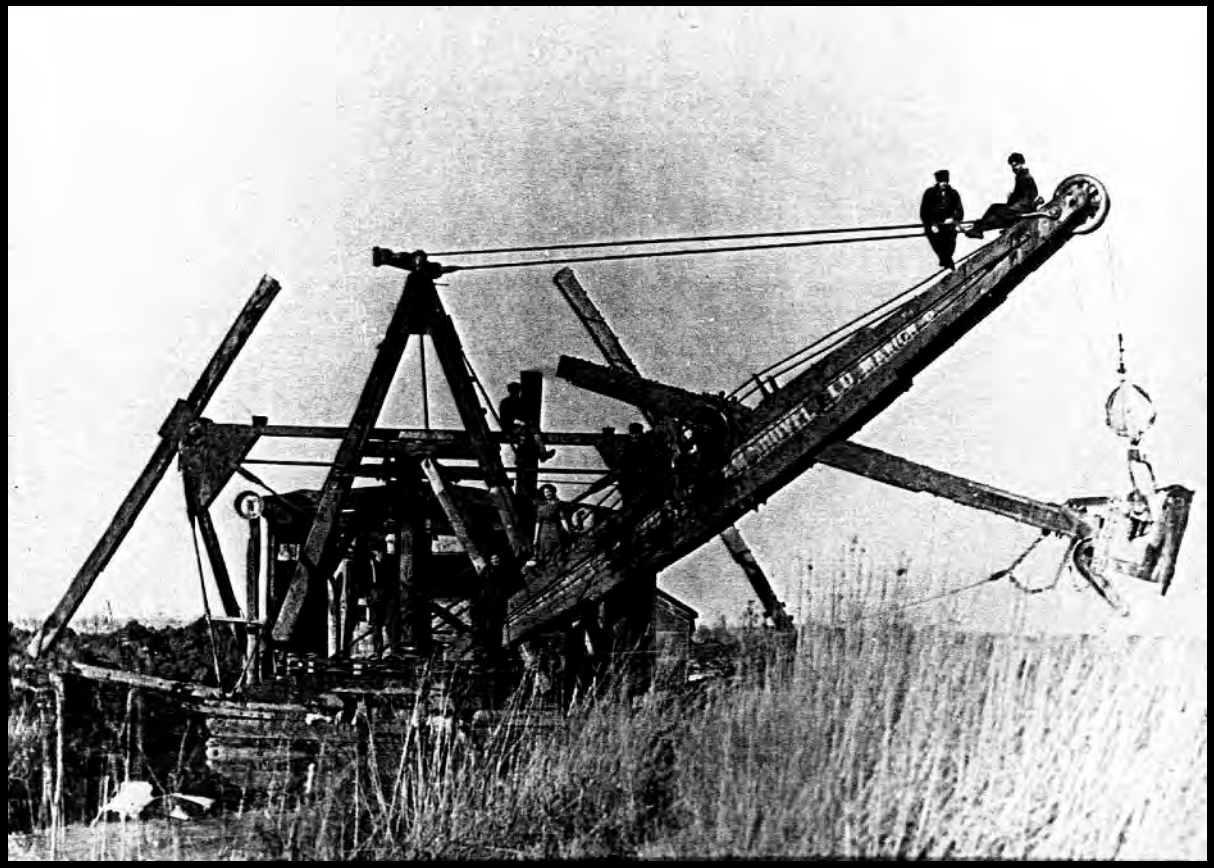
A History of Wetland Drainage...*How they pulled the plug©*



Draining the inlet swamp in Lee County, Illinois, 1888

Thomas R. Biebighauser

tombiebighauser@gmail.com

www.wetlandrestorationandtraining.com

When water stands in a field for any length of time
it is a sure sign that the land needs drainage
Figure 7. Farm Drainage. 1948.

Drainage was critical for the harvest of crops


SERVING GREAT CHOPS
SINCE 1990
NEW YORK'S FIRST ALL ELECTRIC
Down East
Seafood
DELIVERY VEHICLE
nyserda
Tel: (212) 243-5630
ALL ELECTRIC
SMITH
E1

Trying to farm wetland in the early 1900's

Ayres and Coates (1928)

Farming in *Lands*

dead furrow land dead furrow

Ayres and Coates (1928)


Dead furrow
Land
Dead furrow

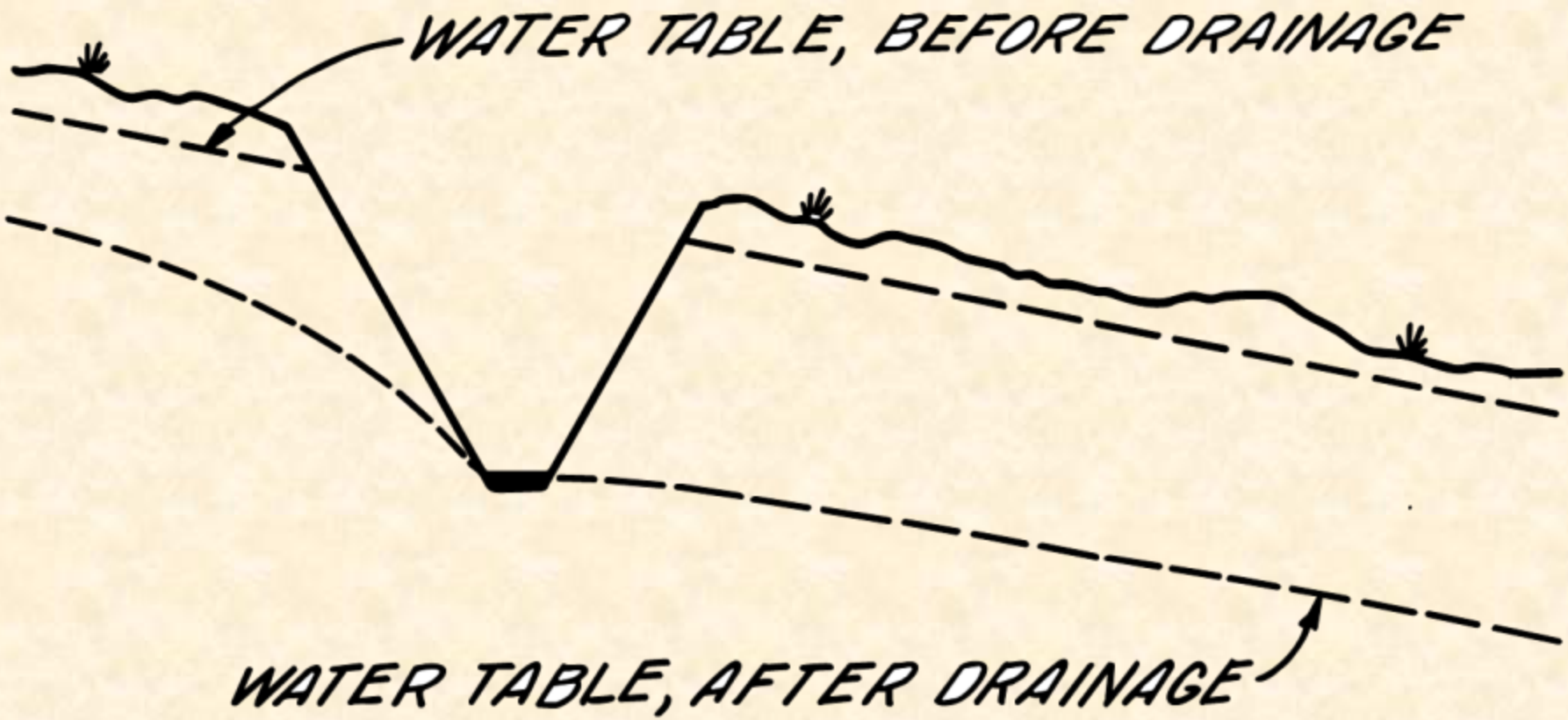

Land
Land
Dead furrow


USGS

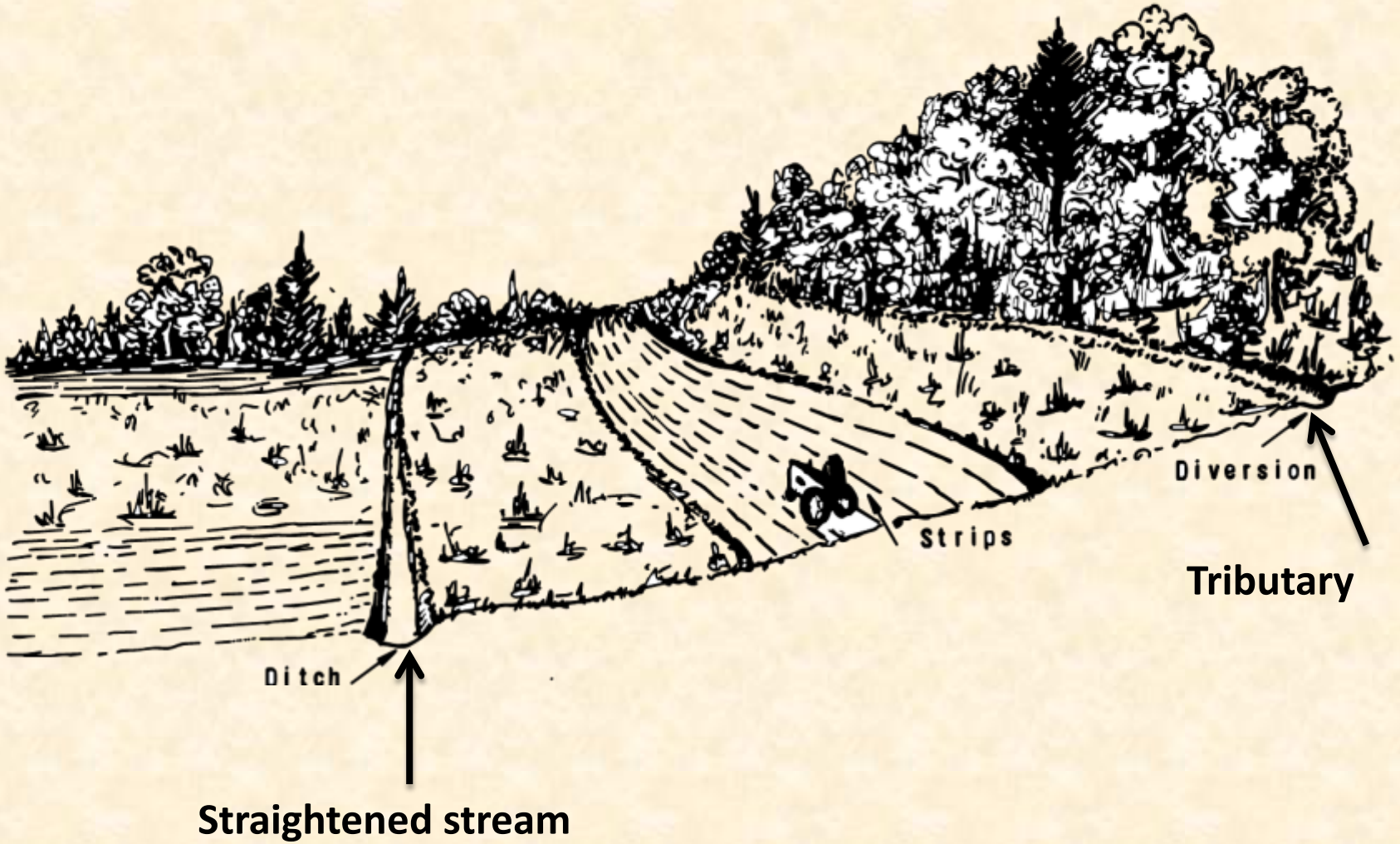
Primehook Creek, Delaware-widening main ditch near the bay

Ann Vileisis photo

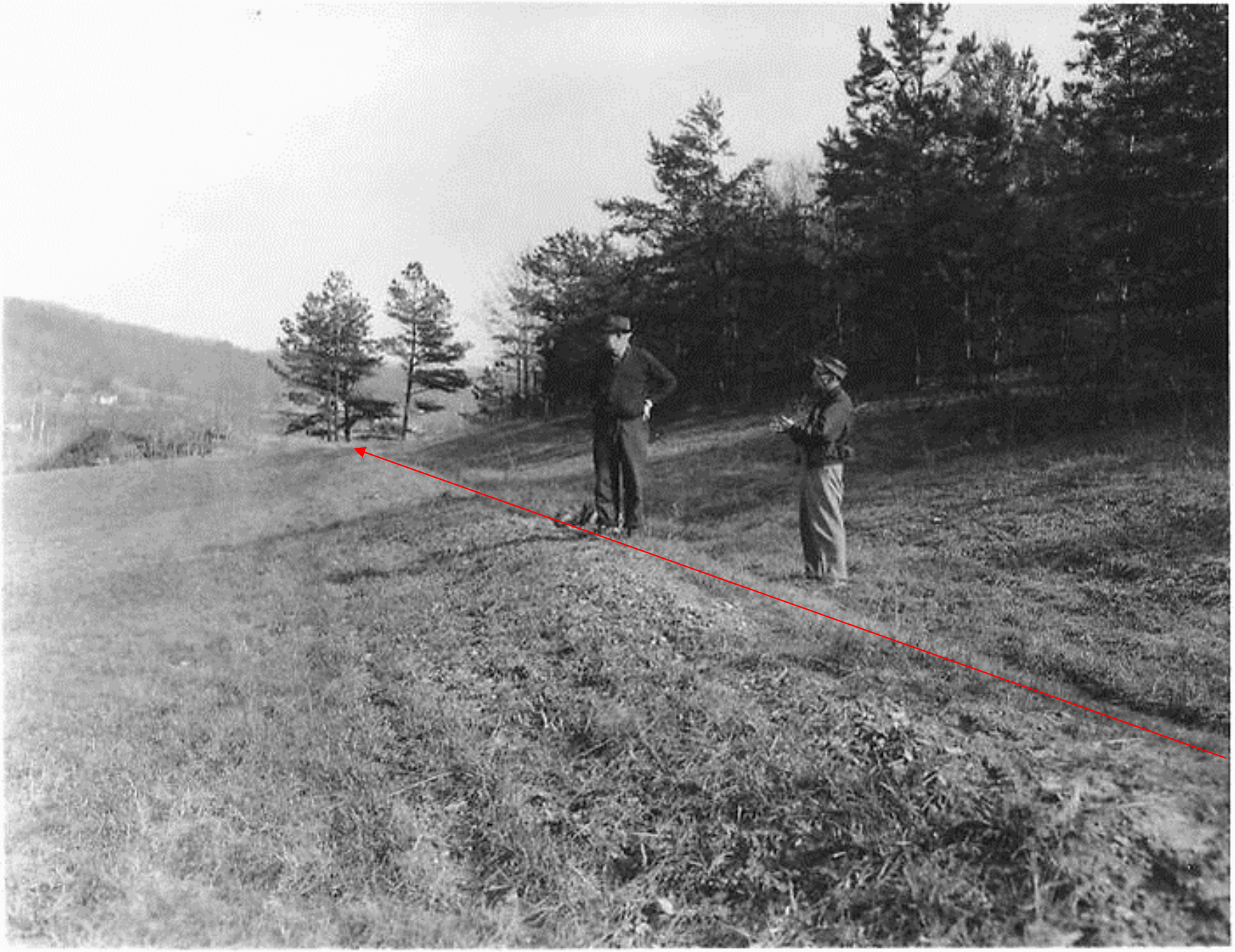
A ditch eliminates standing water & lowers the elevation of groundwater



