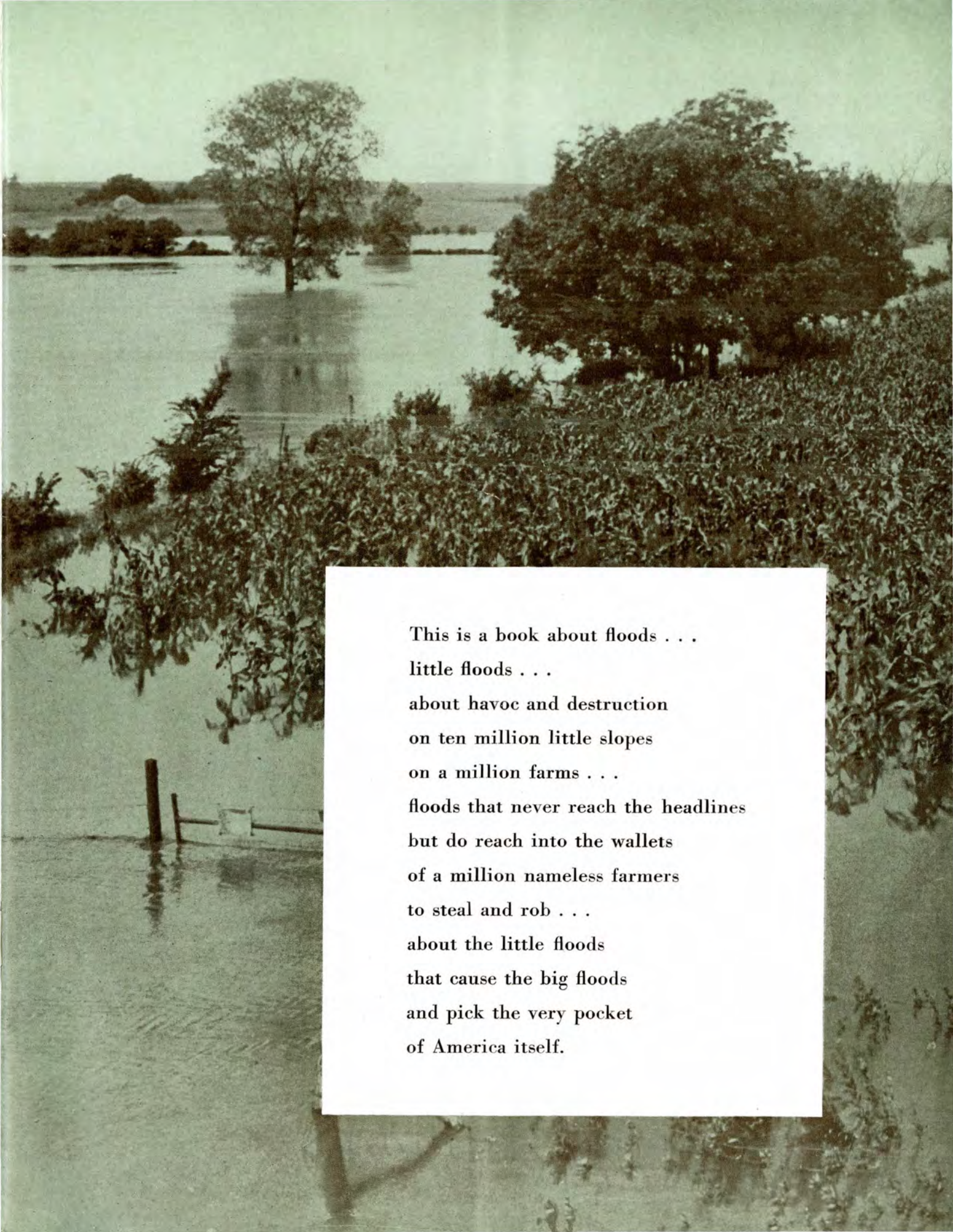




There goes a **THOUSAND MILLION**
DOLLARS A YEAR

*Photos, Front and Back Cover by Courtesy
of the Soil Conservation Service.*



This is a book about floods . . .
little floods . . .
about havoc and destruction
on ten million little slopes
on a million farms . . .
floods that never reach the headlines
but do reach into the wallets
of a million nameless farmers
to steal and rob . . .
about the little floods
that cause the big floods
and pick the very pocket
of America itself.

