portable and readily assembled.

Operation

During a rainulator study, each plot is subjected to a series of simulated storms, or runs. These are applied at desired periods and are of selected duration corresponding to storms with high recurrence intervals. The series of runs most commonly used are a 60 minute "dry" run at the existing moisture condition, a 30 minute "wet" run approximately 24 hours later, and a 30 minute "very wet" run beginning 15 minutes after the end of the wet run. The intensity of 2 1/2 inches per hour is used throughout the three runs. This series of run covers a wide range of moisture conditions, is efficient to apply, and can be accurately reproduced on other treatments or studies. Based on existing information, combinations of intensities offer no known important advantage for most studies.

The water applied during rainulator runs is determined by samples from small aluminum channels placed diagonally across each plot. Runoff is recorded by a water level recorder on a small calibrated form. The soil content of the runoff is determined from samples of the runoff which are periodically collected by a sampling slot on a small rotating wheel. Photographs of each plot are taken prior to each study and at other appropriate times for later reference concerning conditions not noted at the time of the runs.

[illegible]

are required for studies are conducted on test blocks which fulfill the soil, crop, management, and topographic requirements of the experiment. Flats which were established for yield or other types of comparisons and which are also suitable for rainfall application are sometimes available. In such cases, much of the time and expense of operation are for a long period to attain the required study condition is saved.

Controlled experiments can be replicated on soil conditions which vary spatially, temporally and geomorphically and therefore are not limited to conditions available at field research stations. Where treatments are compared at different geomorphical locations, identical rainulator treatments are applied at each location and performing of the treatments with the same patterns of natural rainfall is eliminated.

The twelve manipulator units which are presently in use in Indiana will allow the plots which are each 75 feet long on six plots which are 10 feet wide. The shorter length reduces the time and water required for each series of runs. Use of the shorter plots also permits the completion of six plots within a few hours. Such use is particularly advantageous for comparison of up to 6 treatments. For this procedure, units are available to cover all treatments of one replication, manipulator units are taken on large plots simultaneously, a few manipulator components are moved, and runs are made on the remaining plots. This procedure is available for the other replications. With plots longer than 35 feet, more than three treatments may be compared during the same run with the present equipment.

A group of four persons is required for most efficient operation of the simulator.

Although complete infiltration data is obtained during rainulator runs, the recognition that the rainulator was designed primarily to study erosion and not infiltration is very important. When the study of infiltration is the only objective, other devices are available which will produce results of comparable accuracy with less effort. However, such devices are not well suited for accurate erosion measurement. Erosion studies require the application of high energy water for a sufficient length of time to dislodge enough flowing water to permit a readily transmittable profile of soil particles. The rainulator was developed for such applications.

Research Results

Each series of rainulator runs produces a large amount of data. The collected data is analyzed during the period of the year when rainulator runs cannot be conducted. The results are used to determine primarily the rates and amounts of soil loss, infiltration, and runoff during each run. Various other characteristics can also be studied.

Certain types of studies are better suited than others for rainulator research. Studies of residue management, relative erodiability of soil types, methods of tillage, crop sequences, and rainstorm energy and intensity effects can be studied effectively. Other studies such as those involving freezing temperatures or tall crops are less suited due to simulator or treatment characteristics.

Numerous studies have been conducted using simulated storms applied by the rainulator, and important research information has been obtained. Brief summaries of some of the investigations follow.

A detailed study of the various methods of minimum tillage (plow-plant with and without smoothing and plow, wheel-track plant), as compared to conventional tillage (5) was initiated in 1959. Results from runs during the initial year indicated that minimum tillage for corn increased the amount of infiltration by 50 percent shortly after planting, by 20 percent after the first cultivation, and by 10 percent at harvest time. The minimum tillage treatments had higher infiltration rates throughout all runs. Minimum tillage also reduced the soil loss by 35 to 50 percent during each of the above periods. Soil losses at harvest were relatively minor as compared to losses at the earlier crop stages. Differences between the various minimum tillage treatments were not significant during the initial year. Cultivating the minimum tillage treatments twice as compared to no cultivation was also studied. The cultivations eliminated severe surface crusts, greatly increased the infiltration, and significantly reduced the soil loss. This study will be continued for a total of five successive years of corn.