Where ditches should be placed to drain wetland

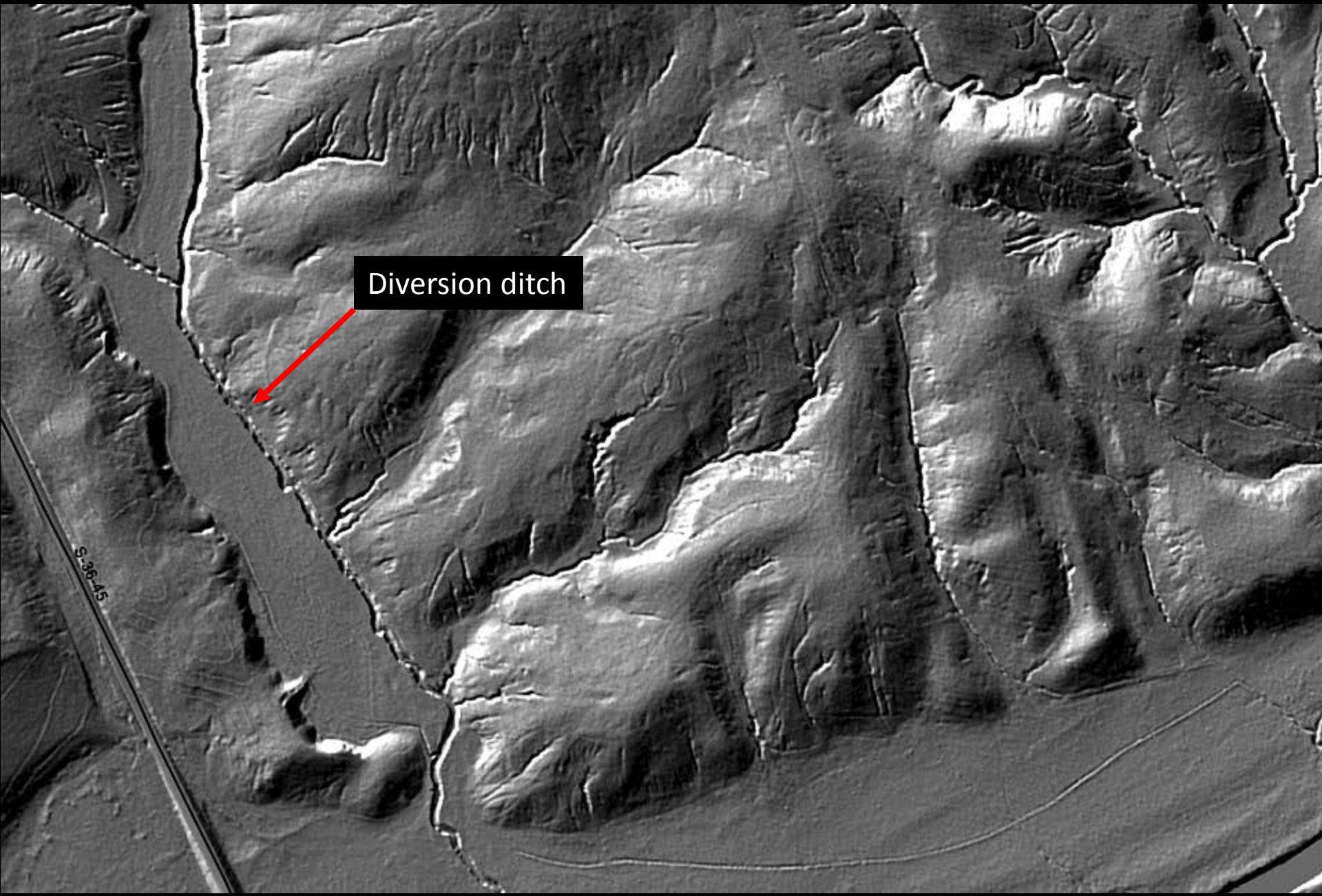


Diversion Ditches




Biltmore Estate
Asheville, North Carolina


Diversion ditch
Lazo Marsh


Diversion ditch
S-36-45

Straightening & Channeling Streams


Stillwater Creek, Wolf County, KY
December 14, 1956

The writer has known of cases where a deep open drain has dried out marshes and swamps through which it passed, for a distance of more than one mile on each side of its banks.
Allen Boyer McDaniel B. Drainage of Farm Lands. 1879

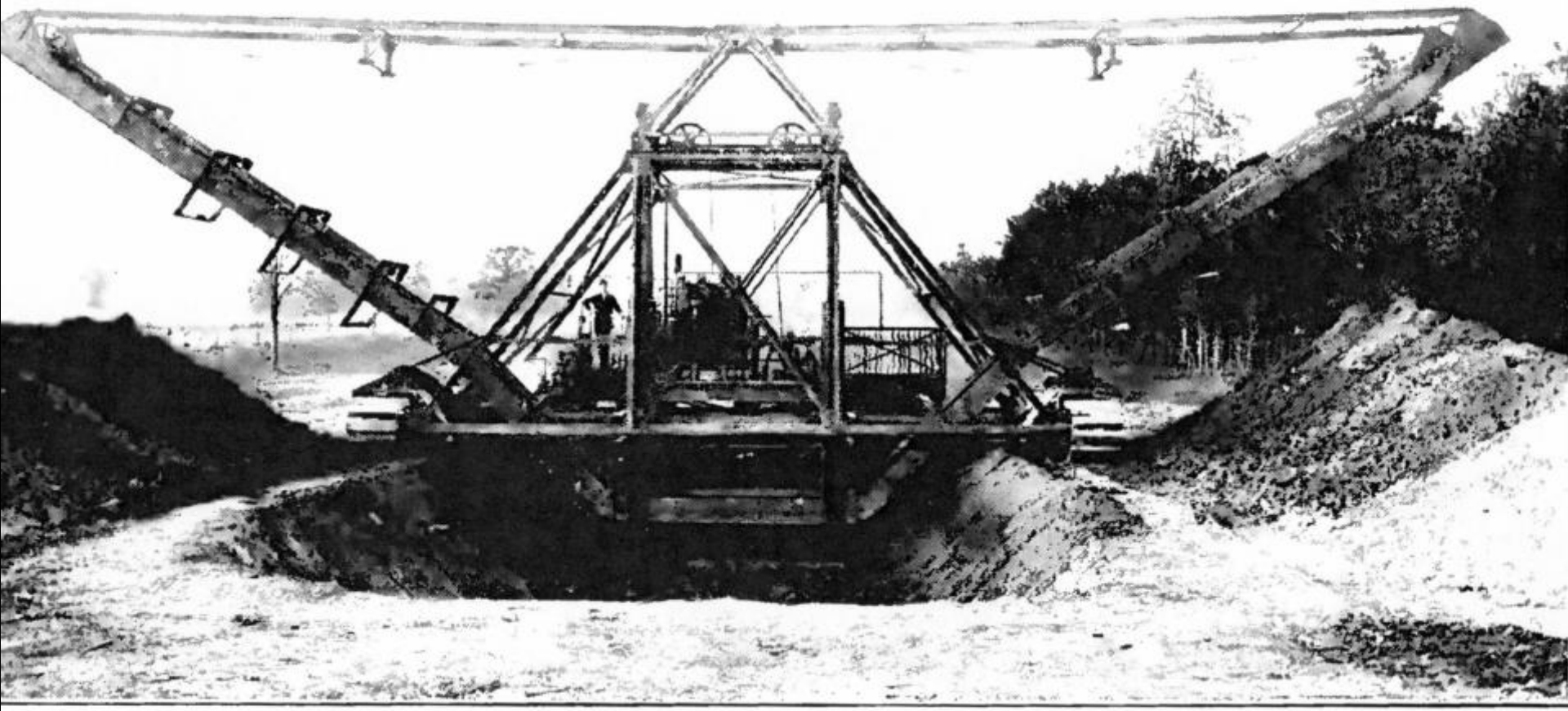


Fig. 8. A Dry Land Dredge or Excavator Constructing a Wide Bottom Drainage Ditch.

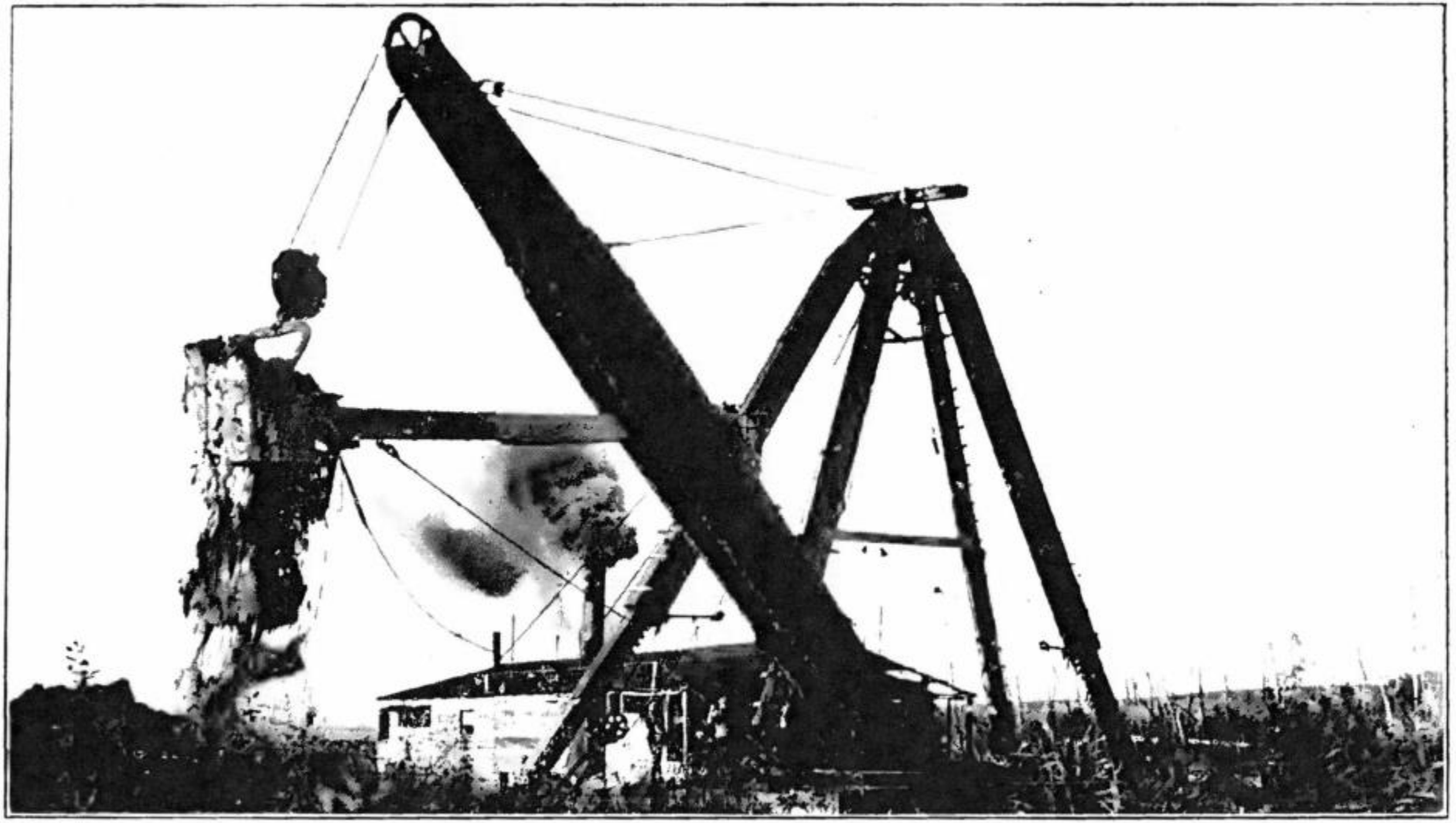


Fig. 11. View of Clay Creek Ditch, Clay and Yankton Counties, South Dakota—Dredge in Operation.

A large, swampy piece of land is a blot on the landscape, a source of ill health, and perhaps a calamity to the people in adjacent communities.

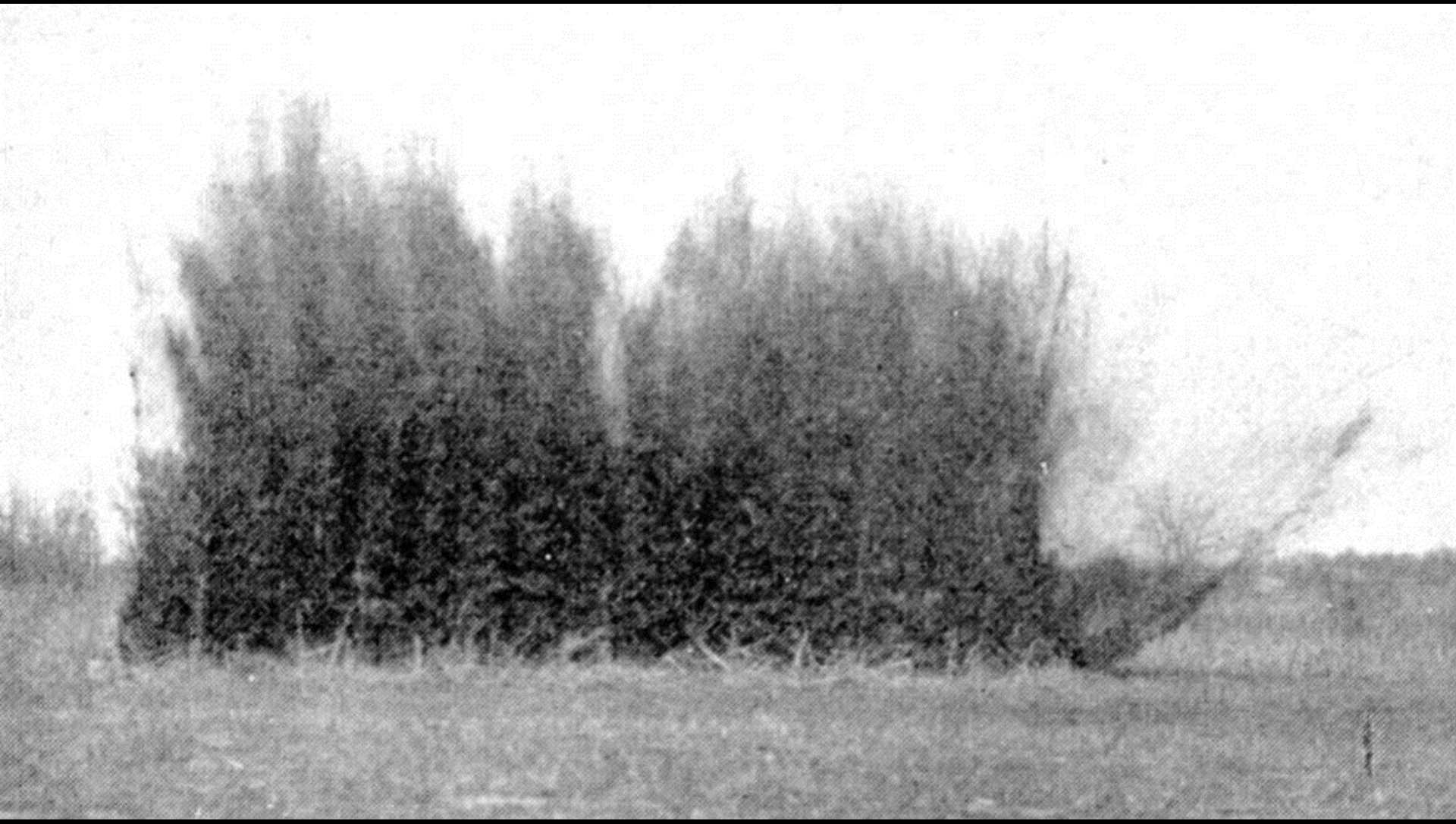
Allen Boyer McDaniel B. Drainage of Farm Lands. 1879


Greenbrier Inn
White Sulphur Springs, WV

Howard’s Creek, Greenbrier Inn

A majority of these straightened streams were once a series of connected wetlands. The water flowing in the channels once maintained wetlands on the surface

