

WORKLOAD ANALYSIS FOR DAVIS SOIL CONSERVATION DISTRICT  
DAVIS COUNTY, IOWA

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### LOCATION AND GENERAL DESCRIPTION

Davis County is located in the southeastern part of Iowa. It is about 70 miles southeast of Des Moines. Its southern boundary coincides with the Missouri state line; it is the third county west of the Mississippi River. The county is rectangular in shape and contains 15 civil townships, 5 of which coincide with the United States Townships.

The total surface area of the county is 326,400 acres. Within this area, there are two major bodies of water - Lake Wapello and Lake Fisher - totaling 362 acres of surface area. Also, there are numerous water impoundments with surface areas ranging from .3 to 15 acres, located throughout the county, covering approximately 400 acres.

The general slopes of the land is to the southeast and east. Surface drainage is excessive over much of the county. Run-off is rapid and much soil material is removed annually from the steeper slopes by erosion. Approximately the southern 5/8 of the county's surface area flows to the southeast and the northern 3/8 of the county's surface area flows to the northeast. About 2.5 miles of the Des Moines River channel cuts across the extreme northeastern corner of the county. Major streams in the county are: Soap Creek, Chequest Creek, Fox River, North and South Wyacondah Creeks, Carter Creek and Fabius Creek.

## COUNTY STATISTICS

Average annual rainfall - 35.0 inches.

Average annual monthly temperature ranges from 21.2° Fahrenheit in January to 73.8° Fahrenheit in July. Annual average temperature - 50.9° Fahrenheit.

Number of farms in Davis County (1984) - 930

1984 Average yield yellow corn - 101.5 bu/ac

1984 Average yield soybeans - 26.1 bu/ac

1984 Average yield wheat - 37.6 bu/ac

Other crops grown: oats, grain sorghum, and white corn.

Livestock and poultry produced, cattle, hogs, sheep, horses and chickens-eggs.

NOTE: Davis County is number one in the state in the number of sheep. There are many sheep flocks throughout the county.

Average land value (1985) - \$550.00/ac (ranges from \$300 to \$800)

County population (data from 1980 census report) - Total population - 9104

(county seat) - Bloomfield - 2849

- Urban population - 3515

Minority groups: Blacks - 15

Spanish American - 25

Asian - 24

Other - 4

There are approximately 65 Amish families (550 people) living throughout the county.

## SOIL DATA

The last soil survey was issued in June 1940, which is badly outdated. In July 1980, at the Iles Heady farm, the "First Acre" ceremony was held to begin mapping for an up-dated soil survey. The Cooperative Soil Survey is still in progress and field work should be completed in 1987.

There have been six major soil association groups determined for this county by John Lucassen, Soil Survey Party Leader, using his best judgment. This may change because the soil survey has not been completed.

|                            |           |
|----------------------------|-----------|
| 1. Gara-Armstrong-Kniffin  | - 101,510 |
| 2. Edina-Seymour-Clarinda  | - 84,864  |
| 3. Nodaway-Amana           | - 69,197  |
| 4. Lindley-Weller-Keswick  | - 48,634  |
| 5. Gara-Armstrong-Pershing | - 13,709  |
| 6. Lindley-Keswick-Rathbun | - 8,406   |
| TOTAL SOILS & WATER ACRES  | - 326,400 |

Class 2w through 5w - 45,363 (90% cropland, 10% other):

Assumed soil loss factors: S = 1%; SL = 450'; T = 5; T/K = 13.5. System "C" (corn & soybeans, fall plowed) = .38; average soil loss is 4T/ac/yr.

These land classes are located mainly along stream bottoms with a few acres of upland areas. Flooding occurs on the bottomland areas adjacent to major drainageways. Intensive row crops of corn and soybeans are used on these soils with minimal acres producing pasture or hay. The major limiting factor of these land classes is due to internal and surface drainage. Wet bottom lands along Soap Creek could use drainage tile, because these soils have better percolation. On other soil types, surface drains would be more practical.

The average soil loss for these acres is below the tolerable limit. Even though the soil loss is below "T", there can be additional treatment to improve the resource base; such as installing drainage practices or setting aside areas for wildlife.