In another study, erosion from cornstalks as left by a picker and from shredded cornstalks (1) were compared. The shredded stalks reduced erosion from the intense storms by 60 percent. Disking of the shredded stalks increased the amount of infiltration, but soil loss was greater than from the shredded-only treatment.

Other rainulator studies have indicated that (1) deep tillage is ineffective in reducing erosion when the channels are not kept open to the surface, (2) a small amount of surface mulch greatly decreases erosion, (3) the erodibility of some soils is affected more by management than by soil type, (4) the first year of corn in a rotation produces less erosion than the second year of corn in the same rotation, (5) erosion from row crops following bromegrass is less than erosion from row crops following alfalfa for the first 2 or 3 years, and (6) benefits from previous meadow crops are insignificant after 2 or 3 years of row crops. More detailed information will be obtained from further study of these and other characteristics.

Efficient utilization of the rainfall resources of the soil over selected periods instead of throughout the period of rainfall action. Simulator results will be of additional value if they can be applied directly in an universal soil-loss prediction equation (3). Therefore, methods by which simulator results can be related to natural rainfall patterns and long-term runoff loss studies are being investigated. Some of the respective erosion factors (4) and the relative losses from different erions (5) show the best promise. Results from studies of effects of factors such as soil composition and land slope are expected to be available and adapted for direct use in a prediction equation.

In addition to the original simulator in Iowa, simulators are now in operation at Agricultural Research Service stations in Georgia and Minnesota and are in various stages of development at other locations. The simulated rainfall approach to runoff analysis and investigations promises to provide a wealth of information concerning the soil and water conservation merits of many land use conditions. The results are also obtained in a much shorter time period than those dependent upon natural rainfall.

Literature Cited

1. MANNING, J.V. and L.P. "EYB", The effects of different methods of Cornstalk Residue Management on Runoff and Erosion as Estimated by Simulated Rainfall. (To be presented at 1961 Annual Meeting, Am. Soc. of Agronomy, Chicago, Ill. and submitted for publication.)
2. "EYB", L. DONALD, An Investigation of Methods of Simulating Rainfall on Standard Runoff Plots and a Study of the Influence of Velocity and Kinetic Energy of Selected Spray Nozzles. Report No. 31, Eastern Soil and Water Management Project, ARS, Agricultural Research Service, USDA, May, 1956. (Unpublished.)
3. "EYB", L. DONALD, Use of the Simulator for Runoff Plot Research. Soil Sci. Soc. Amer. Proc. (In Motion for publication, 1960.)
4. "EYB", L. DONALD and D.B. MOFFAT, Rainfall Characteristics on Runoff Plots. Agr. Eng. 39: 694-699, 1958.
5. "EYB", L. DONALD and HELEN H. MANNING, The Effects of Winter Tillage for Corn and Subsequent Simulation on Soil Erosion and Product. Agr. Eng. (In Press for publication.)
6. MANNING, J.V., A Rainfall Simulator for Agricultural Research and Education. Soil Sci. Soc. Trans. 24: 1-10, 1959.
7. MANNING, J.V., The Influence of Soil Type and Slope on the Rate of Rainfall Soil-Loss Erosion. Soil Sci. Soc. Trans. 24: 11-16, 1959.
8. MANNING, J.V., W.H. MANNING, and J.V. MANNING, The Influence of Rainfall on the Rate of Soil-Loss Erosion. Soil Sci. Soc. Trans. 24: 17-22, 1959.

The first part of the study was devoted to the development of a method for the measurement of the rate of infiltration of water into the soil. This was done by means of a series of experiments in which the rate of infiltration was measured under various conditions of soil moisture and of the rate of application of water.