THIS IS A



"OLD MISERY'S" TOLL

Year	Gross Losses*	Lives Lost
1933	\$ 1,400,000	6
1934	1,800,000	0
1935	39,000,000	110
1936	110,000	0
1937	1,400,000	2
1938	4,300,000	71
1939	610,000	0
1940	1,800,000	5
1941	12,000,000	2
1942	6,900,000	1
10 year total	\$69,320,000	197
1943	\$47,382,000**	7

* Losses along Missouri River and its
Tributaries — U. S. Weather Bureau.

** Tentative estimate U. S. Army Engineers.

2,121,000 acres on the lower
Missouri River and its principal
tributaries are subject to destruc-
tive floods.

Estimated average annual
flood damage to agriculture alone
is \$3,500,000 to \$4,500,000.

Property damage and business
losses, including railroads,
bridges, highways, factories,
buildings, etc., approximately
equal agricultural losses.

"PET HUNTING GROUND OF HAVOC"

Here in this rich section creep floods that are picking the pockets of everyone.

The little floods!

Not only the smashing fury of the lower river, swollen, implacable, devastating. That horror everyone knows about. That is something a man can get hold of.

But the little floods! What of them?

Go upriver with us . . . upstream . . . up branches . . . up the creeks . . . up the little runs . . . to the farms.

A farm in cultivation! Cleared. Tilled. Productive. The larder of America. The livelihood of an American family.

The rain comes, the blessed rain. The very fact of cultivation lets much of the precious water run off the land quickly.

Every drop carries its burden of priceless soil. Drops become little rivulets, running fast downhill, the easiest way. Off, and gone forever, is that much more fertile soil.

The rivulet cuts itself a little runway.

Next time it rushes a little faster . . . taking more water and more soil, faster.

The runway deepens.

Ever faster, goes the water . . . ever deeper and wider, and heavier in the farmer's riches.

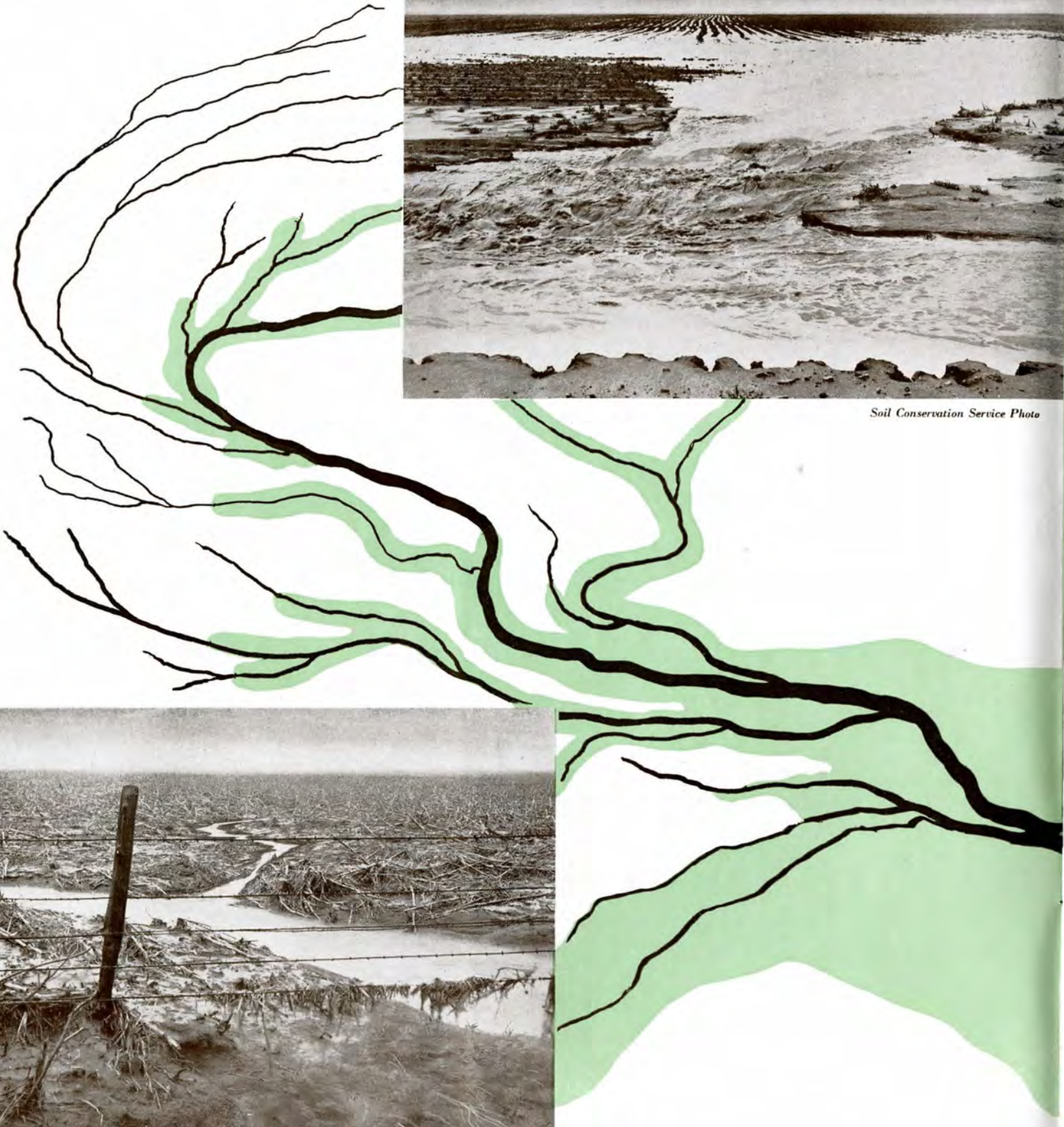
That is where the big floods come from.