Class 2E soils - 973 acres (85% cropland, 15% pasture, hayland & other):

Assumed soil loss factors: 2 = 4%; SL = 300'; T = 5; T/K = 14.4; none contoured. System "C" (corn & soybeans) = .37. The soil loss is 7T/ac/yr.

These soils are located adjacent to 2w and 3w soils in the upland and higher bottomland areas. They are seldom seeded, due to critical need for income. A corn/soybean, straight row system is usually used. Landowners suffer severe rill erosion on the uplands because of the large quantity of water that builds up on the 3w soils. Terracing would be a good permanent practice to break up the slope length along with management practices of contouring and conservation tillage. The bottomland benches would benefit from diversions above them.

At the present excess soil loss rate, the existing 9" average of topsoil will be eroded at the critical 3" level in 130-160 years. A slower rotation and conservation tillage will increase the life span of this soil.

Class 3E soils - 120,435 acres (80% cropland, 20% pasture, hayland & other): Assumed soil loss factors: Slope, slope length, T limit and T/K are based on each individual soil type. The average common "C" of .34 was used on all soil types. All acres on each soil type is an estimate.

ARISPE (23) - 602 acres: Slope = 7%; slope length = 150'; T = 5; T/K = 15.6; tolerable "C" = .09; 19T/ac/yr lost with an excess of 14 tons that could be saved.

PERSHING (131) 3854 acres: Slope = 5%; slope length = 200'; T = 3, non contoured; T/K = 8.1; tolerable "C" = .062; 14.5T/ac/yr excess of 11.5 tons.

WELLER (132) 37,937 acres: Slope = 7%; slope length = 150'; T = 3; T/K = 7.0 across slope; tolerable "C" = .064; 18T/ac/yr lost with excess of 15 tons.

SEYMOUR (312) 27,700 acres: Slope = 5%; slope length = 200'; T = 3; T/K = 8.1 non contoured; tolerable "C" = .064; 16T/ac/yr lost, excess of 13 tons.

SHELBY (24) 11,617 acres: Slope = 1%; slope length = 150'; T = 5; T/K = 17.9 across slope; tolerable slope = .08; 21T/ac/yr lost, excess of 16 tons gone.

ADAIR (192) 17,414 acres: Slope = 7%; slope length = 150'; T = 3; T/K = 9.4 across slope; tolerable "C" = .064; 16T/ac/yr lost, excess of 13 tons.

ARMSTRONG (792) 11,876 acres: Slope = 5%; slope length = 200'; T = 3; T/K = 9.4 across slope; tolerable "C" = .1; 11T/ac/yr lost, excess of 8 tons.

This class of soil has the greatest amount of excess soil lost per acre. As economic pressure increases on the landowners, these soils are farmed more intensively. These soil types can be farmed, but certain conservation practices need to be applied. The productive life span of these soils, under present cropping conditions, ranges from 30 yrs on Shelby to 230 yrs on Kniffin.

The projected life of Seymour is 108 years; but this soil has one of the most severe rill and sheet erosion problems, due to the location of the landscape. Usually Seymour soils are located below Edina units. When the surface water builds up in large quantities, it increases its velocity as it crosses the gently sloping Seymour soils. Most farmers are more concerned with the rills and gullies that form on B & C slopes than the amount of sheet erosion that occurs. It is easier for landowners to see gully and rill erosion than sheet erosion.

The erosion rate can be reduced and productive life can be extended on these slopes with conservation tillage, but soil conservation tillage should be used in combination with other practices. For example, on Shelby soils, the expected life of the remaining topsoil can be extended to 60 years. Conservation tillage has the same effect on the other 3E soils.

Tile outlet terraces are a popular practice on these soils to help control sheet, rill and gully erosion. Most waterways are too narrow and lack adequate cover, due to the extensive use of grass and broadleaf herbicides. In recent years, there has been a renewed interest in constructing waterways. Installing terraces costs approximately \$450 to \$500 per acre. There is some interest in contouring and strip cropping on these soils, but each year fewer acres are completed. Larger machinery size makes contouring and strip cropping very inconvenient practices.

Class 4E & 5E soils-94,048 acres (50% cropland and 50% pasture, hay & other):  
Assumed soil loss factors: Slope, slope length, T value and T/K values are based on specific soil type within this class. A common "C" value of .22 was used.