In order to obtain a more accurate estimate of the rate of infiltration, a series of experiments were conducted in which the rate of infiltration was measured under various conditions of soil moisture and of the rate of application of water. The results of these experiments are given in Table I.

The second part of the study was devoted to the measurement of the rate of infiltration of water into the soil. This was done by means of a series of experiments in which the rate of infiltration was measured under various conditions of soil moisture and of the rate of application of water.

The results of these experiments are given in Table I. The rate of infiltration was found to be a function of the rate of application of water and of the soil moisture. The rate of infiltration was found to be a function of the rate of application of water and of the soil moisture.

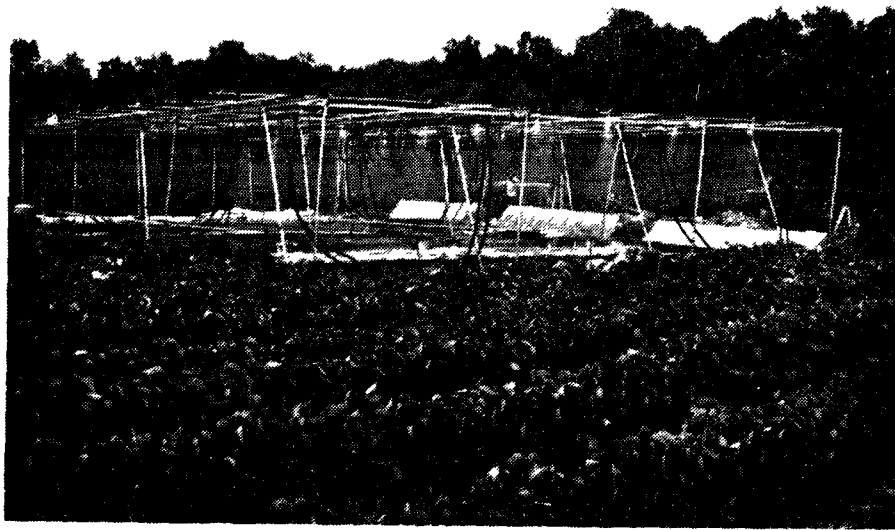


FIGURE 1. EXPERIMENTAL ENCLOSURE

" " " " " " " "

Incorporating herbicide and insecticide in the 8-inch strip provides good pest control in the row. However, chemical weed control between the rows has sometimes been poor. Some farmers use the rotary machine for full-width tillage, but this increases power requirements and erosion hazards. Volunteer corn and cumbersome turning when pulling a planter are problems in some fields.

Wide-Strip Tillage (Till-Plant System)

Planting in a pre-formed ridge with the till-plant system allows earlier planting than other no-plow systems. Soil in the ridge dries out and reaches germinating temperature ahead of non-plowed soils with a level surface profile. Our 1968 experiments show excellent stands for the till-plant system on all soils. Chemical weed control has been good with this system. Erosion control potential is excellent when ridges go across slopes.

We have noted some difficulty in keeping the disc hillier-type cultivator centered between rows when forming ridges. Other types of cultivators might be more successful when soils are cloddy.

Narrow-Strip Tillage or "No-Till" Planting

Use of the fluted coulter to till a 2.5 inch strip for each row allows early rapid planting with low power requirements. Per cent stand, plant growth, and weed control, however, have often been less satisfactory than with conventional tillage. Using a disc ahead of the "no-till" planter should help to incorporate residues and chemicals but may not solve the weed control problems. One hundred to 200 pounds of extra weight per row on the planter aids penetration of the coulters in dense soil and should improve stand.

This system, with residues left on the surface, cuts soil loss to a minimum, but may provide poor water intake due to the compacted surface on medium-textured soils.

Research at the Purdue Agronomy Farm at Lafayette has shown that corn root growth in the compact soil resulting from 6 years of "no-till" planting was severely reduced compared to corn roots with conventional tillage. The effects of the smaller root system on fertilizer and water uptake by the corn plants are now being studied.