Muncie, Indiana



Using World War I surplus dynamite

Moving a stream or digging a ditch will trigger head-cuts to form


Head-cut

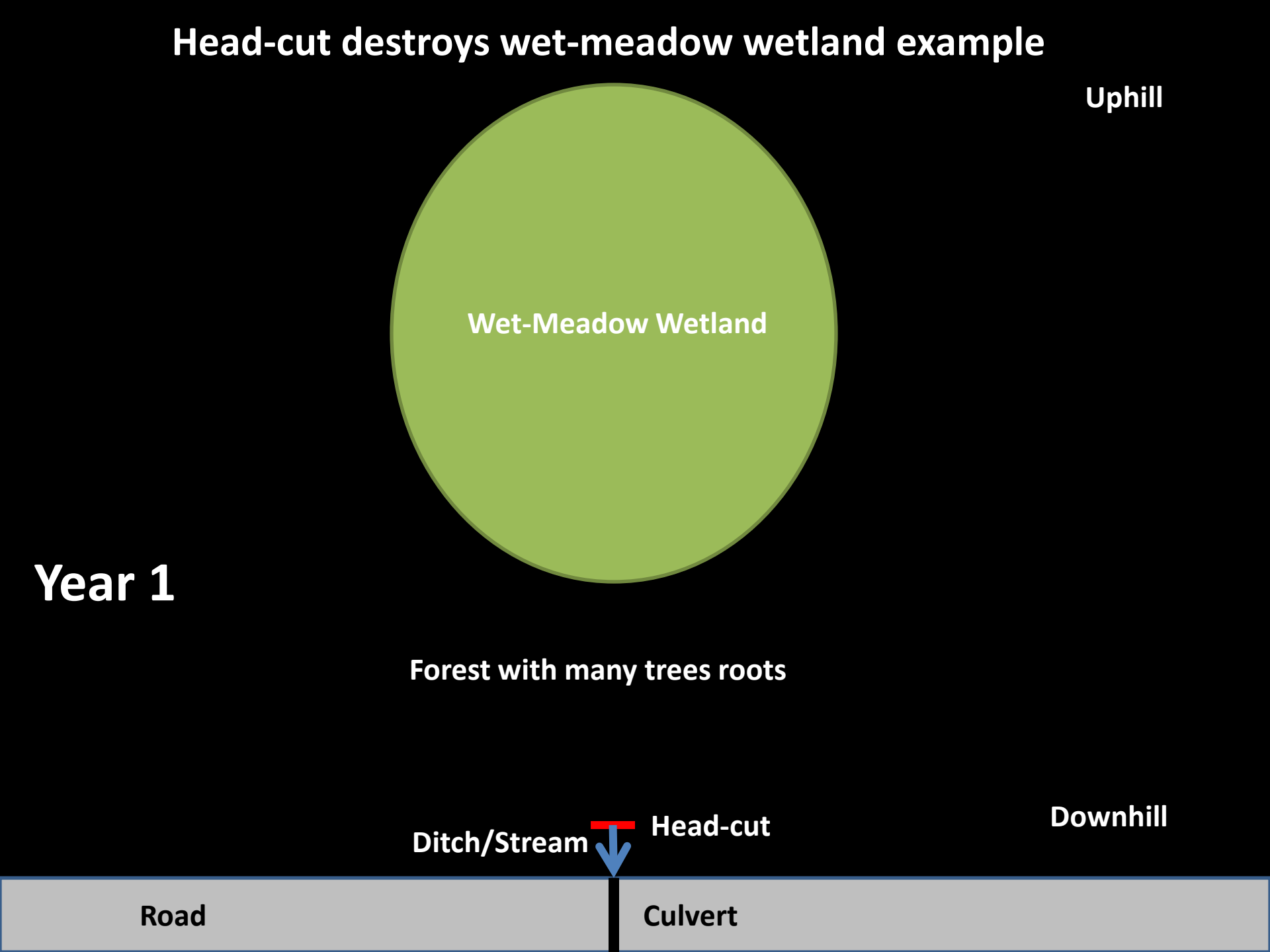

Narrow stream with low banks
Head-cut is advancing upstream
Advancing head-cut leaves
a deeper and wider channel behind