Soil loss by soil type:

LINDLEY (65): Slope = 5.9%; slope length = 120'; T/K = 15.6 across slope.  
Tolerable "C" = .08; 14T/ac/yr lost, excess of 9 tons.

GARA (179): Slope = 9%; slope length = 120'; T = 5; T/K = 17 across slope.  
Tolerable "C" = .08; 14T/ac/yr lost, excess of 9 tons.

RINDA (223): Slope = 8%; slope length = 120'; T = 3; T/K = 7.1 across slope.  
Tolerable "C" = .05; 13T/ac/yr lost, excess of 10 tons.

KESWICK (425): Slope = 11%; slope length = 120'; T = 3; T/K = 8.1 across slope.  
Tolerable "C" = .035; 19T/ac/yr lost, excess of 16 tons.

RATHBUN (532): Slope = 7%; slope length = 120'; T = 3; T/K = 7 across slope.  
Tolerable "C" = .06; 11T/ac/yr lost, excess of 8 tons.

Seven to ten years ago, these soils were pasture and hayland, but have been brought into production. More farmers are getting out of the cattle market because of none or very low profits. If the landowner had the land paid for and was a good livestock manager, there was potential for a modest profit. When a person has to borrow money at high interest rates to establish a herd, the likelihood of profit is slim.

These soils are good for hay production. With a cut-back in cow/calf herds, the demand for hay has decreased. Also, fencing is very expensive to install and maintain.

During the late 70's and early 80's, there was a fast rise in the price of marginal land in this county. A lot of people bought this type of land, planning to rotate corn and soybeans to get the greatest return per acre to pay off the high interest rate and inflated land prices. During the past two years, land prices have fallen rapidly, forcing landowners to continue a corn and soybean rotation regardless of the severe soil loss suffered. These soils are difficult to farm on the contour due to larger machinery size and the numerous drainways that need to be grassed to provide outlets for the contour rows. Usually, if contoured, the waterways are ignored and gullies form in the draws.

Conservation tillage will help in part to control soil loss on these soils. High residue levels will help extend the life span. These soils are very fragile. Topsoil cannot be maintained on a continuous row cropping system. These soils are difficult to bring under erosion control without extensive practice application. The best solution, from the economic and conservation viewpoint, would be to rotate longer, seeding grasses and legumes, and use no-till when row crop is used.

**Class 6E & 7E Soils - 69,038 acres:**

These land classes are assumed to be dedicated mainly to hayland, pasture, woodland, and wildlife. In some parts of the county there has been quite a bit of land clearing to make more pasture or hayland.

The majority of this area is rough timber pasture. Some landowners manage these areas to get maximum forage production, but the majority only take what is produced by nature. Some of the areas in the county are critically overgrazed by cattle, sheep, and hogs because of improved stocking rates. Also, the attitude of landowners is that putting stock on timber is a way of getting some kind of production from it. Timber production is retarded each year due to overgrazing from the preceding year.

Livestock economics prohibit most landowners from improving these areas to provide maximum production. Even the cost-share programs are not much help, because the landowners, in most areas, cannot afford the percentage of cost share they are required to provide. A temporary solution to the problem would be raising the state and federal percentage, then the landowner would need to come up with less.

**Abandoned Coal Mine Area:**

Numerous abandoned surface strip coal mining areas are located in western Davis County. These sites are found predominantly in the Lindley-Weller-Keswick soil association group and along Soap Creek Channel and its tributaries. These sites are usually composed of open pits, which range in size from two acres and smaller. There are stripping and gob piles located around or intermingled with these open pit areas. The majority of the sites range in size from 20 to 40 acres. Natural vegetation has reestablished itself on all but a few areas on the sites. These areas or "Hot Spots" will not allow vegetation to grow. The two Priority 1 sites have been reclaimed in this county with the federal sponsored Rural Abandoned Mine Program.

The Rural Abandoned Mine Program (RAMP) has been cancelled. The Iowa Department of Soil Conservation has taken over this program and called it Abandoned Mine Lands (AML). Criteria for AML is different from RAMP. Some of the old Priority 2 & 3 have a possibility of being Priority 1 sites. In the fall of 1985, an AML project was started. This is located along the Wapello-Davis County line on the Hall property.