General Comments

Few problems were encountered with all no-plow tillage systems on lighter soils such as sandy loams. On heavier soils, better management and some equipment adaptations may be necessary to control weeds, produce adequate stands and maintain yield potential.

Purdue research indicates that surface-applied phosphorus and potassium remained in the top two inches and potassium remained in the top two inches of soil after six years of no tillage. Such methods as chiseling, rotary tillage, ridgeing and discing offer some incorporating

to about four inches, but far less than deep plowing. This indicates that soils which are low in fertility should be built up to a medium or high soil test level before switching to shallow tillage.

Soil testing in non-plowed fields should separately represent tilled and untilled portions of the soil profile. Depletion of phosphorus or potassium in the major part of the root zone may indicate the need for periodic plowing.

In the long run, questions concerning insect and disease problems, fertilizer placement, and the effect of soil density on root development must be answered to properly evaluate the no-plow systems.

Section Ten

EXHIBITS



Wake Conservation District

Executive Park, Suite 103 2010 Inwood Drive
422-3373 or 422-6131, Ext. 100

COOPERATOR-DISTRICT AGREEMENT MILLEN COUNTY SOIL CONSERVATION DISTRICT

SUPERVISORS

EDWARD E. BODEN
1200 ... Road
Ft. ... Indiana 46509
C...

...
...
...
... 46741
VICE ...

...
...
...
... Indiana 46808
SEC...

...
...
...
... Indiana 46774
ME...

...
...
...
... Indiana 46809
ME...

ASSOCIATE MEMBERS

...
...
... Indiana 46773

...
...
... Indiana 46797

TECHNICAL PERSONNEL

...
...
...

...
...
... EXT 160

...
...
... EXT 160

...

I desire to cooperate with the Milen County Soil Conservation District in achieving its soil and water conservation objectives.

I further desire to become a cooperator in the district's Conservation Study Program. I therefore, request assistance that will help in making land use and treatment decisions where needed and/or in determining the conservation practices needed on my land.

I desire to develop a conservation plan on my land with assistance from the Soil Conservationist available from the district. This conservation plan will spell out the financial assistance that will be available to me for the installation of the practices until the end of the program period (fiscal 1977).

The conservation plan will not constitute a contract between the cooperator and the district. This conservation plan does not require me to take part in the cost-sharing program nor does it obligate the district to furnish cost-sharing to the cooperator.

In order to receive cost-sharing on practices identified in the conservation plan further negotiations between the district and me will be needed to enter into a legal contract for cost-sharing.

I will grant district representatives the right to access and egress to my land during the period of this agreement, for the purpose of conducting surveys, and planning, installing and inspecting applied conservation practices.

I understand the help I receive will be dependent on the ability of the district to supply the services. These services include such items as soil survey maps and interpretations, and technical assistance for planning, applying and maintaining conservation practices.

Neither the District nor I will be liable for damages to the other except for those caused by negligence or misconduct.

This cooperative agreement will be for the initial period through October 1977 following signature by both parties and continue in effect until I or the district cancels by giving sixty (60) days notice in writing, or in connection with the property terminate.

...

...

...

OR

...

...

...

...

...

PHONE

...



Allen County Soil & Water Conservation District

Executive Park Suite 103 - 2010 Inwood Drive Fort Wayne, Indiana 46805
422-3273 or 422-6131, Ext 160

GROUP COOPERATOR DISTRICT AND INDIVIDUAL BLACK CREEK SEWAGE TREATMENT PLANT

STATE OF INDIANA

FILE NO.

I desire to cooperate with the Allen County Soil and Water Conservation District in achieving its soil and water conservation objectives as a community

Our group desires to become a cooperator in the District Black Creek Sewage Treatment Plant and, requests assistance that will help in making land use and treatment decisions where needed and/or in applying and maintaining conservation practices needed on our lands.

We desire to develop a conservation plan on our land with assistance from the Soil Conservationist available from the District. This conservation plan will include the conservation practices needed on our land and will be subject to the amount of financial assistance that will be available to our group for the installation of the practices until the end of the program period (October 1977).