And something can be done about them!

THIS IS THE PRICE WE PAY . . .



Soil Conservation Service Photo



Soil Conservation Service Photo

Headline floods throughout America are estimated to cost about \$100,000,000 per year.

Minor floods, the damages along the smaller tributaries, set America back to the tune of another \$100,000,000 a year.

Add both of those bills together and multiply by four . . . \$800,000,000; that is the estimated cost of the little floods on the farms — the cost of soil erosion way back where floods really start. Floods cost us a total of \$1,000,000,000 a year.

An impressive share of this staggering loss occurs in a "pet hunting ground of havoc"—the Missouri River Watershed.

Year after year, the struggle goes on against downstream destruction . . . with dams and levees and such controls.

Now it is possible to do something upstream, in the fields, to reduce losses downstream and stop the pilfering of the farm.

Water can be managed on the farm.

Ninety-five per cent of soil loss can be stopped by concerted efforts . . . and crop yields improved.

Runoff water can be greatly reduced in volume . . . as much as fifty per cent.

More importantly, it can be retarded in speed of delivery to streams, thus discouraging the very beginnings of big floods.

Soil kept on the farm never becomes silt in streams and rivers and reservoirs to choke them, and make floods even more devastating.

Water can be managed on the farm.

The methods are known, developed, demonstrated.

The equipment is simple . . . practical and efficient attachments for modern farm tractors, as shown on subsequent pages.

The need for concerted action is very great.

One thousand million dollars a year is a lot of money.



Soil Conservation Service Photo

Water Management on the Farm

Water Control Measures

Grassed Waterways

Diversion Ditches

Contour Furrows

Contour Listing

**Plowing, Planting and
Cultivating on
Contours**

Strip Farming

Terracing

Stabilizing of Gullies

Farm Ponds

Fences on Contours

**Soil-conserving Crop
Rotations**

**Proper Stocking and
Management of
Grazing Land**

**Permanent Vegetation
on Steep Slopes**

is of **FIRST IMPORTANCE**

So far, we have stressed management of water on the farm as the prime factor in reduction of flood devastation.

Now, we shall show what the control measures are, what they look like, and how they can be accomplished with simple equipment

... that does not have to be imported at high cost, nor operated by specialists

... equipment so inexpensive it is within the reach of the farmer himself and his neighbors

... that he himself can handle, efficiently

... just his modern farm tractor using modern implements

... that he can use continuously to maintain his measures to full efficiency.

This makes sense.

This should be the beginning of a reversal of the mounting losses of soil fertility, of destruction of farm land through gullying, of decline of cattle and sheep carrying capacity, and of the growing frequency and severity of floods.

Let us kill off the *little* floods!

The pictures will tell how ...

HOLD WATER AND SOIL BY GRASSED WATERWAYS



Soil Conservation Service Photo

**Grassed waterways are a simple means of slowing down runoff
and reducing soil losses**

Channels for grassed waterways should be made shallow and sufficiently wide to permit mowing and raking hay or harvesting

seed. These channels should be as wide as two or more times the width of swath of the harvesting equipment.