**FUNDING ASSISTANCE PROGRAMS AVAILABLE TO DAVIS COUNTY LANDUSERS**

**Watershed Development (PL-566):**

The following projects are administered through USDA Soil Conservation Service with local and state sponsorship:

South Wyacondah (Big Wyacondah) drainage has a completed PL-566 Flood Prevention Watershed Project and is in the operation and maintenance phase. Local sponsors were the Davis Soil Conservation District and Davis County Board of Supervisors.

Carter Creek drainage had a watershed plan developed through PL-566 Watershed Program, but local adversity to the project stopped it before final commitments were made. Carter Creek Watershed Project never became a reality.

Soap Creek Watershed has had an allocation for funds from Washington D.C. Economic, Engineering, and Biological Planning. Actual construction will begin in 1988.

North Wyacondah PL-566 pre-application was submitted years ago. In the last year there has been renewed public interest, especially from Missourians that are downstream. Missouri would be responsible for planning and implication.

#### SPECIAL LAKES STATE COST-SHARE PROGRAM

This program is administered by the Iowa Department of Soil Conservation and the Davis Soil Conservation District. Lake Wapello State Park Watershed has been designated as an area eligible for 75% cost-share funds, due to excess rate of siltation that is filling the lake. These funds are made available through the appropriations to the Iowa DSC cost-share programs. Only watersheds draining into state lakes that have excess soil loss qualify for the funds. There are 4989 acres drainage area in this watershed. It is located in Land Resource Area 109, the "Iowa and Missouri Heavy Till Plain". Lindley-Weller-Keswick is the principal soil association, which consists of moderately to steeply sloping soils. An inventory of the watershed practices that have been completed in 1985 are as follows:

1. 19 landowners in the watershed.
2. 98% of the watershed exceeded tolerable soil loss limits.
3. Estimated permanent & temporary conservation practices needed:
  - a. terraces \$5,000
  - b. pasture improvement \$100,000
  - c. grade stabilization structure \$30,000
  - d. water & sediment control basins \$20,000

#### STATE OF IOWA COST-SHARE PROGRAM

Administered by the local SCD Commissioners with funds allocated through the Iowa DSC, 50% cost-share is available to landowners for temporary and permanent conservation practices. Approximately \$73,000 to \$93,000 have been available in the last 2 years for state cost-share. All funds have been exhausted and there have been additional requests to the Iowa DSC for funds.

Also, in the last year, the DSC has a no-interest loan program available to landowners. The loan is made for a maximum of ten years, but can be paid off in five years.

#### AGRICULTURE CONSERVATION PROGRAM (ACP)

This program is administered by the ASCS office. The county committee consists of three people who are locally elected. These people set up the cost-share rates and decide what programs will be funded, according to ACP regulations. At present, cost-share on temporary and permanent conservation practices has been set at 50% and now 60% rate for seeding of cropland. The committee's philosophy is to not increase cost-share rates, making the money available to many people. In the past few years, due to poor farm economy, they have raised the cost-share percentage rate so landowners won't have to spend so much on their part.

The average annual funds allocated to this program is \$55,000. Funds are usually cost-share on seedling first, then the remaining funds on permanent practices such as terraces, grade stabilization structures and farm ponds.

## LONG TERM AGREEMENT (LTA)

This program is also administered by ASCS with technical assistance from SCS. This program provides cost-sharing on a contractual basis over a specific period of time, usually 3 to 5 years. The early LTA's were set on a 10 year basis, but these were difficult to finance due to rapid cost increases. The Soil Conservation District reviews applications and sets a priority rating based on the conservation plan and the need of the landowner. Final approval comes from the ASCS County Committee. SCS assists the landowner in the design, layout and checkout of the planned practices and an annual review status. The status review checks on the progress of fulfilling the agreement terms and updates the ASCS County Committee. There are two active, and six completed LTA's to date.

## CALCULATING THE TIME SPAN IN WHICH THE RESOURCE "MUST BE" TREATED

In considering the length of time in which a resource "must be adequately treated", different types of soil and the resource management system should be taken into account. For example, in the Class 3E soils, the "must be treated" time spans from 30 years on Shelby, 108 years on Seymour 5% slope land, to Kniffin at 234 years on 3% slope land. The soil losses are based on a common "C" of .34. If there could be a slow down in rotation on Seymour soils to have a "C" of .14 CC,B, with more residue left; the "must be treated" time period would raise to 156 years. The critical life span of the resource can change greatly by improving the resource management system from year to year.