The conservation plan will not constitute a contract between the group and the District. This conservation plan does not require the group to participate in the cost-sharing program nor does it obligate the District to provide cost-sharing to the group.

In order to receive cost-sharing on practices identified in the conservation plan further negotiations between the District and the group will be required to enter into a legal contract for cost-sharing.

We will grant district representatives the right to enter and access to our land during the period of this agreement, for the purpose of conducting surveys, and planning, installing and inspecting and maintaining conservation practices.

We understand that the help received will be dependent on the ability of the District to supply the services. These services include conducting surveys, and interceptions, and technical assistance in applying and maintaining conservation practices.

Neither the District nor the group will be liable for damages or losses except those caused by negligence or misconduct.

This cooperative agreement will be for the period ending October 1977 following signature by both parties and continues in effect until the group or the district cancels by giving sixty days notice in writing or by connection with the property termination.

COOPERATOR

DISTRICT

DATE

DATE

OPERATING UNIT NUMBER

Technical Approval:

0702

BLACK CREEK SEDIMENT STUDY PROJECT

COUNTY ()

Part I - Cooperator

Name _____

Address _____

Contract No. _____

Acres in _____

Section _____

Contract period from _____ to _____

Operating Unit Number _____

Part II - Terms and Conditions

The undersigned and above-named cooperators hereby agree to participate in the Black Creek Sediment Study Project and fully understands that his participation herein is subject to all the provisions of this contract. He hereby agrees to carry out, on the operating unit described in Part I, hereof, land use, illustrative, conservation cropping systems, and conservation measures in conforming with and as shown on the attached plan of operations. The said plan of operations is hereby made a part of this contract and is subject to annual review and modifications subject to approval of all concerned parties. The cooperator agrees to follow the said plan of operations according to its title schedule of land use and treatment and in accordance with the regulations and regulations obtained from the local Soil Conservation Service office and the Black Creek Handbook. The cooperator hereby certifies that he has control of the operating unit during the period of this contract term herein.

Part III - Cooperator's Signature

Date _____

Signature _____

Part IV - Approved

Date _____

By _____
Contracting Officer

Date _____

By _____
Project Architect/Engineer

| Section | Contract Number | Contract Number |
|------------|-----------------|-----------------|
| 10.1.1.1.1 | | |
| Operator | | |

The Following Modifications (or waivers) are Made in the Contract:

[illegible]

Technical Approval: _____ Date: _____

2025

District Conservationist

Contracting Officer

Action Approved:

Project Administrator

五、

**APPLICATION FOR PAYMENT
FOR COST-SHARE
UNDER THE BLACK CREEK
STUDY PROGRAM**

Black Creek Study Area
San Diego County SWCD

Township _____
Section _____
Contract No. _____

I (we) certify that the following information is true and correct and that the identifiable unit for which cost share is requested was carried out and performed in accordance with the specifications and provisions of the above numbered contract; as required under the Black Creek Study Program.

Specified Conservation Practices Performed

| (a)
Line | (b)
Constr
Item
No. | (c)
Practice and Identifiable
Unit | (d)
Date: | | (e)
Extent | (f)
Average
Cost--\$ | (g)
Cost
Share
Rate | (h)
Amount
Earned |
|-------------|------------------------------|--|--------------|----------|---------------|----------------------------|------------------------------|-------------------------|
| | | | Begun | Complete | | | | |
| 1. | | | | | | | | |
| 2. | | | | | | | | |
| 3. | | | | | | | | |
| 4. | | | | | | | | |
| 5. | | | | | | | | |
| 6. | | | | | | | | |
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| 9. | | | | | | | | |
| 10. | | | | | | | | |
| 11. | | | | | | | | |
| 12. | | | | | | | | |
| 13. | | | | | | | | |
| 14. | | | | | | | | |

TOTAL AMOUNT EARNED: \$ _____

And I (we) have completed form SBA-363 listing in-kind contributions for the above work.