Head-cut


Stream
Head-cuts have moved through this alluvial fan


Diverted stream has eroded down to bedrock

Head-cut destroys wet-meadow wetland example



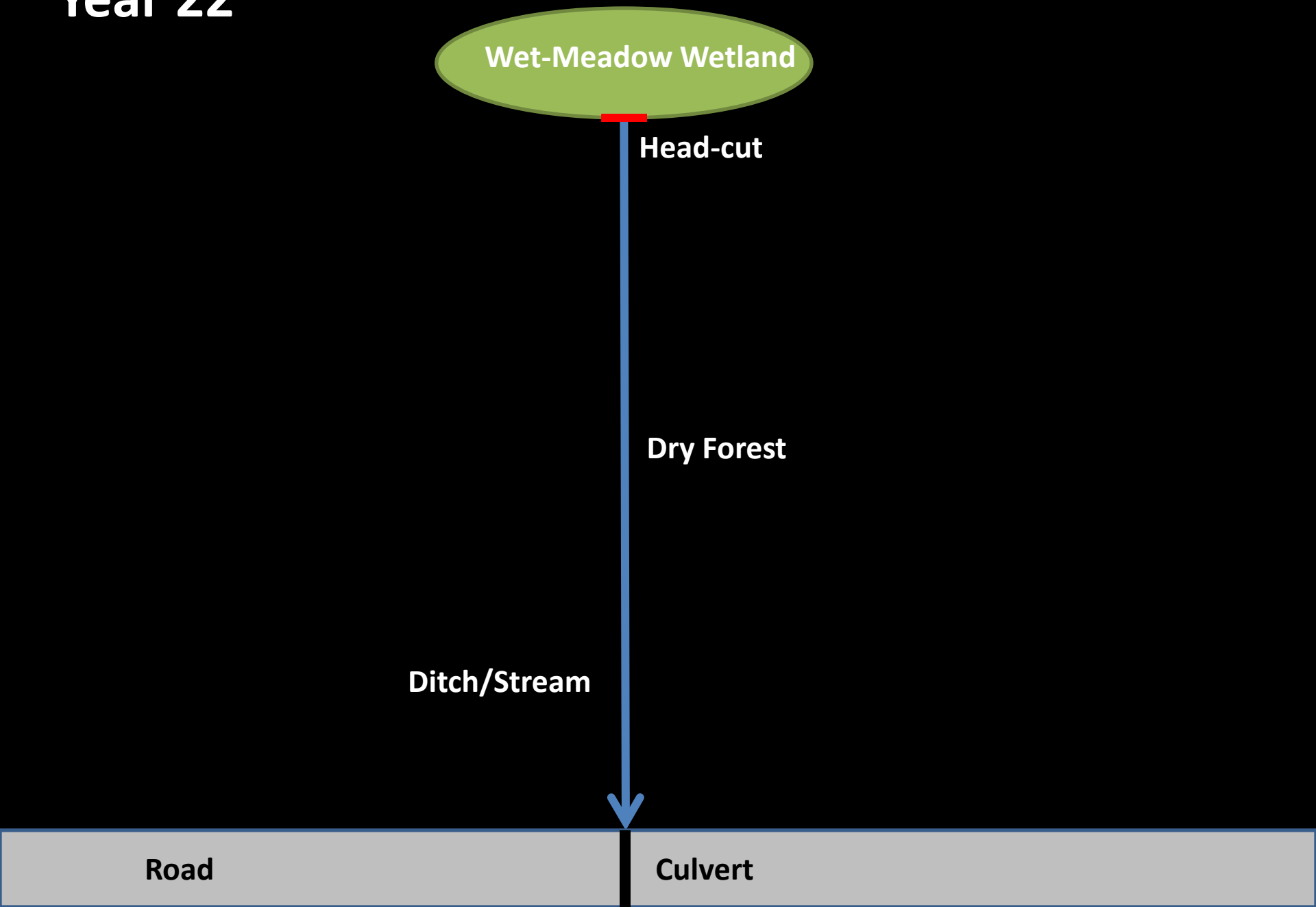
Year 20

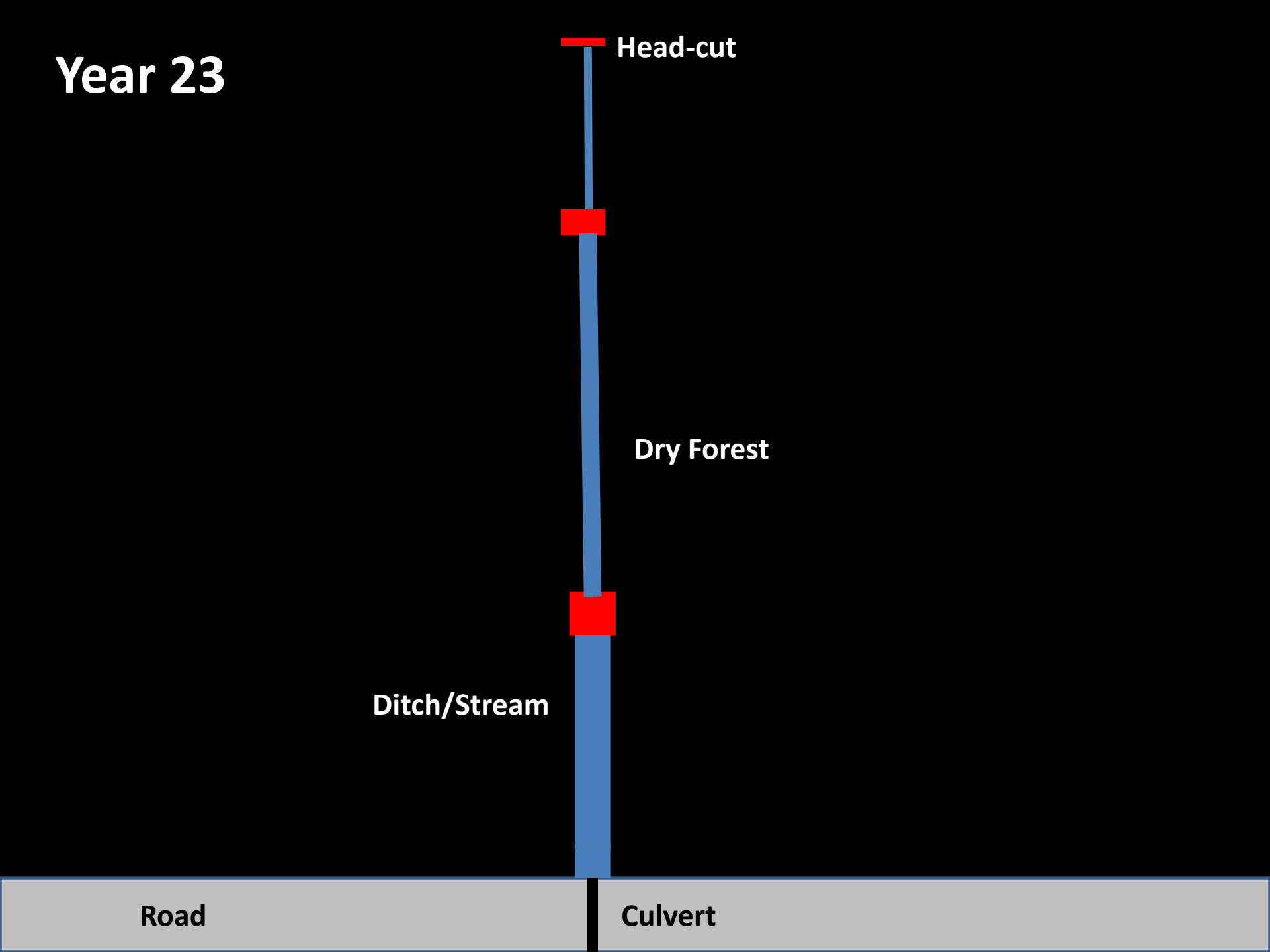

Wet-Meadow Wetland
Head-cut
Dry Forest
Ditch/Stream
Road
Culvert

Year 21


Wet-Meadow Wetland
Head-cut
Dry Forest
Ditch/Stream
Road
Culvert

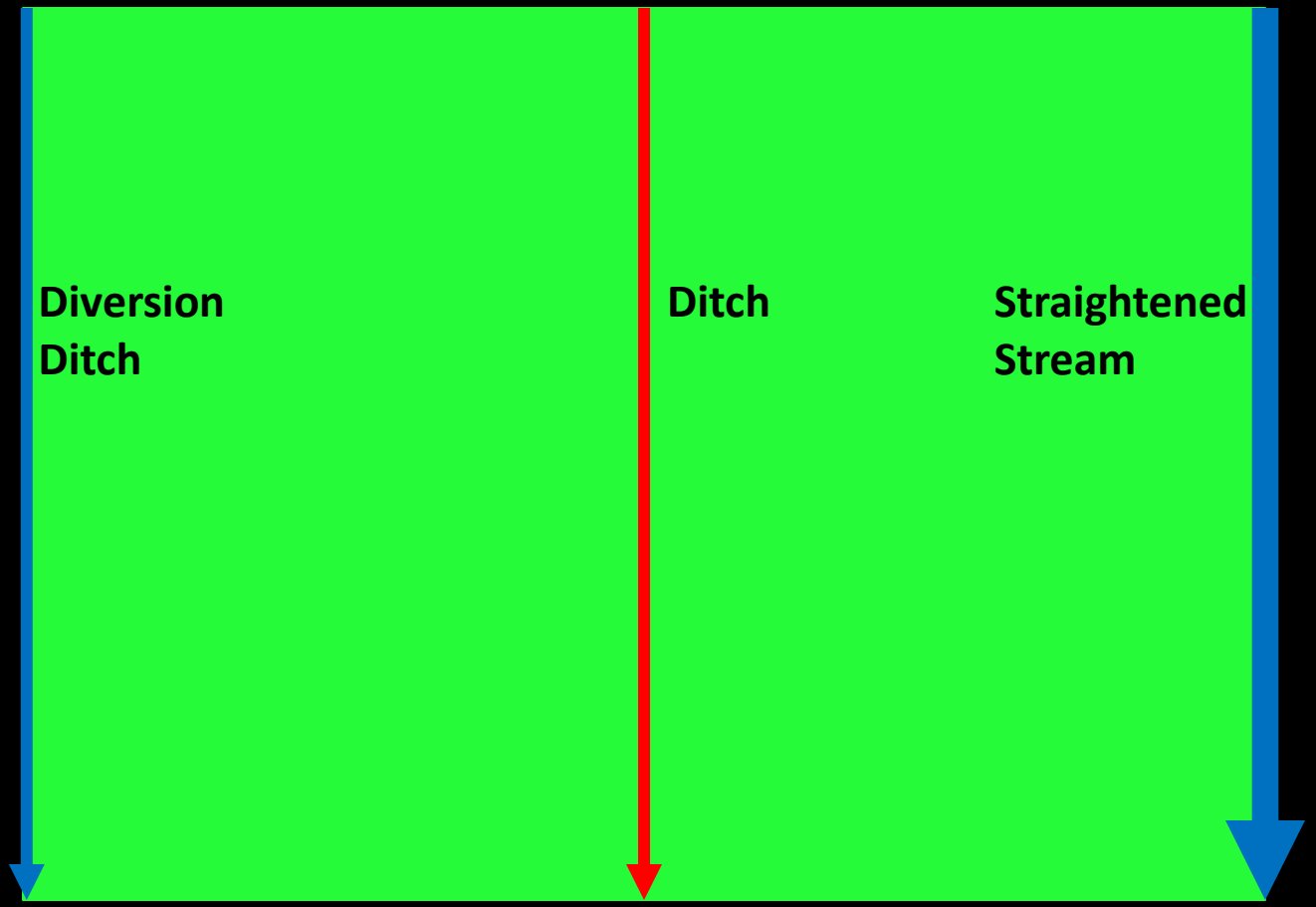
Year 22


Wet-Meadow Wetland
Head-cut
Dry Forest
Ditch/Stream
Road
Culvert


Year 23
Head-cut
Dry Forest
Ditch/Stream
Road
Culvert

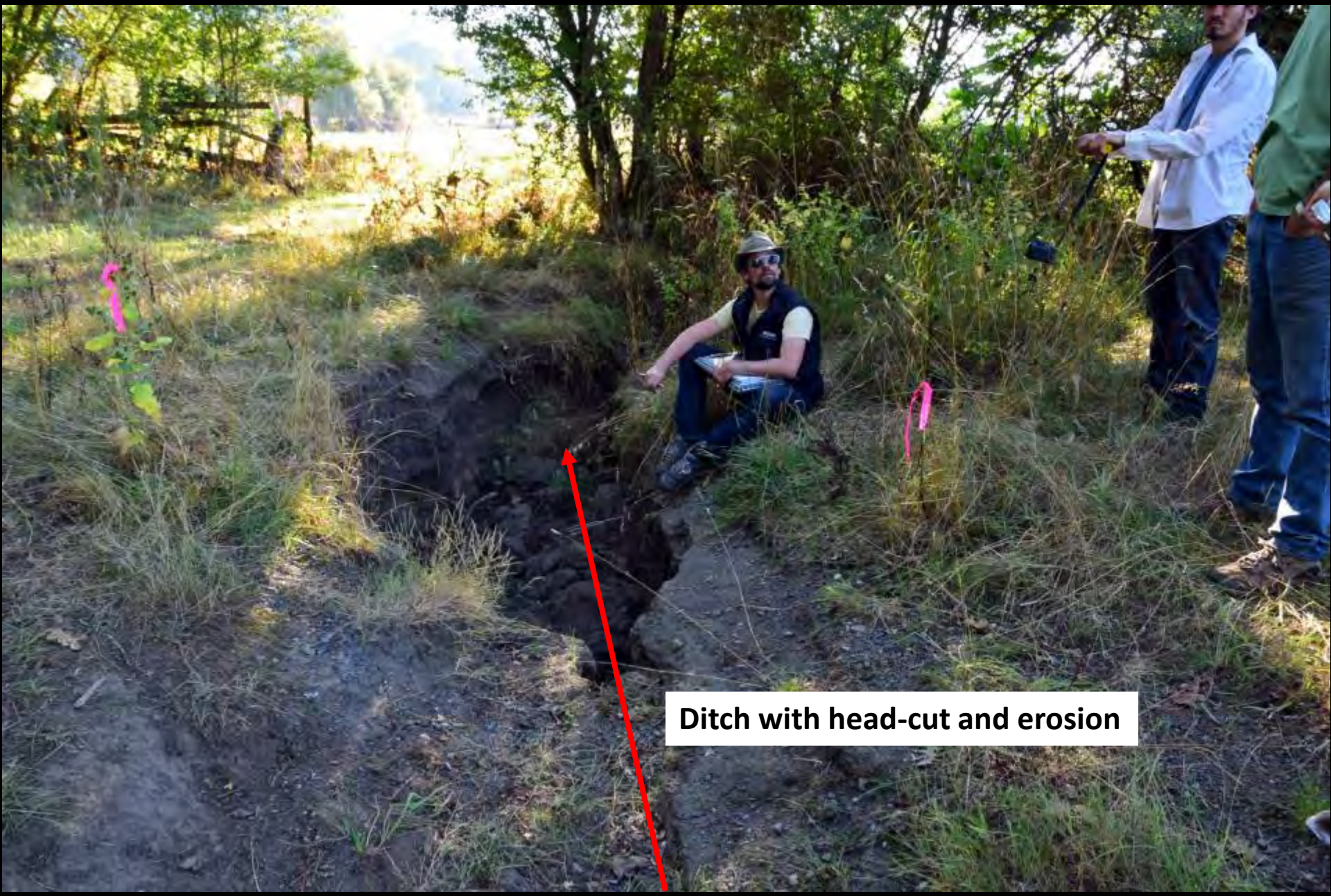
Problems with ditches

A ditch separates one field into two fields



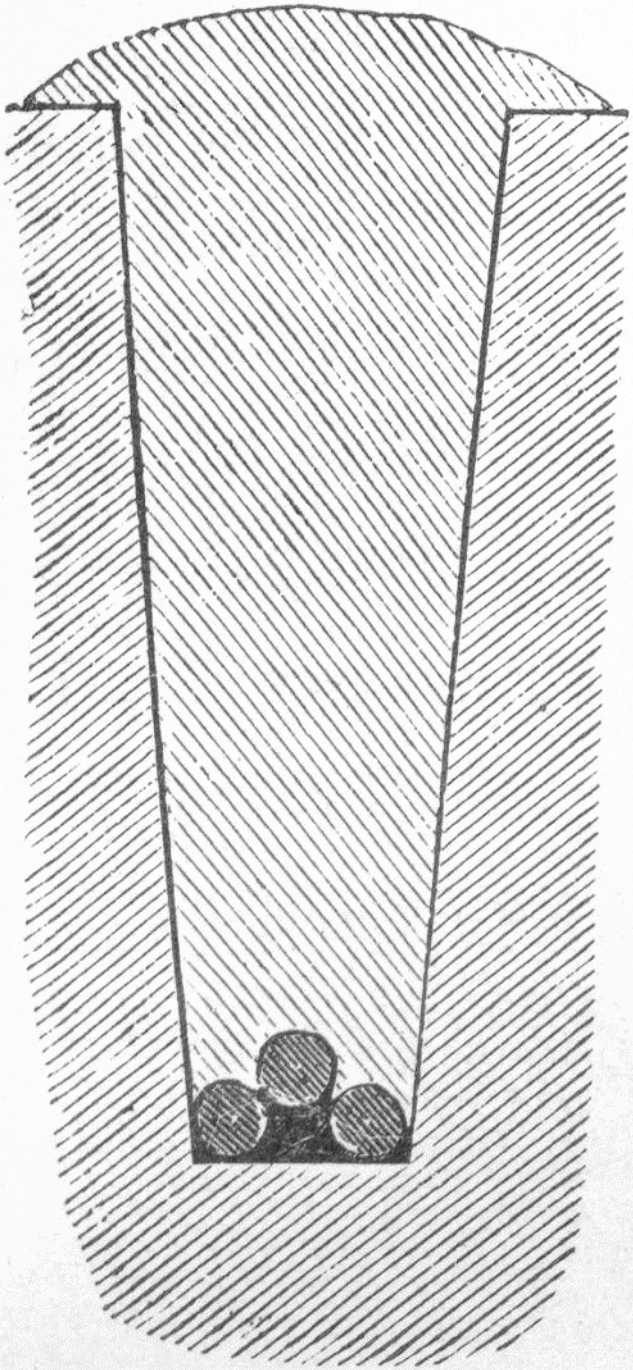

Beaver dam blocking drainage ditch

Beaver dam blocking diversion ditch


Ditch with head-cut and erosion


Fleming County, Kentucky


Menifee County, Kentucky




Dix River
Lincoln County, Kentucky


Bear Creek
Boyd County, Kentucky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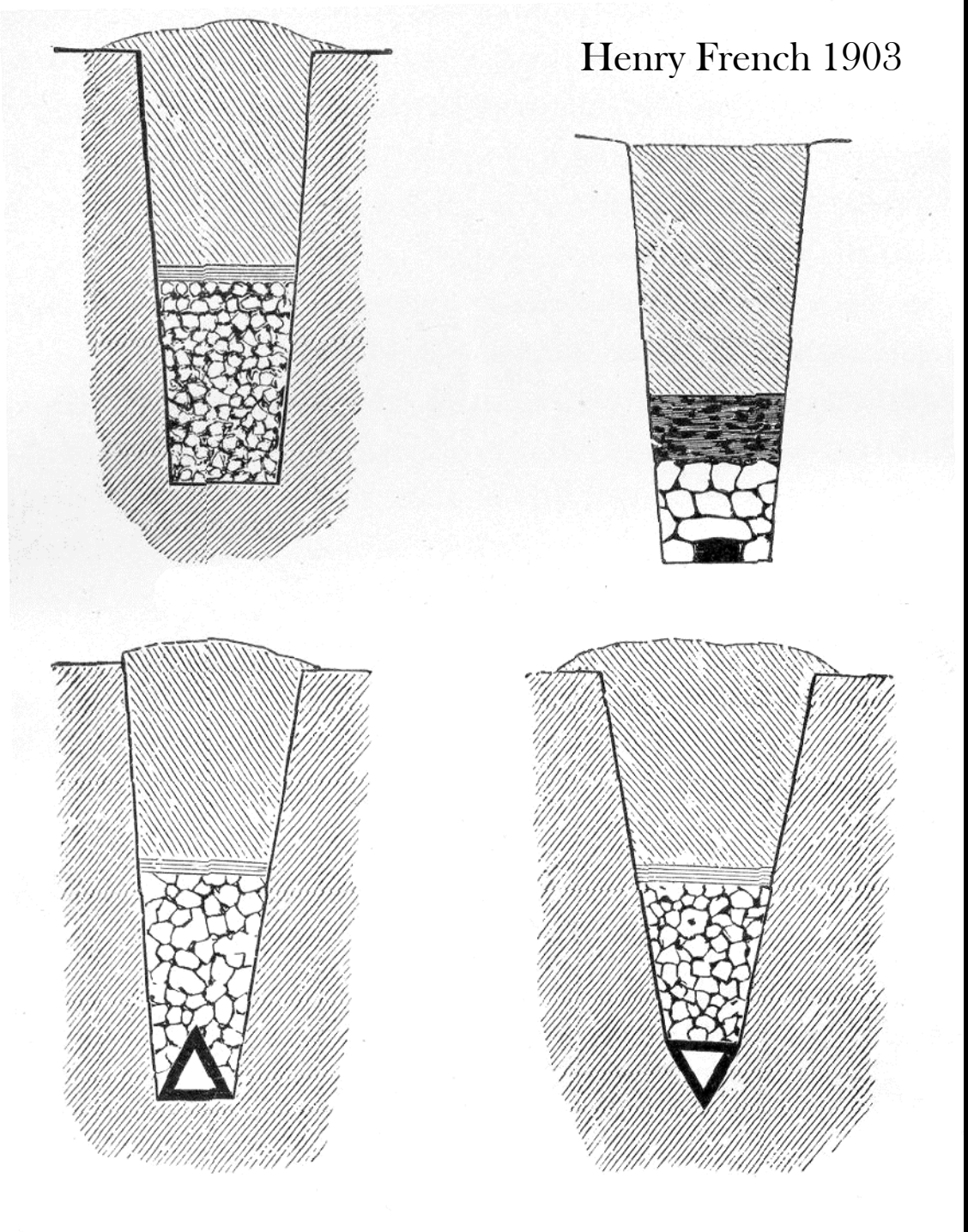
edr-22vT25222-g-19720-21-tonemapped