Many factors can have an effect on why a landowner uses one resource management system and his neighbor uses another, even though they both may have similar soil types. One person may have a good working background and know how of and enjoys working with livestock. The neighbor, on the other hand, may not have the management ability to handle livestock, labor or facilities, but is a good grain manager. The life of the resource will vary greatly between these two operators, because of their resource management systems.

## WHAT SHOULD BE THE ANNUAL RATE OF APPLICATION?

Conservation tillage systems will give the most immediate "slow down" of excess erosion occurring on cropland that is intensively farmed. Many land-users are either trying some type of conservation tillage system or planning to in the next year. The District Resource Inventory estimates total conservation tillage system acres needed in the county at 124,520 acres. There are approximately 19,281 acres in the county on which some type of conservation tillage system is used. That leaves 105,239 or 84.5% of the needed application yet to be accomplished.

If this practice could be implemented on those acres needing treatment next year, the life span could be extended greatly as shown before. However, there are many factors involved that are not controllable from this office. Some of these factors are weather, interest rates, livestock prices, machinery costs, fertilizer costs, chemical costs, seed costs, fuel costs, and hundreds of other factors too numerous to mention. These all effect how and when landusers apply conservation to their land.

Based on past application rates in the county and needed treatment, the application rates (as set out in the District Resources Inventory) are considered to be acceptable at this time. The five year priorities are a reasonable application rate. The rates are, in most cases, above the present application rate, but still within the capabilities of the staff.

#### WHAT IS LIMITING CURRENT APPLICATION PROGRESS?

1. Current depressed economic conditions in agriculture.
2. Interest rates.
3. Land cost and return of investment.
4. Inadequate funds on the part of landowners.
5. Landusers have higher priorities than conservation work.
6. Lack of concern for the need for conservation.
7. Short construction periods in fall and spring.
8. Shortage of tiling contractors during peak periods.

#### LIMITING FACTORS FOR EACH CONSERVATION PRACTICE

The above items effect application of all practices. Terraces, waterways, structures and the earth moving practices are affected more than the management practices. This office has no control over the first four factors. Factors 5 and 6 can be overcome through information, planning and follow-up programs. With the information programs, this office could have a more immediate affect on the lack of concern. When a landuser realizes that there is a problem, it will increase the priority of doing something about it.

The short periods for construction in the spring and fall could be extended to include the summer. Planting small grains that are harvested in July could allow for spreading out the workload. In summer construction, the dirt moves more efficiently, thus keeping the cost down. This office encourages landusers who are participating in the reduced acreage program to consider using these areas of construction. In both state and federal cost-share programs, a higher priority is given to areas in reduced acre basis.

The earth moving contractors do a good job of getting work completed in a timely manner. There are not enough tilers to keep ahead of all the earth moving contractors during peak seasons. Since the agriculture economy is in sad shape, it would be a difficult time to start tiling.

Contouring and strip cropping are very good practices for this country's rolling hills. Both require a stable outlet for surface runoff. Waterways have become very hard to maintain due to the chemical runoff killing the vegetation. Strip cropping works well for those who need forages. There are fewer livestock operators each year, thus decreasing the need for forages. There has been a major shift from livestock to row crops in recent years.

Conservation tillage is a practice that is becoming more popular each year. We are emphasizing this practice on all of our contracts as a good way to control erosion without a high output of cash. The major limiting factor with this practice is that landusers are hesitant to change to a system they are not familiar with. As more and more neighbors begin to use these systems and have success with them, the hesitation will decrease and the majority of landusers will be using some form of conservation tillage.

WHAT WILL IT TAKE IN DOLLARS AND PERSONNEL  
TO ADEQUATELY TREAT THE RESOURCE?

It is estimated that there is a present need of 343,441 man hours to adequately treat the resource in Davis County. This figure was developed from the "remaining to be done" column of the District Resource Inventory. Factors used in developing the personnel staffing plan in Iowa were multiplied times the needed units to get the total needed man hours. If the 343,441 man hours is divided by the available man hours per individual on a full time basis (2088 hours per year), a total of 164 man years is needed.