COOPERATOR'S NAME _____

SIGNATURE _____ DATE _____

ADDRESS _____

I certify that the identifiable unit specified in the above application has been properly carried out, meets the standards of the Black Creek Study Program specifications and that the Cooperator is in compliance with provisions of the above numbered contract.

Date _____ District Conservationist _____

Date _____ Contracting Officer _____

TRANSFER AGREEMENT
BLACK CREEK STUDY

BCS-6
Black Creek Study Area
Allen County SWCD

Township _____
Section _____
Contract No. _____

PRESENT COOPERATOR(S)
NAME AND ADDRESS

NEW COOPERATOR(S)-NAME AND ADDRESS

(signature)

(signature)

The undersigned present cooperator and the new cooperator hereby certify that the present cooperator has transferred to the new cooperator the following right and interest in the operating unit described in the above-numbered Black Creek Study Program contract:

All Rights and Interest Transferred

Contract items to be carried out by the new Cooperator

Now, by virtue of this transfer and the request of the new Cooperator that he be substituted under the above-mentioned contract for the present cooperator with respect to the right and interest transferred. It is agreed:

1. The new cooperator hereby agrees to be bound by all the terms and conditions of that contract with respect to the right and interest transferred.
2. The new cooperator agrees that his rights to cost shares or other assistance under the above, mentioned contract with respect to the right and interest transferred shall be the same as the rights of the present cooperator would have been if the transfer herein mentioned had not taken place.
3. The SWCD agrees to pay such cost shares or give such other assistance as may not be due or may hereafter become due to the new cooperator or the present cooperator under the above-mentioned contract and this transfer agreement on the basis of and subject to the terms and conditions of the above-mentioned contract and this transfer agreement, and the rules and regulations applicable to the Black Creek Study Project.

Approved: _____

Contracting Officer: _____ Date: _____

BCS-7

Black Creek Study Area

Allen Co. SWCD

Township _____

Section _____

Contract No. _____

AGREEMENT COVERING NON-COMPLIANCE
WITH PROVISIONS OF CONTRACT

Cooperator

Address

1. DETAILS OF NON-COMPLIANCE;

2. NATURE AND EFFECT OF NON-COMPLIANCE WITH PROVISIONS OF CONTRACT
(CHECK APPLICABLE BLOCK)

- a. warrents termination of the contract-contract terminated
- b. does not warrent termination of the contract-contract not terminated

3. FORFEITURE, REFUND OR PAYMENT ADJUSTMENT (SET OUT FOR COOPERATOR NAMED
AT TOP OF PAGE)

4. ACCEPTANCE OF COOPERATOR

The undersigned hereby agrees that, under the above identified, Black Creek Study Program contract, his forfeiture or refund or payment adjustment shown in paragraph 3 above is proper and any amounts in connection therewith, as indicated in paragraph 3 above are due and owing by him. The undersigned also agrees to the nature and effect of non-compliance with provisions of the contract as set out in paragraph 2 of this form and waives the right to any further proceeding under the regulations governing contract violations.

signature

date

5. APPROVAL

contracting officer

date

chairman SWCD

date

NOTICE OF CONTRACT VIOLATION
Black Creek Study Program

BCS-8
Black Creek Study Area
Allen County SWCD

Township _____
Section _____
Contract No. _____

Name of Cooperator

Address of Cooperator

You are hereby notified that information has been received which indicates a violation of the above-identified Black Creek Study Program contract as follows:

You may obtain a hearing before a hearing officer by the Chairman of the Allen SWCD respect to such violation if you file a written request for such a hearing in the office of the Allen County SWCD,

(Address)

(City)

(State)

not later than 30 days after you receive this notice. If you request such a hearing, the hearing officer will notify you in writing of the time, date and place set for the hearing. You may be represented at such a hearing and will be given a full opportunity to present facts and information relevant to the alleged violation, including oral or documentary evidence. If you fail to request a hearing within the time specified above, you will have no further right to a hearing officer.