Duncan, British Columbia

Rock Drains



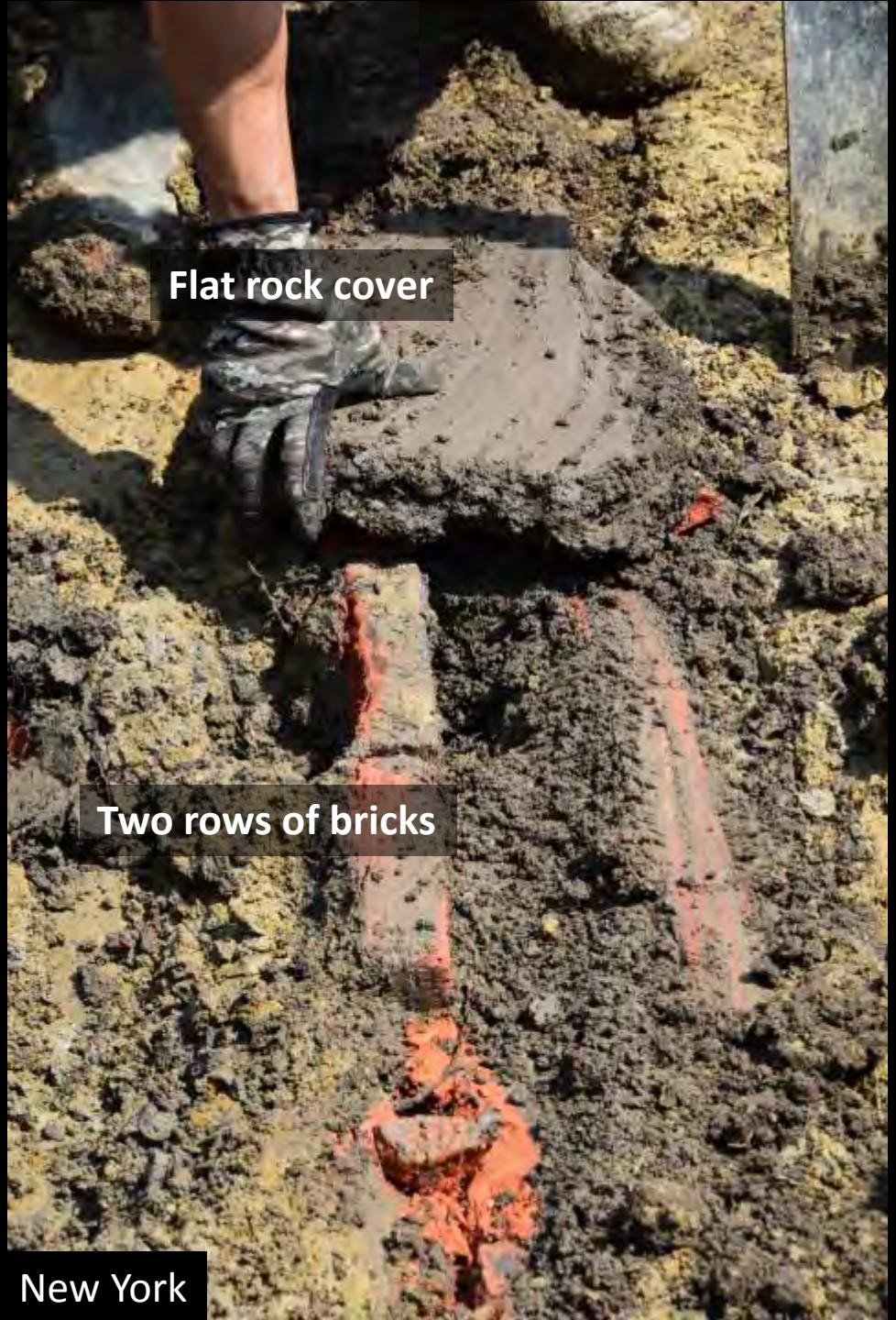

Lost Creek
Carter County, Kentucky


Hector
New York


Victoria
British Columbia


Rock drain
Duncan
British Columbia

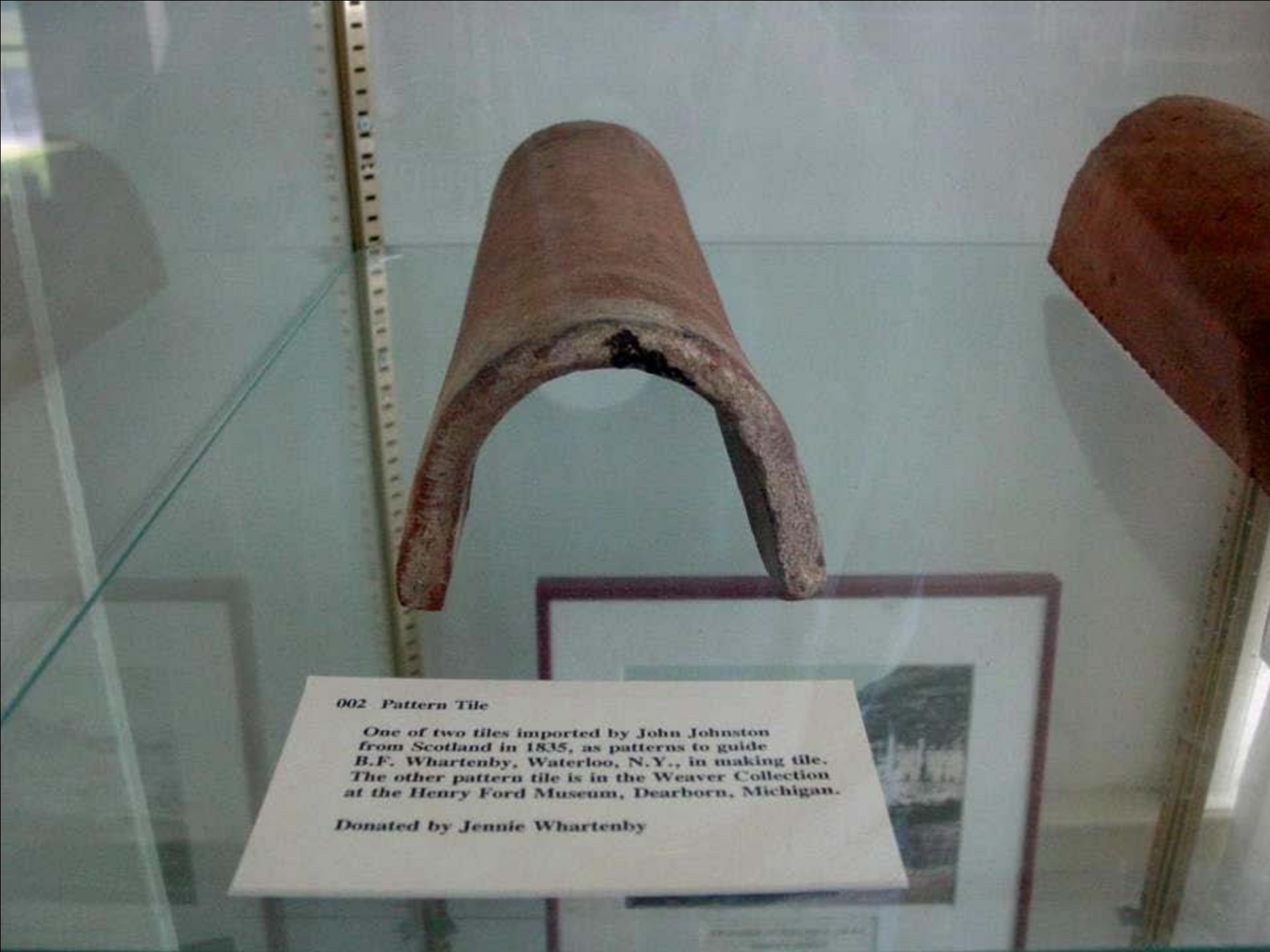

Rock drain
Duncan
British Columbia

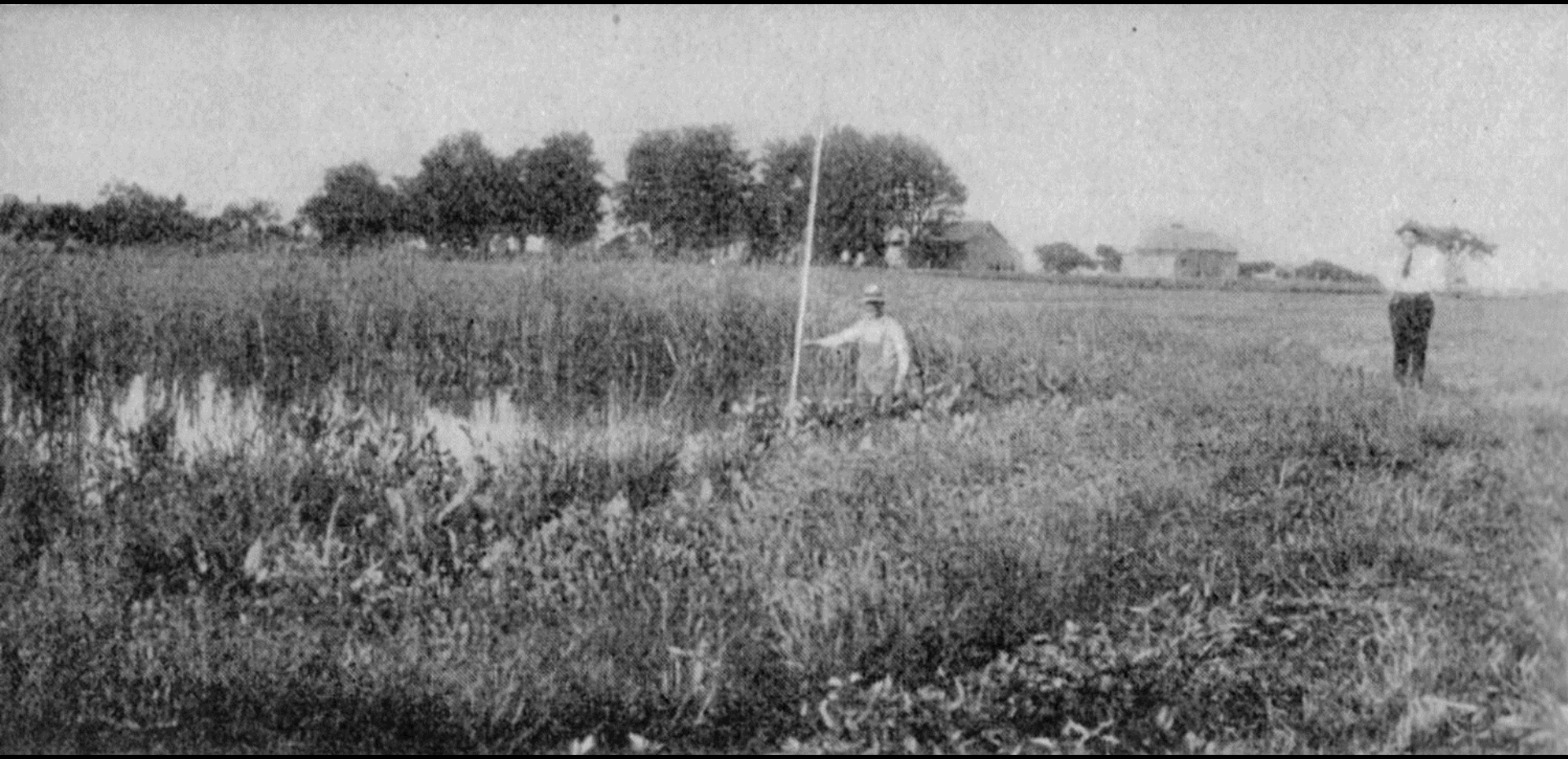


New York

John Johnston

Geneva, New York


002 Pattern Tile
One of two tiles imported by John Johnston from Scotland in 1835, as patterns to guide B.F. Whartenby, Waterloo, N.Y., in making tile. The other pattern tile is in the Weaver Collection at the Henry Ford Museum, Dearborn, Michigan.
Donated by Jennie Whartenby



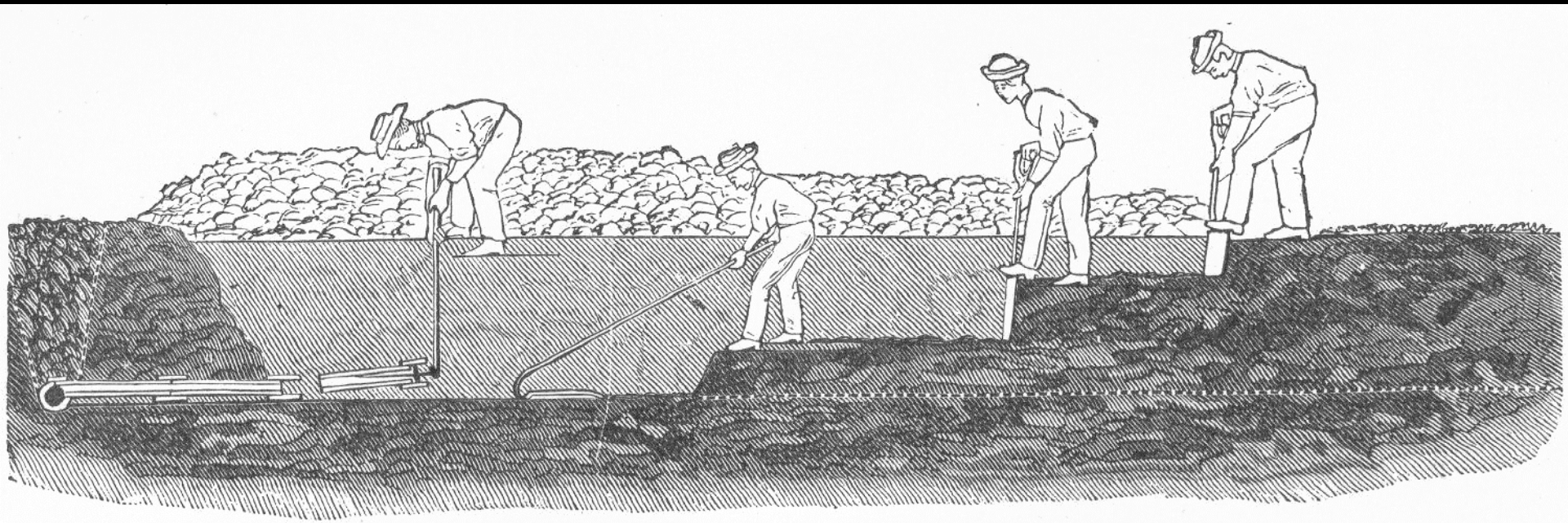


Fig. 65.—OPENING THE DITCH AND LAYING THE TILES.

How tile drainage improves fields

Before

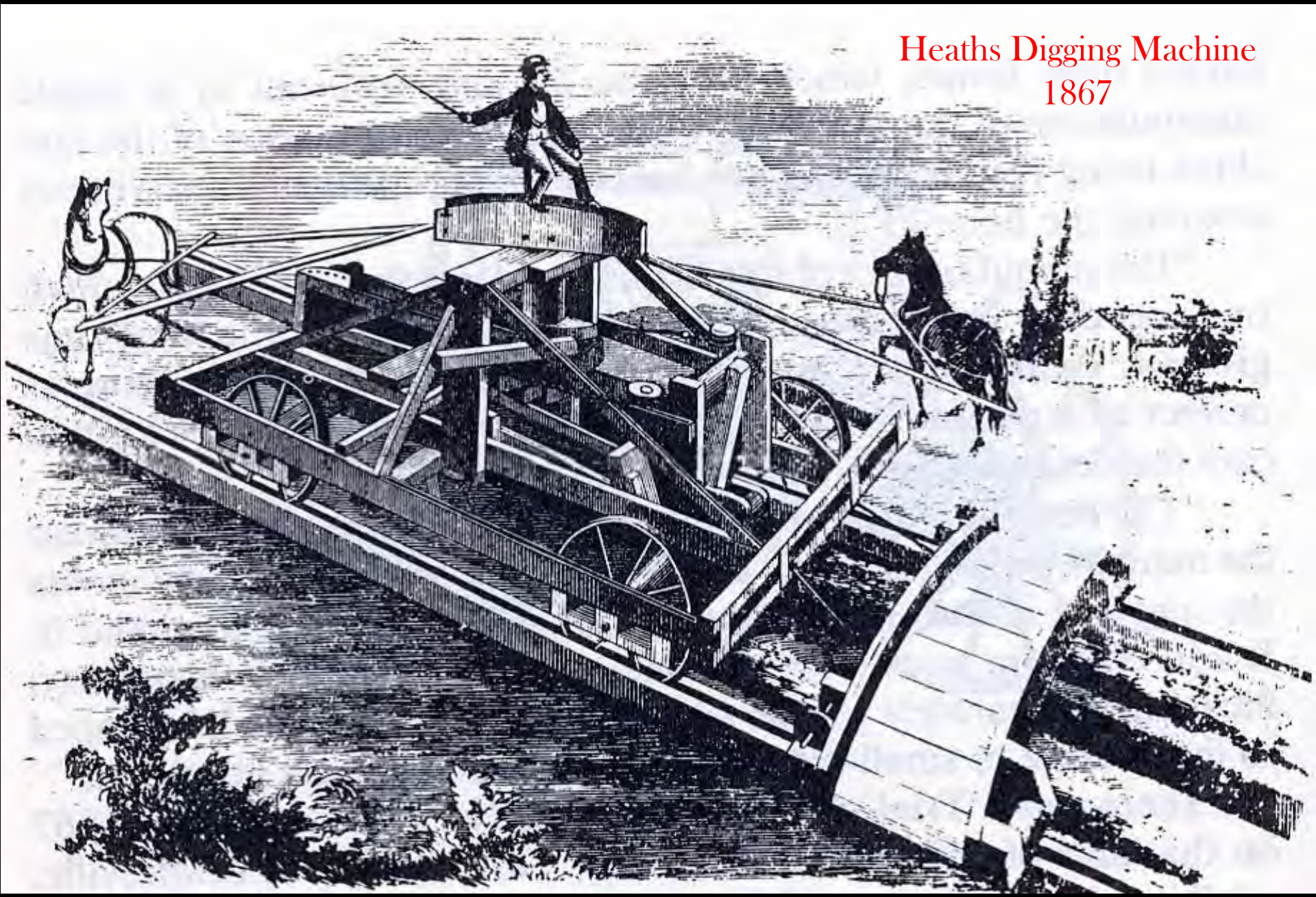
After

Elementary Agriculture by K.L. Hatch, pp. 64-65, 1907

Not Drained

Drained

Buried drain lines remove water from a wetland much like the hole in the bottom of a flower pot, only the field is much larger!

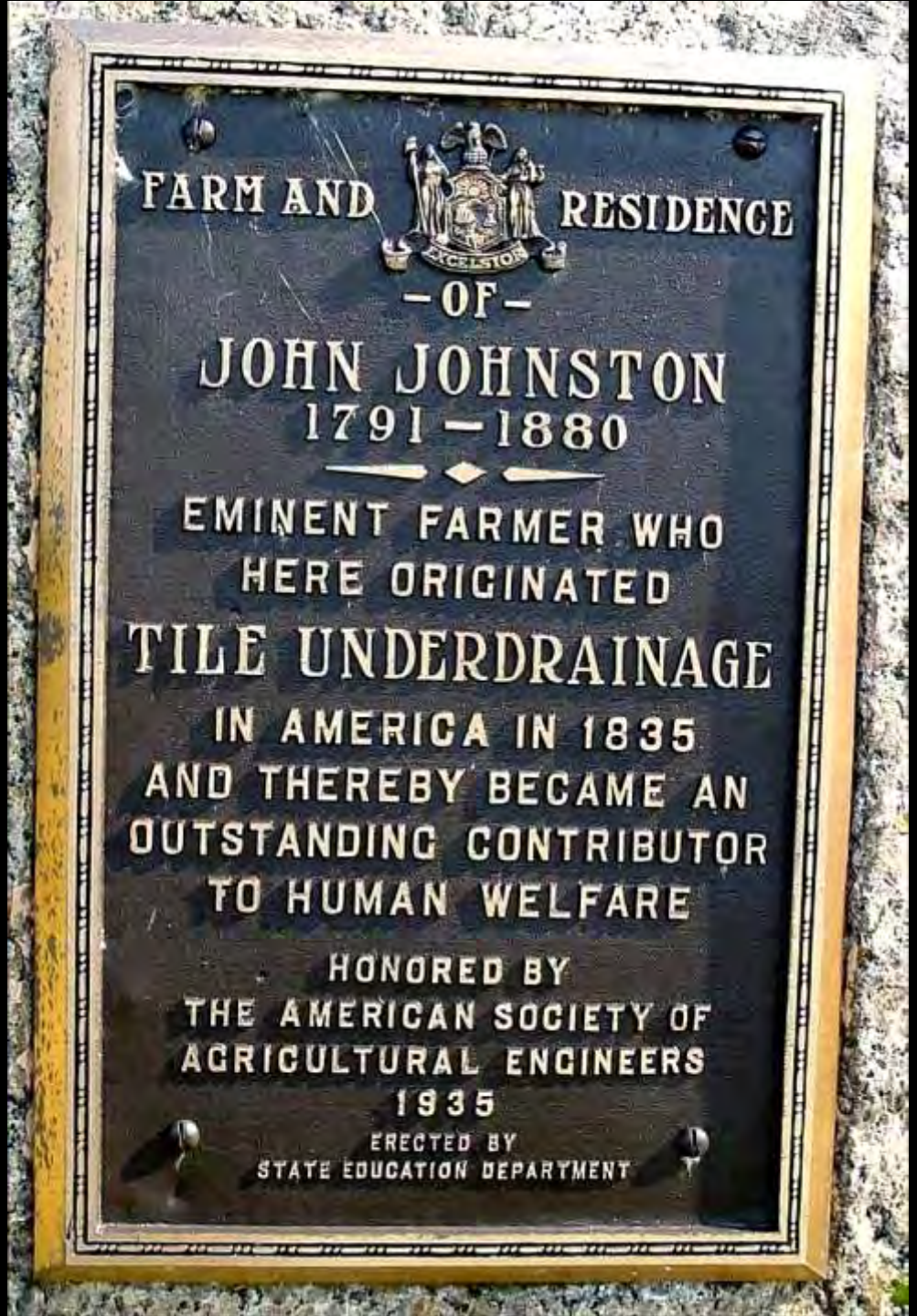

Heaths Digging Machine
1867

B.F. Whartenby Clay Tile Factory Waterloo, NY

By 1871 there were 10-factories manufacturing clay drain tile in Waterloo!