No need to slow down when you come to the grass with a mounted, power-lift plow.

Disc harrows should be straightened while crossing grassed waterways. Power-angled discs make this easy and convenient to do.



These strips are not "wasted", or set aside only for water channels. Instead, they are narrow, winding "fields" within the larger field. As the pictures show, they are not difficult to work across or to maintain.

With proper treatment, these waterways can be highly productive of hay or seed; they generally contain the best soil in the field and have moisture when the higher ground is dry.

HOLD WATER AND SOIL BY DIVERSION DITCHES



Water from the upper fields is seriously damaging this field. A diversion ditch along the upper edge of the field would carry off the water slowly, without gullyng the cultivated land.

Diversion ditches are broad, substantial channels *across the slope*, to carry water slowly, the "long-way around", instead of in a rapid rush down the natural waterways. They are used to shut off damaging accumulations of water coming from higher

land. They are frequently used to divert water from the head of a gully so that the gully may be filled or stabilized against further growth. Diversion ditches are built, also, across the top of steep slopes where no other erosion control structures are practical.



With this inexpensive terracer, a diversion ditch is built quickly and easily. A tractor-mounted, power-operated scoop is used to add extra earth to the ditch bank or berm across the old channels. This should be done to prevent overflow from the new ditch at these low places.



HOLD WATER ON PASTURES BY CONTOUR FURROWS



Soil Conservation Service Photo

More water soaks into the soil making better pastures instead of bigger floods

Contour furrows on closely-grazed pastures hold water until it can soak into the ground. These contour furrows should be carefully laid out on the level to avoid becoming drainage ditches.

On range land diversion ditches and contour furrows act as irrigation channels to divert floodwater or runoff from natural drainage. This pays dividends in supplemental feed.

HOLD WATER FOR CROPS BY CONTOUR LISTING



Soil Conservation Service Photo

The only direction the water contained in these contour listed furrows can go is down or up, *not downstream*.

Extra water stored in the subsoil by contour listing — water that would have been useless, possibly damaging, runoff—may mean the difference between a good crop and crop failure. With a tractor-mounted, power-



operated lister (middlebuster) it is possible to follow contours accurately, and to make beds of uniform width on sharp curves. Modern machinery takes the trouble out of turning and short point rows.

HOLD WATER PLOWING, PLANTING, AND



Soil Conservation Service Photo

Plow, plant and cultivate on the
contour . . .

. . . and every row becomes a small
water-holding terrace.



AND SOIL BY CULTIVATING ON THE CONTOUR



Working on the contour fits the farming pattern to the natural lay of the landscape

Planting and cultivating on the contour bring yields up to 50% greater than up-and-down hill, straight-line farming.

Power requirements are less. Tests have shown that as much as 10% more land can be plowed in a given time and that fuel consumption per acre will be 10-15% less, if plowing is done on the contour.

On gentle slopes, where the soil does not wash too easily, soil erosion can be checked effectively by plowing, planting and cultivating on the contour. Runoff of water will be reduced by one third to one half. The water that is held soaks into the soil to carry crops through dry weather.

To keep contour rows nearly level, new "base lines" must be run at intervals. But the point rows which are often formed are no problem to the farmer with a mounted, power-lift plow, planter and cultivator.

Even on land that looks flat there is generally a fall of at least one or two feet every hundred feet. But when it is understood that some rivers run hundreds of miles with an average fall of less than one foot per mile, it is easy to see that excessive runoff and erosion will occur on the so-called "flat" lands. Nearly all "flat" land requires one or more erosion and water control measures.

HOLD WATER AND SOIL BY STRIP FARMING



Soil Conservation Service Photo

Long, narrow fields "on the level" save soil, water, soil fertility and power

Strip cropping on the contour, or in combination with terraces, is necessary to hold soil and water losses to a minimum on long slopes.

Keeping alternate strips in hay tends to prevent water from rushing down the whole length of the slopes. But even where hay is not included in the rotation, strips of different crops are better than one crop down the entire field.

Strips of hay or grain between strips of contour-

cultivated crops, such as corn, are a simple means of adjusting the irregularities between contours and of avoiding point rows.

On terraced fields, strip cropping permits following the line of the terraces instead of working across them and tearing down the terrace ridges.