Using an annual salary of \$18,500 shows a financial need of \$3,034,000 to provide the staff necessary to apply the needed treatment. The present staff include:

|                                        |                     |
|----------------------------------------|---------------------|
| 1 District Conservationist             | @ 2088 hours        |
| 1 Federal Soil Conservation Technician | @ 2088 hours        |
| 1 State of Iowa Engineering Aide       | @ <u>2088</u> hours |
|                                        | 6264 hours          |

Present staff time available equals three man years. With the current staff level, it would take 54.6 years to provide the needed assistance to adequately treat the resource. With some of the soils having the maximum 30 year life, it is very critical that the staff concentrate on the most critical eroding soil types units.

The dollars needed to encourage application of the needed practices could be calculated using the data in the District Resource Inventory. If 50% of the "remaining to be done" practices require cost-share assistance, the cost would be as follows:

Conservation tillage -  $105,239 \times .25 = 26310 \times \$10/\text{ac} = \$263,100$

Terraces -  $11,508,638 \times .5 = 5,754,319 \times 1.60 = \$9,206,910$

It is apparant that the costs of applying the needed treatment is astronomical. Under the current economic conditions, the necessary dollars and personnel to adequately treat the resource on time is not available. It does not appear that they will be in the near future either.

WHAT SHOULD THE PRIORITIES BE?

With the present set of circumstances, conservation tillage will be the most effective erosion control for the dollars and personnel available. Therefore, a high priority should be placed on information demonstrations, technical assistance, and planning Resource Management Systems that will promote this practice.

Seeding down of highly erodible cropland is also another good practice for the dollars spent. This practice is hard to accomplish because of the declining livestock values.

There will be a continuing need for terraces on many farm units to control excessive runoff and to decrease slope length. When technical assistance is provided to landowners for terraces, water and sediment basins, structures, etc., conservation tillage should be included as a part of the system. The follow-up program should encourage the landowner to carry out the planned conservation practices, but the conservation tillage alternative should be stressed.

A large number of the items limiting application is not within the control of this agency or the Soil Conservation District. The construction season can be lengthened by encouraging landusers to use wheat or oat ground to install practices during summer months. Acreage payments should be available to those who are willing to use a temporary cover crop on land units, so that conservation practices can be installed. A priority for cost-share funds should be given to those who will make special arrangements to accomplish earth work during "slack" construction periods.

Management practices will reduce excess erosion dramatically, but requires an intensive selling effort from the staff and all associated with the soil conservation program in Davis County. Rotations need to be slowed down to incorporate more forages. Strip cropping can be a big factor in reducing erosion without a large outlay of funds. Contouring will reduce erosion levels by about 50%. (Both of these are excellent practices but hard for the landuser to do because of the large machinery size.) This does create a need for waterways or tile outlet terraces. Terraces and waterways can be used in combination to help reduce some of the costs.

When profitability returns to the livestock industry in this country, it would do more to promote erosion control than all the people and dollars this agency could muster. This county is a livestock producing area with some parts suitable for intensive row crop production. Landusers have been forced into abusing their marginal land for the sake of survival during low cattle and sheep prices. Again, the greatest impact on soil erosion would be an increase of profit in the livestock industry.

#### FIVE YEAR PLAN OF NEEDED APPLICATION RATES

| PRACTICE                      | 1986   | 1987   | 1988    | 1989    | 1990    |
|-------------------------------|--------|--------|---------|---------|---------|
| 329 conservation tillage (ac) | 13,000 | 15,000 | 16,000  | 17,000  | 18,000  |
| 330 contour farming (ac)      | 200    | 400    | 600     | 700     | 900     |
| 412 grassed waterways (ac)    | 10     | 15     | 20      | 30      | 40      |
| 585 strip cropping (ac)       | 50     | 100    | 150     | 200     | 250     |
| 600 terraces (ft)             | 85,000 | 90,000 | 100,000 | 101,000 | 103,000 |
| 108 & 109 conservation plan   | 5,000  | 5,025  | 5,500   | 6,000   | 6,500   |

These application rates have been estimated using past trends, present conditions, and assumptions of what the landusers will be able to accomplish towards erosion control on their land. The rate of application will probably decrease due to poor economic conditions.