John Johnston Farm
72 miles of buried clay tiles installed on 320-acres


The Commercial
Waterloo Advertiser.
LEE & LUCAS
NEW GOODS,
FLAX-SEED.
SAW LOGS.
500 Pine,
400 Oak, and
200 White-wood
ALMANAC
1851


FARM AND RESIDENCE
EXCELSIOR
-OF-
JOHN JOHNSTON
1791—1880
EMINENT FARMER WHO
HERE ORIGINATED
TILE UNDERDRAINAGE
IN AMERICA IN 1835
AND THEREBY BECAME AN
OUTSTANDING CONTRIBUTOR
TO HUMAN WELFARE
HONORED BY
THE AMERICAN SOCIETY OF
AGRICULTURAL ENGINEERS
1935
ERECTED BY
STATE EDUCATION DEPARTMENT

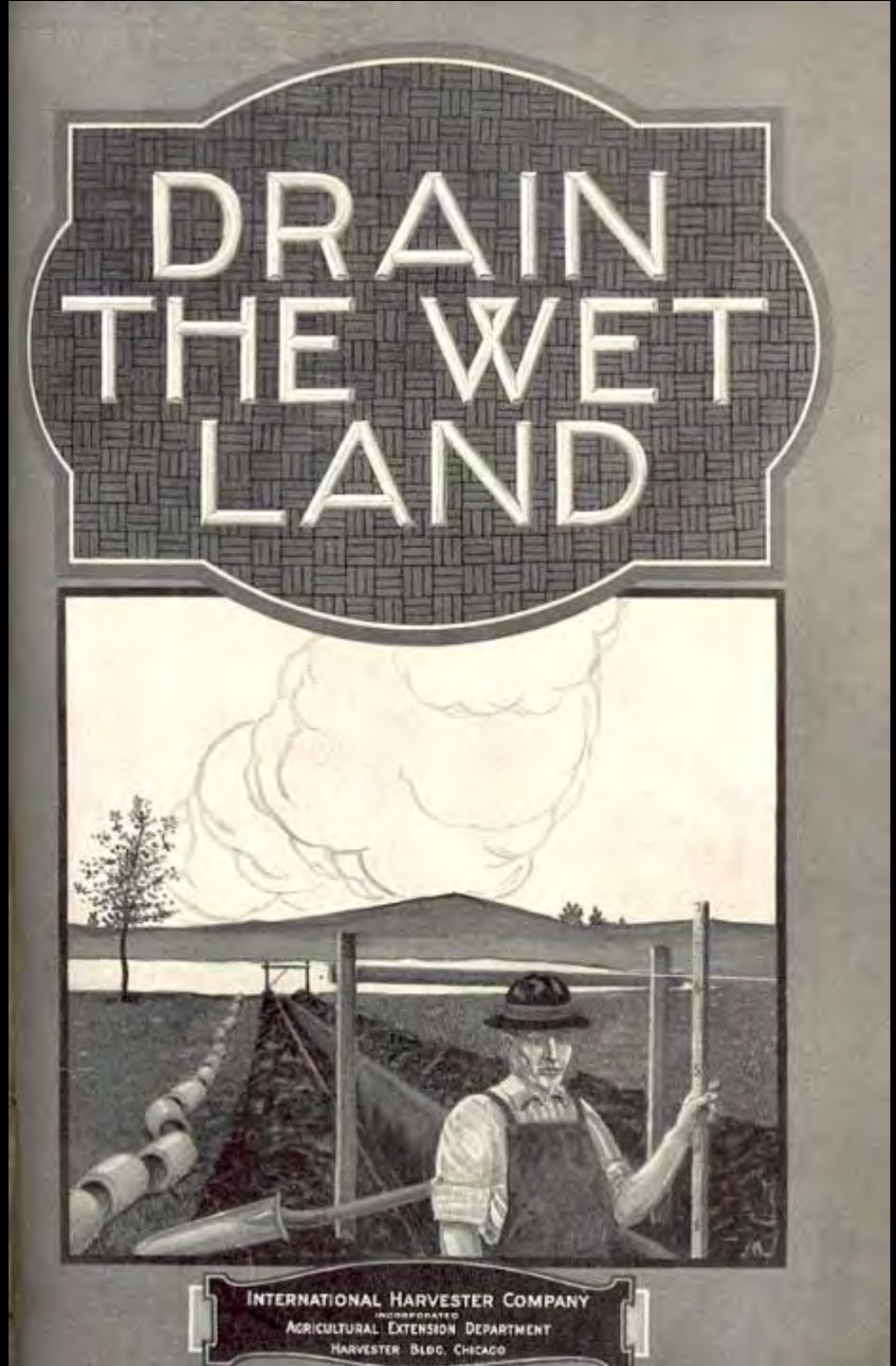

Mike Weaver
DRAIN TILE MUSEUM
Home of John Johnston
"Father of Tile Drainage in America"
FOR ADMISSION PROCEED TO ROSE HILL MANSION
4/10 MI. NORTH ON 96A


Geneva, New York

Before installation of buried clay tile

After installation

1,140 Factories manufacturing clay tile in US by 1882!



Wetland drainage techniques were advanced and shared

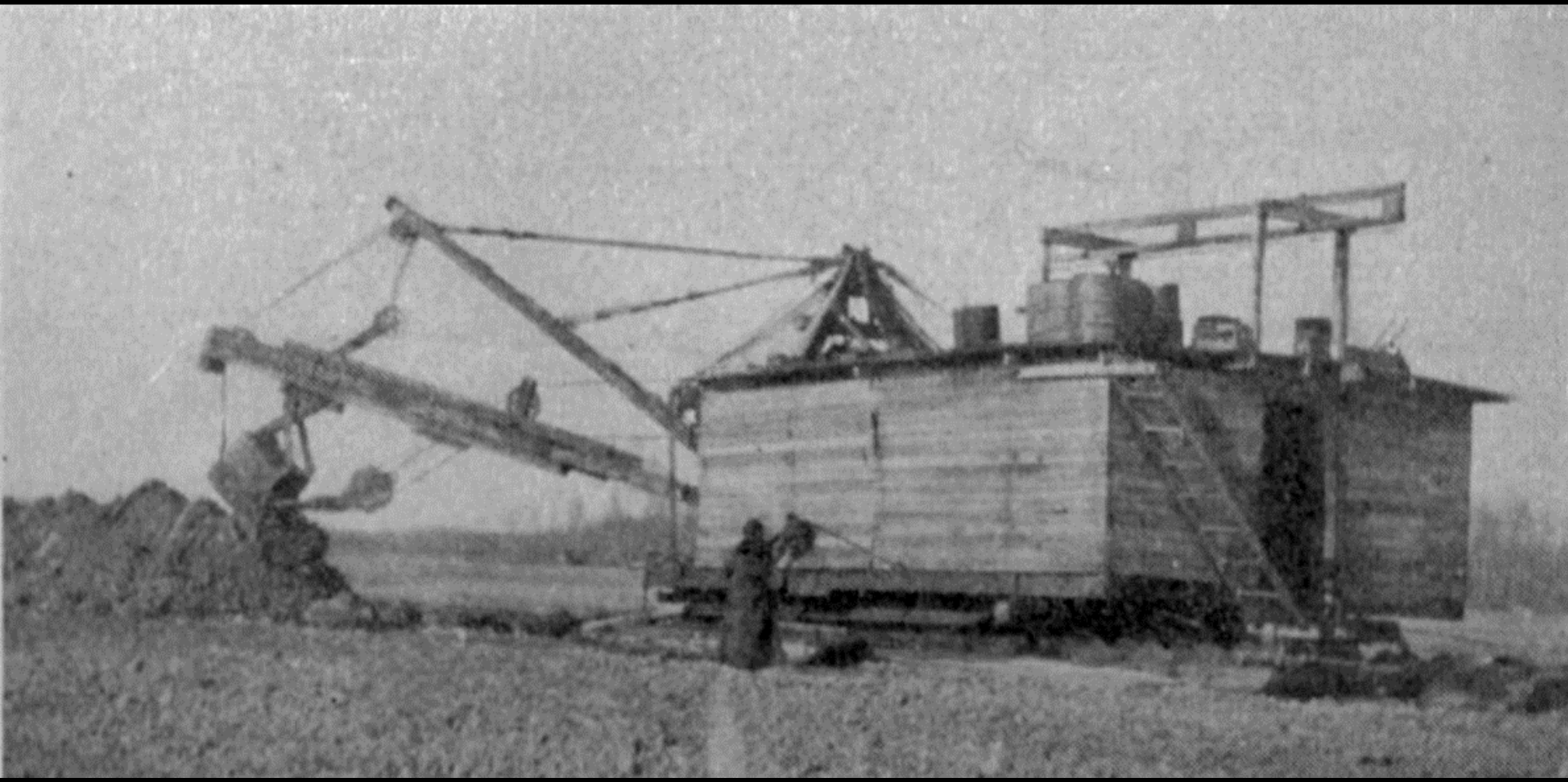
Farm Drainage Handbook

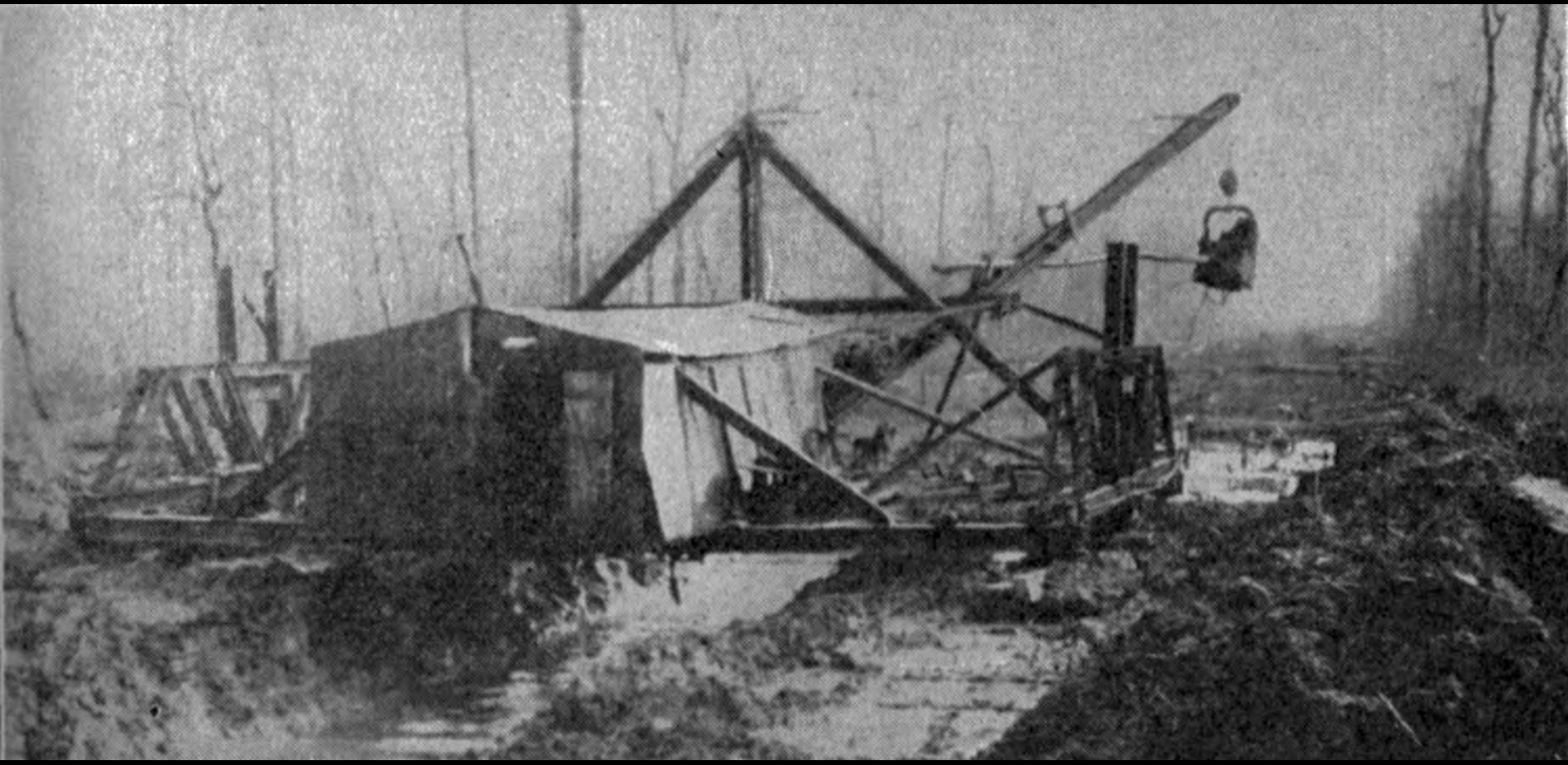
Extension Bulletin 269 1951

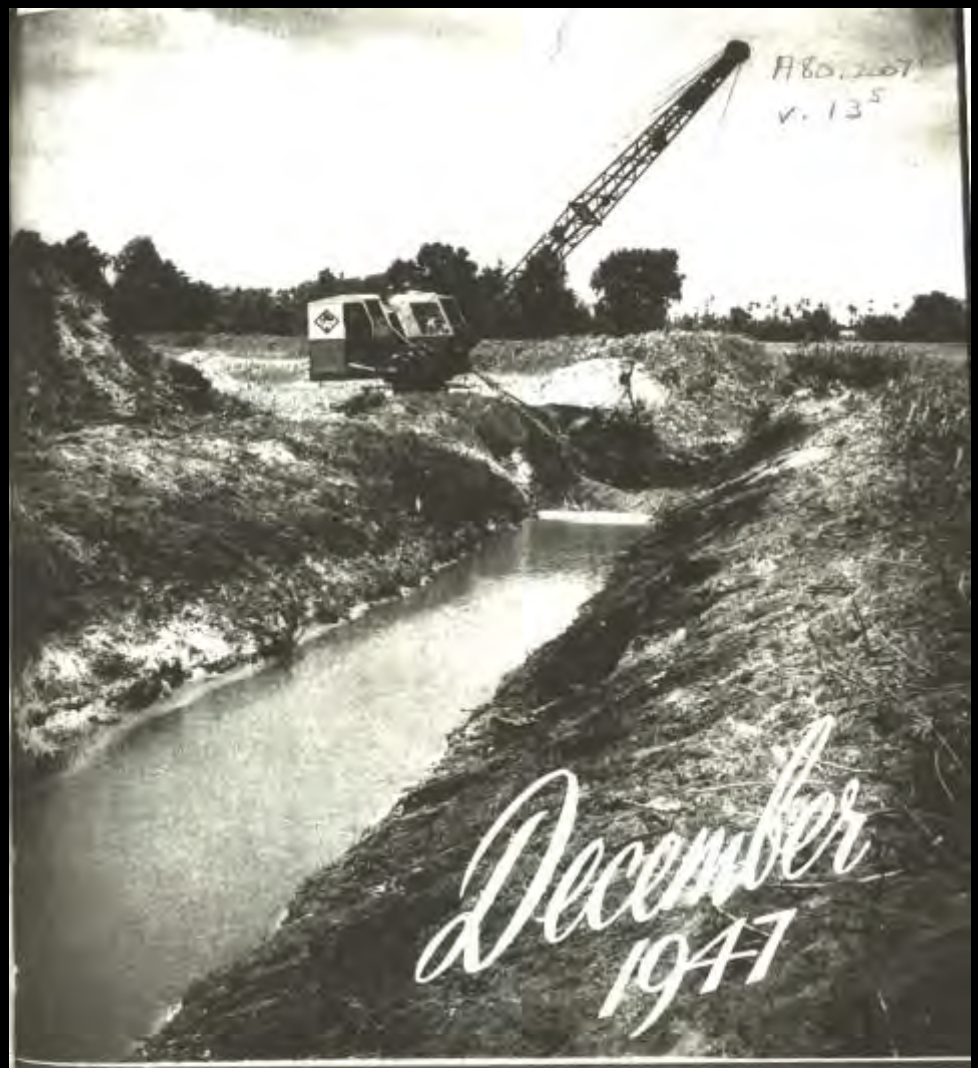
FARM DRAINAGE in 10 Easy Lessons

PURDUE UNIVERSITY
Agricultural Extension Service
Lafayette, Indiana

Drainage Districts were formed to create the outlets needed for buried drain lines