Request for information concerning this notice or the alleged violation should be referred to the above mentioned SWCD office.

DATE: _____

(Contracting Officer)

ANNUAL CONTRACT STATUS REPORT
BLACK CREEK STUDY

Black Creek Study Area
Allen County SWCD

Township _____
Section _____
Contract No. _____

Name of Cooperator(s):

_____ of _____
_____ of _____

1. Program in carrying out contract:

2. Waivers or modifications needed in contract:

Date _____

(Designated SCS Technician)

BOS-10
Black Creek Study Area
Allen Co. SWCD

NOTICE OF CONTRACT TERMINATION
BLACK CREEK STUDY

NAME _____ Township _____
ADDRESS _____ Section _____
OPERATING UNIT NUMBER _____ Contract No. _____

You are hereby notified that in accordance with the regulations set forth in the Black Creek Study Program Handbook that, contract number _____ is terminated, effective _____.

The reason for termination is: _____

A refund of cost-share payments made under the terms of the contract is required. You will be informed of the amount of the refund and how it is to be made by the Allen County Soil & Water Conservation District, Executive Park - Suite 103, 2010 Inwood Drive, Fort Wayne, IN 46805.

DATE _____ PROJECT ADMINISTRATOR _____

CONTRACT CHECK SHEET

| NAME OF COOPERATORS: | | C.O. | D.C. |
|---|--|------|------|
| ITEMS REVIEWED | | | |
| A. APPLICATION | | | |
| 1. Cooperator is eligible and has control of the operating unit for the required contract period. | | | |
| 2. Land is eligible and qualified as an operating unit. | | | |
| 3. Has all or any part of operating unit been under a previous BCS contract. | | | |
| 4. Priority for participation shown on BCS-1. | | | |
| B. PLAN OF OPERATIONS/TIME SCHEDULE OF LAND USE AND TREATMENT | | | |
| 1. All fields and acreage accounted for. | | | |
| 2. Planned treatment is compatible with technical guides. | | | |
| 3. Plan contains all essential practices scheduled in proper sequence and agrees with the conservation plan map. | | | |
| 4. Contracting Officer certifies that the plan meets objectives of the program. | | | |
| 5. SWCD Board has been given opportunity to review. | | | |
| C. CONTRACT | | | |
| 1. Conservation plan map included, and shows field numbers, acreage and land use. | | | |
| 2. Soil and land capability maps and legends included as applicable. | | | |
| 3. Practices, identifiable units, cost-share rates, average costs, and specified maximum costs are in accordance with current approved lists of practices, cost-share rates, and costs. | | | |
| 4. Period of contract is within the applicable limitation. | | | |
| 5. Total cost-share obligations are within limitations as allowed in the BCS Handbook. | | | |
| 6. Contract item numbers assigned for all practices and identifiable units. | | | |
| 7. Cooperator has signed form BCS-3 and has authority to sign. | | | |
| REMARKS | | | |

Date Checked and Initials of D.C.

Date Checked and Initials of C.O.

BLACK CREEK SEDIMENT STUDY PROJECT

CERTIFICATION FORM

I _____ DO HEREFY CERTIFY
THAT I HAVE CARRIED OUT THE PRACTICE OF _____
IN THE AMOUNT OF \$ _____ ACCORDING TO THE
STANDARDS AND SPECIFICATION IN MY CONSERVATION PLAN AND ACCORDING
TO THE PROVISION OF THE CONTRACT BETWEEN MYSELF AND THE ALLEN
COUNTY SOIL & WATER CONSERVATION DISTRICT.

SIGNATURE

DATE

AGREEMENT

I _____ do hereby agree to pay

_____ the sum of \$ _____

which is the amount he bid for the construction of _____

I will make payment as follows: _____

_____ and subject to technical approval of completion of the _____ by
Soil Conservation Service personnel.

signature of owner

I _____ do hereby agree to
construct the _____ for the _____ of my
ability and according to the _____ of the
landowner.

signature of contractor

[illegible]