When rectangular fields are replaced by contour farming, strips of different crops are needed to maintain the desired acreage of each crop.

These modern machines make STRIP FARMING PRACTICAL

MOUNTED PLOWS

Tractor-mounted plows follow the curves of contour strips, cutting full-width furrows. Furrows can be turned upgrade as well as down. Best of all, the finishing of irregular shaped areas is made easy. Now it is unnecessary to lay out fields in the parallel-sided "lands" which have so universally accompanied the use of the moldboard plow.

POWER-ANGLED DISC HARROWS

A disc harrow in which the cutting angle can be changed instantly and without effort by the operator while he is seated on the tractor and while the tractor is in motion, answers another problem of strip farming. Such a harrow can be turned sharply at the ends of narrow strips. When working on the irregular spaces between contour strips, it can be straightened while passing over land already finished and returned to cutting angle when unworked ground is reached.

MOUNTED, POWER-LIFT CULTIVATORS

Planting and cultivating crops in rows following contours is a basic part of strip cropping. Mounted cultivators are under accurate control in working across the slope. A quick, effortless power lift speeds up the cultivation of point rows (if field layout makes them unavoidable).

"STRAIGHT-THROUGH" COMBINES

Since the strips of grain are long and narrow, with a great deal of outside edge and no fence row separation from other strips, it is desirable that a combine discharge the straw in its own path rather than to the side on the alternate crop. "Straight-through" combines meet this requirement of strip cropping.



CONTROL RUNOFF WATER WITH TERRACES



Soil Conservation Service Photos

In regions of scanty rainfall, terraces hold water until it can soak into the subsoil. In regions of heavier rainfall, where some runoff is wanted, terraces are graded slightly to make the water take a long, slow path across the slope instead of the destructive rush downhill.



TERRACE BUILDING IS NO LONGER A JOB REQUIRING GIANT MACHINES

NOW, attachments for the farmer's own tractor enable him to do his and his neighbor's terracing

A tractor-mounted disc terracer is an efficient, one-man machine for building terrace ridges.



This terracer has reversible blade for moving dirt in either direction.

The tractor-mounted scoop — another attachment for a modern farm tractor — aids in construction or repair of terrace ridges.



CONSTRUCTION of Terraces is only Year after Year



Soil Conservation Service Photo

Plowing parallel to the terrace ridges. In this case a grassed waterway is being maintained as a drainage outlet for the terraces.

It is easy with tractor-mounted power-lift plows to rebuild the terrace ridge and clean out the channel each time the field is plowed.



the beginning . . .

MAINTENANCE is equally important

Methods and practices vary according to rainfall, crops grown and soil types. But for all regions, the necessary machinery is available for easy maintenance of terraces as part of regular farm work.

The ease of controlling a power-angled disc harrow encourages proper terrace maintenance. It eliminates heavy cutting where not wanted. It permits short turns up or down grade, without strain.



A tractor-mounted power-lift implement takes the trouble out of cultivating the point rows which accompany some types of terrace management.

GULLIES CAN BE STOPPED



Soil Conservation Service Photo

Good land, as well as poor, is often broken by gullies which grow larger every year. The results are accelerated erosion and runoff, fields broken into irregular areas hard to farm, increased breakage of machinery, loss of land from productive uses, and finally ruin and abandonment.

CONTROL OF GULLIES

The choice of method depends on degree of gullying, type of farming, type of soil and other factors. Control methods include diversion ditches and terraces to reduce the water flowing into the gullies; damming; filling. In deep soils, filling is a good method of restoring all the land to productive uses.

**Many gullies
may be filled by using
a modern short-coupled
tractor with mounted plow**



The gully has been plowed in, the land smoothed, and is ready for seeding. Further damage will be prevented by a wide strip as a permanent grassed waterway.



KEEP WATER ON THE FARMS in FARM PONDS



Soil Conservation Service Photo

Farm Ponds . . . store water that would otherwise run off the farm
. . . provide water for the livestock that go along with improved pastures
. . . provide water where good wells are not available

. . . eliminate much of the time and attention necessary when livestock are watered from wells.

Even when full, ponds have a buffer action, reducing the rapidity of runoff, and thus contributing to flood control.

This used to be a gully. An earth dam with a small amount of concrete stabilized the gully and formed a valuable pond.