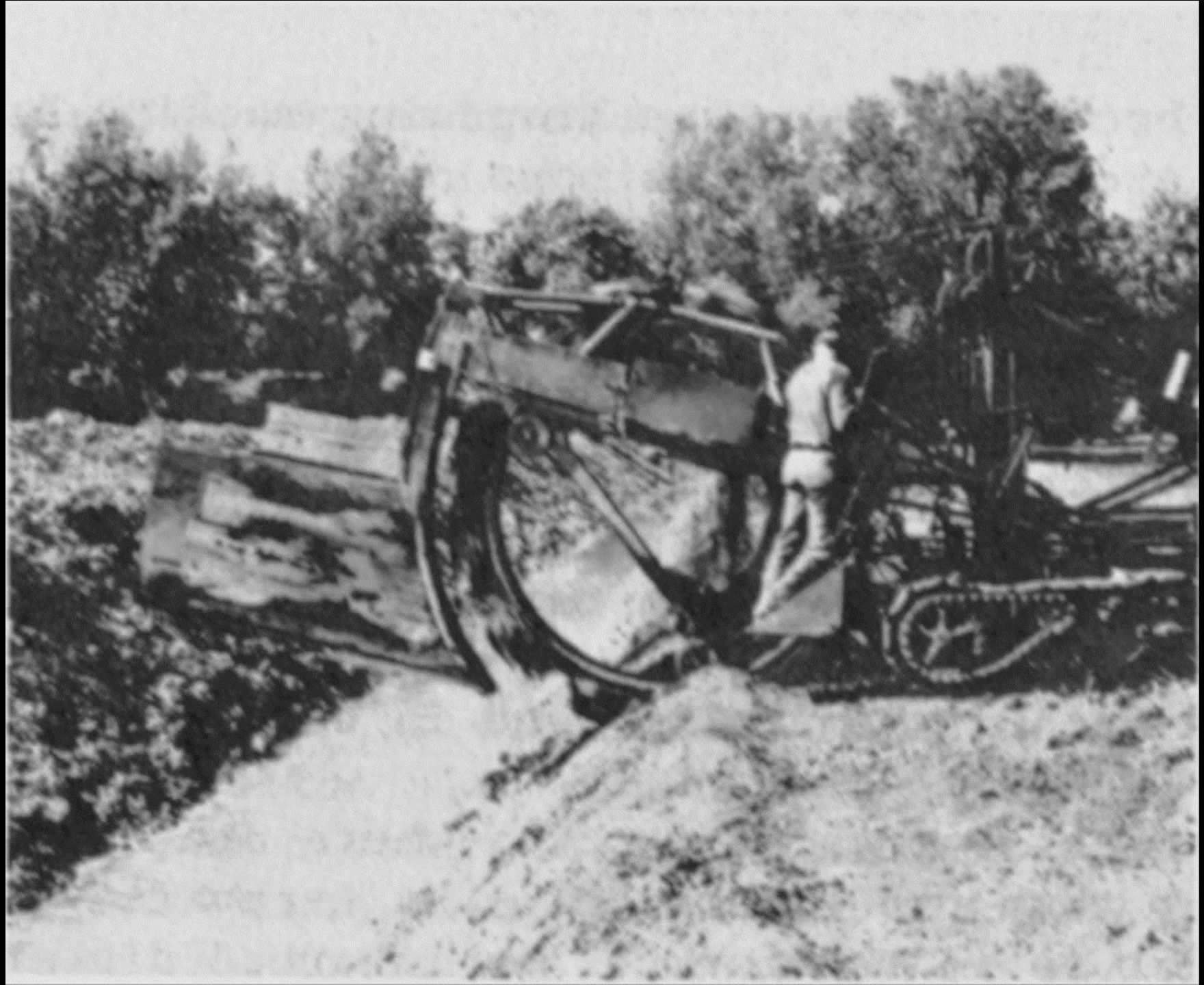


December 1947

SOIL CONSERVATION

OFFICIAL ORGAN OF THE SOIL CONSERVATION SERVICE

UNITED STATES DEPARTMENT OF AGRICULTURE WASHINGTON D. C.



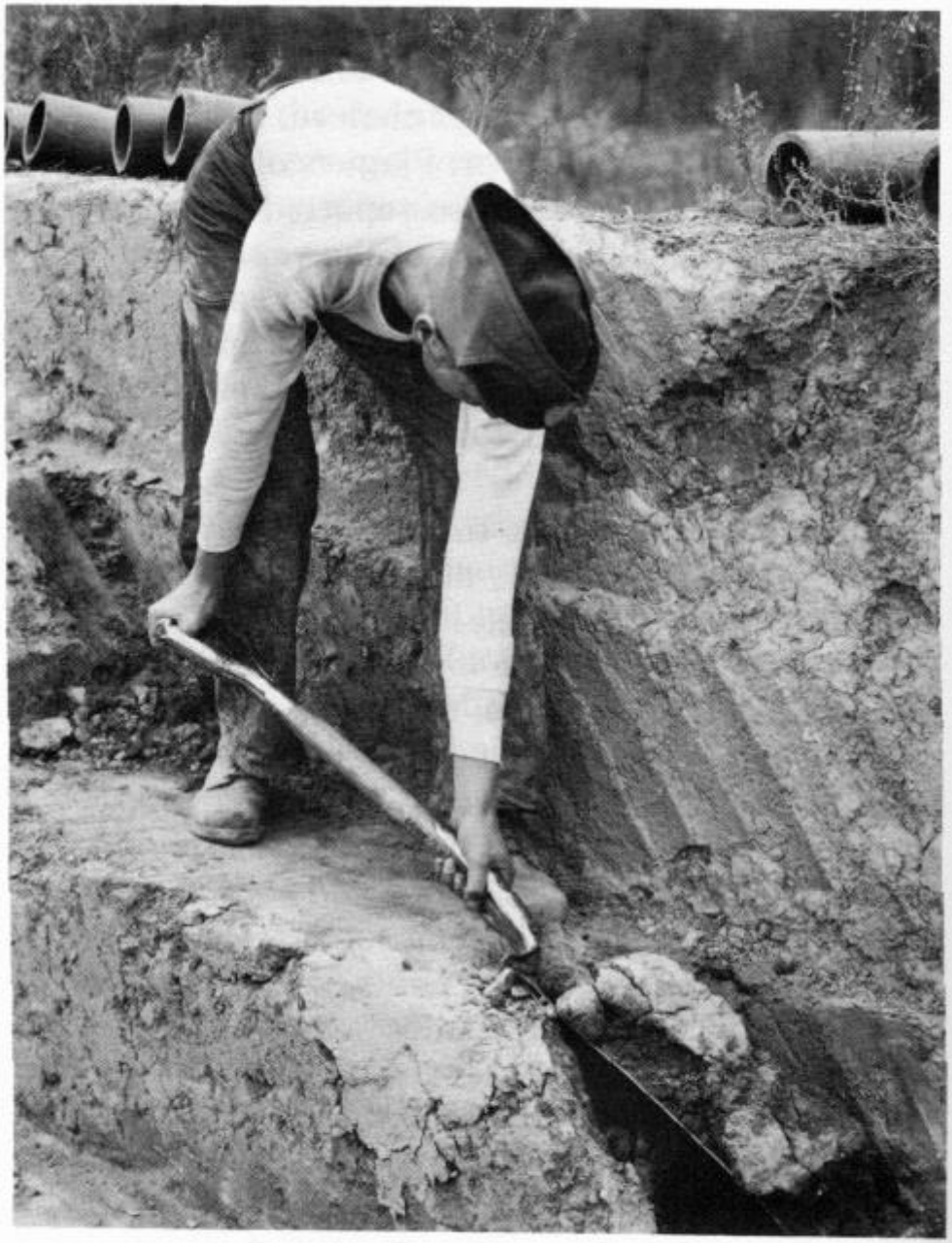
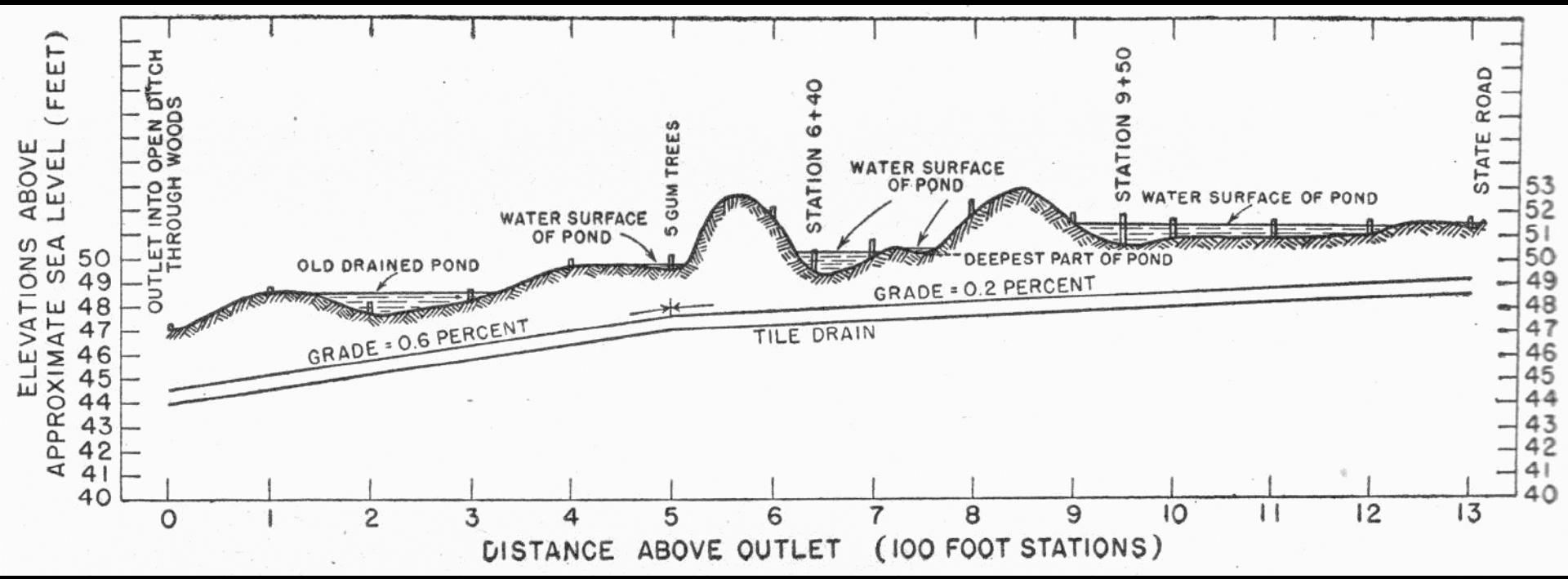
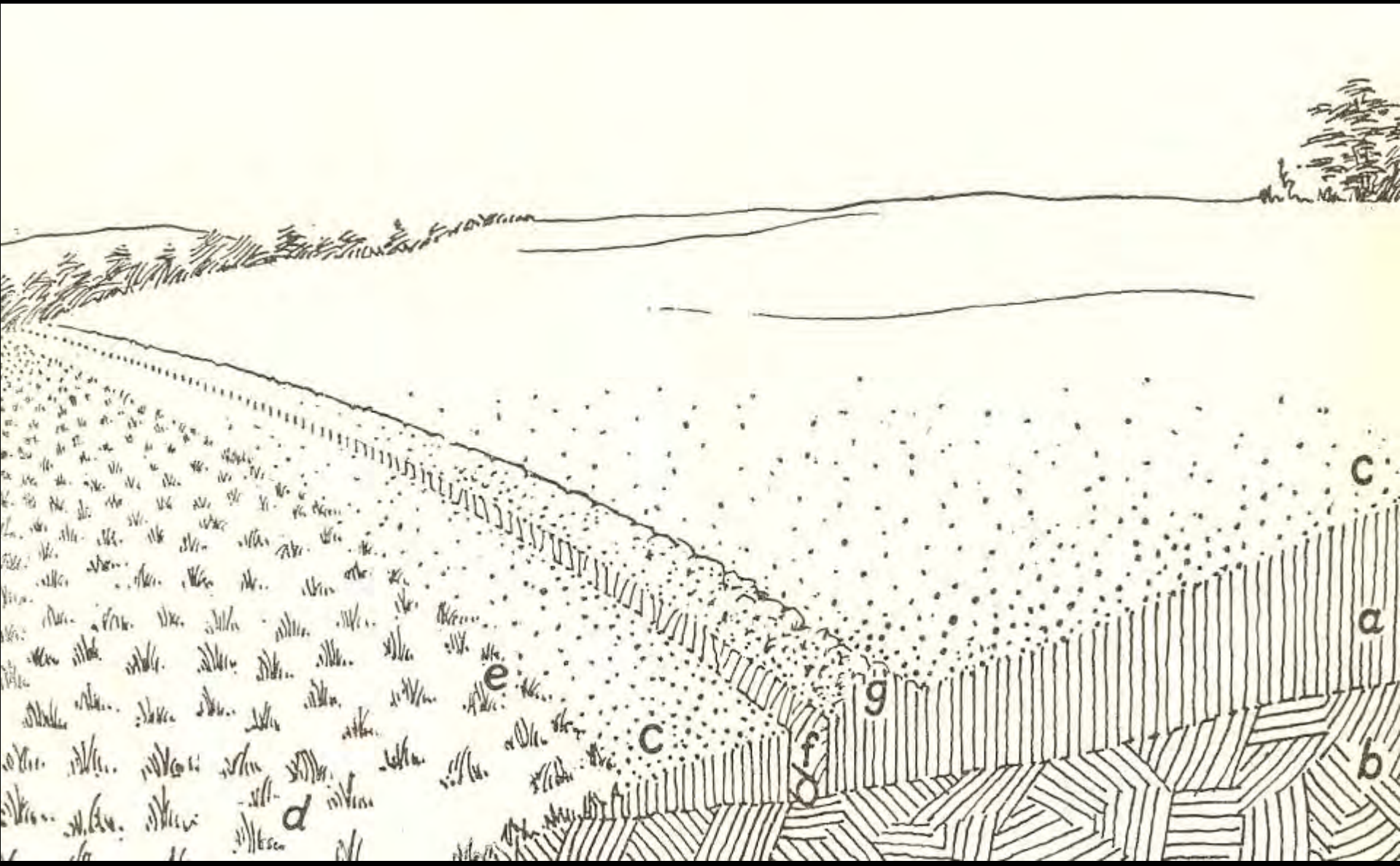


Figure 2-2—Drainage rehabilitation work occurred during the Depression thanks in part to the Civilian Conservation Corps.