Soil Conservation Service Photo



A scoop which mounts on a modern farm tractor speeds up the building of ponds — makes it practical to build *all* the ponds a farm needs.

Soil Conservation Service Photo

Natural water ponds may be dug deeper, forming valuable collecting basins.



Ponds also save water for irrigating farm gardens or small fields of feed crops

Water that is wasted in the spring, especially from farms in the drier regions, can be stored in ponds, practically and economically, for use several months later to irrigate small areas.

These small watered fields will produce as much as nearby acreage many times larger. As an added advantage, certain crops can be grown that formerly were out of the question.

FENCES ALONG CONTOUR LINES

Fences determine and "freeze" the pattern of farming. Where fences are relocated along contour lines, they support and encourage a permanent system of farming aimed at maximum control of erosion and runoff



Soil Conservation Service Photo

On many farms there are miles of fence that should be relocated. If the postholes must be dug by hand, this heavy task could easily be the major consideration holding back reorganization for conservation farming. A tractor-mounted, power-operated posthole digger makes short work of this essential operation.



Management of Water on the Farm

Benefits NON-FARMERS, too

Obviously the farmer, himself, reaps the benefits of the modern water management methods he puts into practice.

His land is increased in productivity.

The value of his farm is maintained or enhanced.

He has added insurance against loss in dry periods.

In addition, widespread adoption of these practices will bring a whole train of general benefits in their wake.

Floods downstream will be mitigated by lessening and slowing down of runoff water. Silting will be reduced. Flood control works will last longer and be made more effective.

Navigation will be improved through decreased silt deposit, by maintenance of more normal water level, and by reduction of flood damage to docks and locks, to warehouses, loading equipment, and to other shore installations.

Power structures will benefit, too. Effective life of dams and other power conversion works will be lengthened and flood damage reduced.

All those whose interest is focused on floods, and what they cost, may well let their eyes turn upstream to the farms — to the little floods at the very beginning of things.

The equipment for stopping the little floods is at hand.

THE JOB TO BE DONE

The little floods take place where and while our food is being grown, where and while a million farmers are making their only livelihood.

The program of control must go on the same way, where and when other work is going on.

Levees, downstream, of course.

Floodwalls, shield of safety to cities, manifestly.

Dams. Yes. Flood control reservoirs. Certainly.

But first in precedence, in point of amount of damage corrected, and in point of cause before effect are the little works for the little floods right back at their beginning on the farm.

How big is the job?

— in the whole United States:

122,000,000 acres should be plowed and planted on the contour

90,000,000 acres should be strip cropped

95,000,000 acres should be terraced

720,000 acres should be put in ponds

— in the eight states in the Missouri River Basin (not including the small areas of Colorado and Minnesota which are also in the Missouri Watershed):

	Contour Planting (Acres)	Strip Cropping (Acres)	Terraces (Acres)	Terraced Outlets and Grassed Waterway (Acres)	Ponds (Acres)	Spreading Water (Acres)
Iowa	7,831,868	2,108,161	1,326,584	610,734	24,634	
Missouri	3,909,051	467,989	1,185,465	308,349	44,356	
Kansas	8,734,280	5,543,799	7,891,467	459,501	98,934	35,497
Nebraska	3,790,234	3,842,316	2,765,607	331,191	7,504	78,108
South Dakota	5,233,547	6,638,107	810,622	198,826	11,717	150,712
North Dakota	1,374,925	12,554,789	24,734	65,730	40,166	33,569
Montana	1,587,499	4,624,367	300	41,743	6,918	103,235
Wyoming	312,199	526,293	11,121	5,654	1,195	52,695
Data from Soil Conservation Service.						

The means are available. The technical methods are perfected.

Farmers cannot be expected to bear all the costs of changing their farms and farming methods to conform to these simple principles, because the *whole community benefits*.

Valleywide control programs are necessary. Water is no respecter of property lines.

To accomplish the necessary practices on all farms in a watershed, where needed, is a great undertaking. But it is possible. Technical supervision and financial aid will be needed on most farms.

Control work on individual farms does not ordinarily require large investments. And whatever the investment, the justification is right at hand. The very practices that result in flood control bring a more prosperous agriculture to the farm itself.

They pay their own way right on the farm.

The benefit in flood control all the way downstream is an extra . . . a wonderful plus.





THE HEADLINE FLOOD

Starts with a myriad of little floods far away