ELEVATIONS ABOVE APPROXIMATE SEA LEVEL (FEET)
OUTLET INTO OPEN DITCH THROUGH WOODS
OLD DRAINED POND
WATER SURFACE OF POND
5 GUM TREES
STATION 6+40
WATER SURFACE OF POND
STATION 9+50
WATER SURFACE OF POND
STATE ROAD
DEEPEST PART OF POND
GRADE = 0.2 PERCENT
GRADE = 0.6 PERCENT
TILE DRAIN
50 49 48 47 46 45 44 43 42 41 40
53 52 51 50 49 48 47 46 45 44 43 42 41 40
0 1 2 3 4 5 6 7 8 9 10 11 12 13
DISTANCE ABOVE OUTLET (100 FOOT STATIONS)


550G


c
a
e
g
c
f
b
d

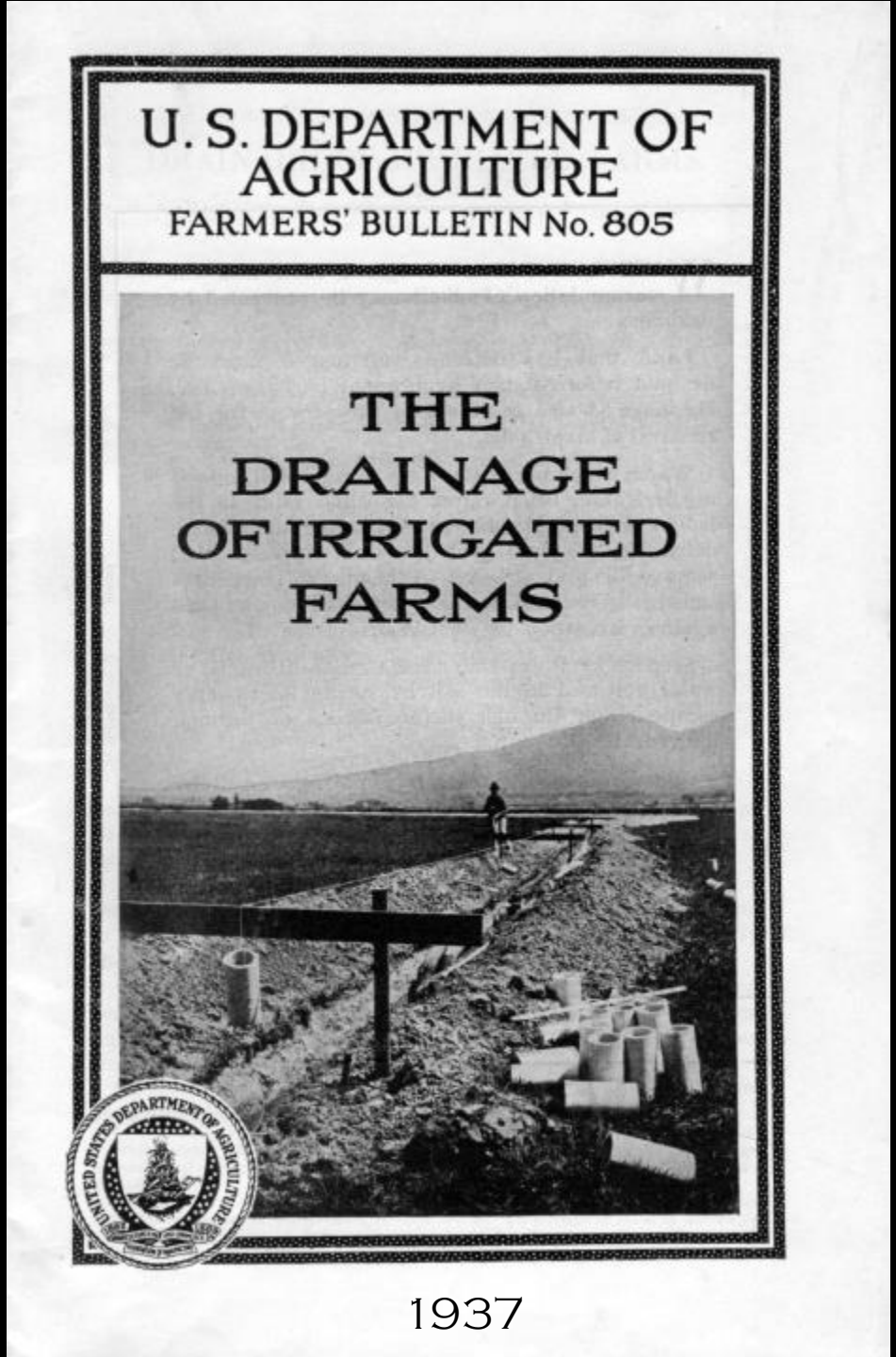
Surface inlet for buried drainage system

Surface inlet the day it rained

Surface inlet one day after rain

Surface inlet two-days after rain

Surface inlet three-days after rain



Irrigated land in the West and Southwest was drained using buried drain lines

Filling of Wetlands

Vancouver Island, British Columbia

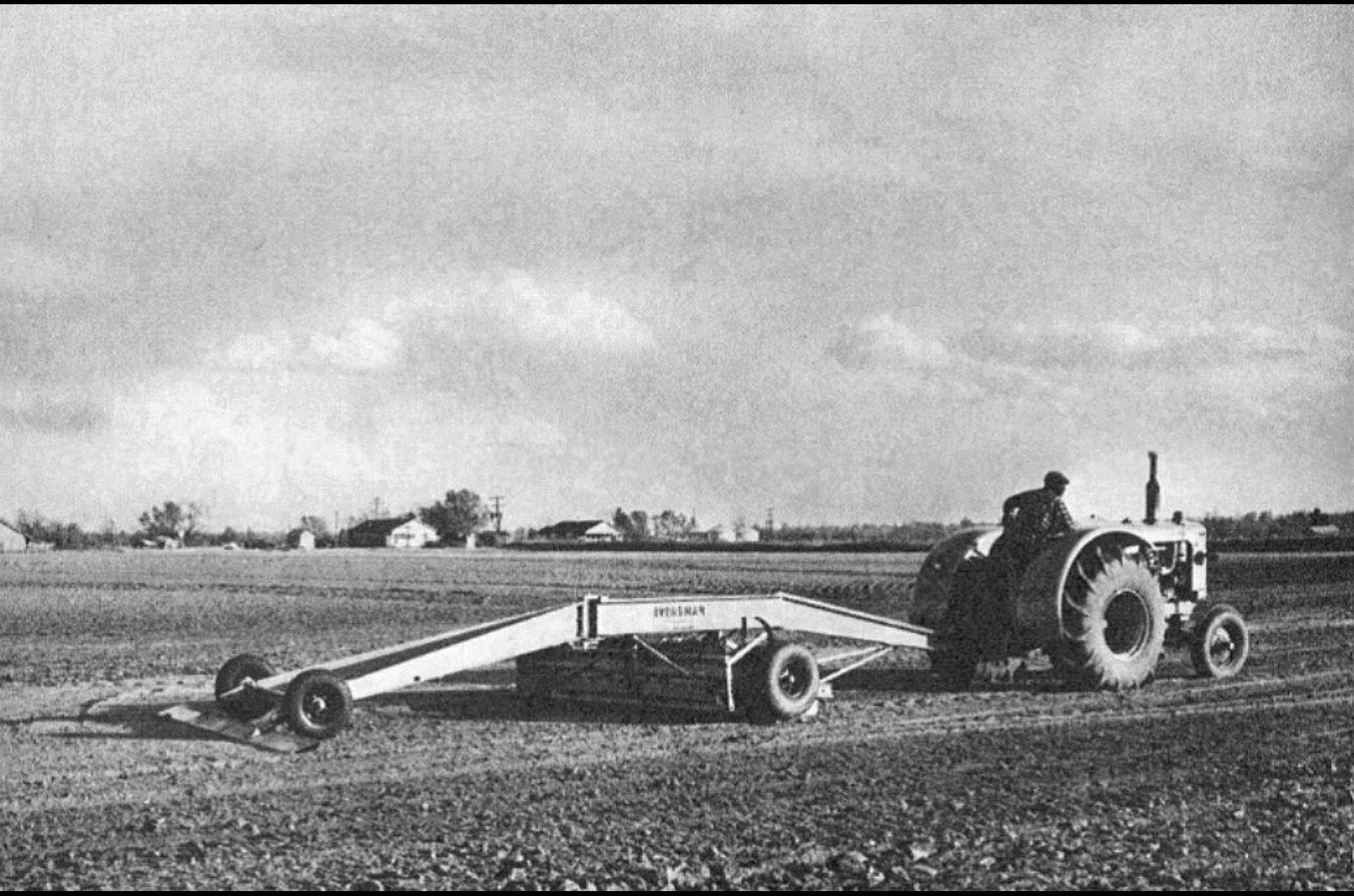

Morehead, Kentucky

Creston, British Columbia


Powell County, Kentucky


Indian Creek
Morgan County, Kentucky


Outlet



A major sign showing where wetlands have been filled

The fields do not contain pits and mounds

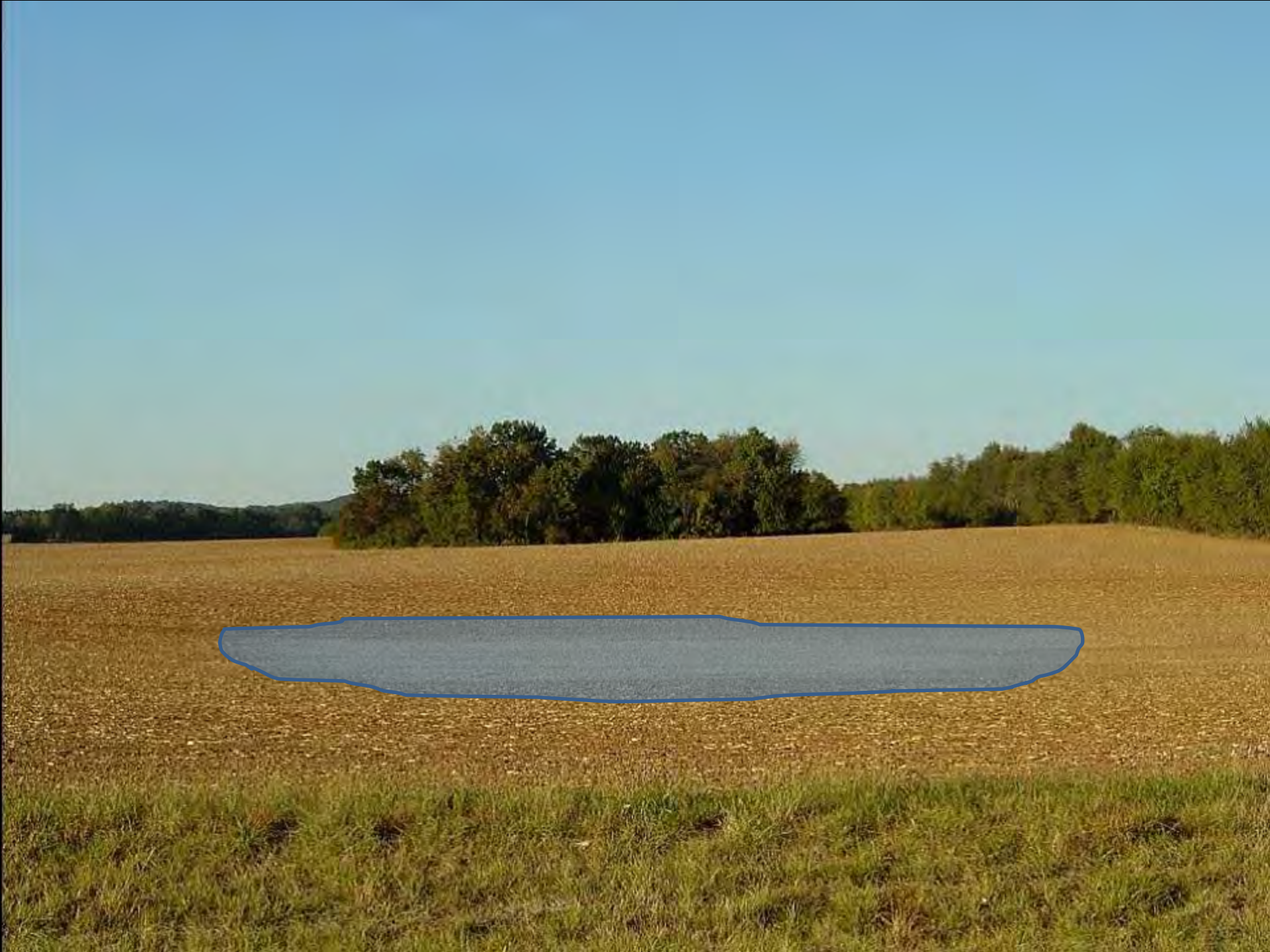
This root mass
was
4.5 meters high!

How can you tell where wetlands have been filled & drained?

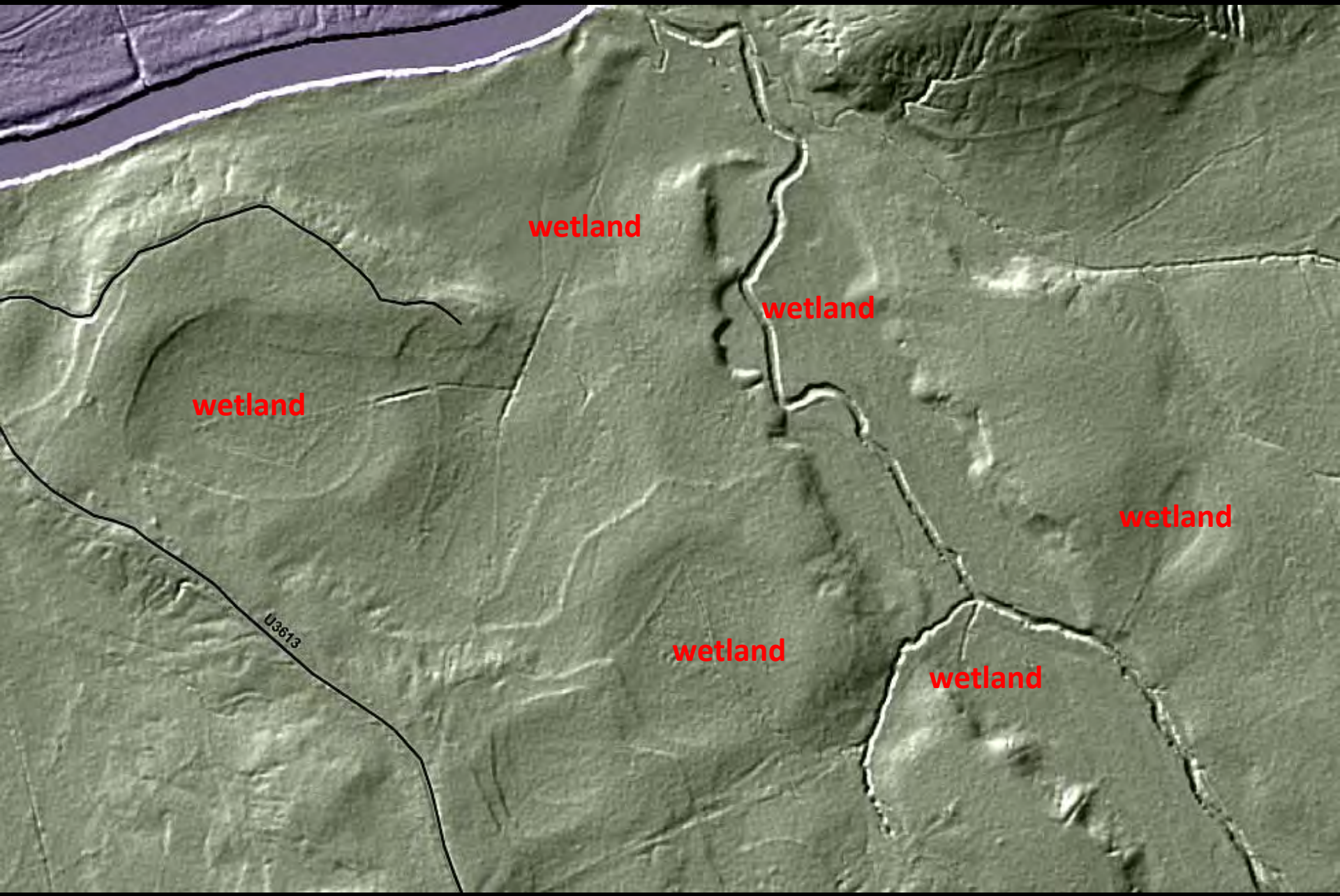
Think of a fashion model, no one can naturally look this perfect

Fields are retouched wetlands, just like glamour photos!


Can you find the historic wetlands?



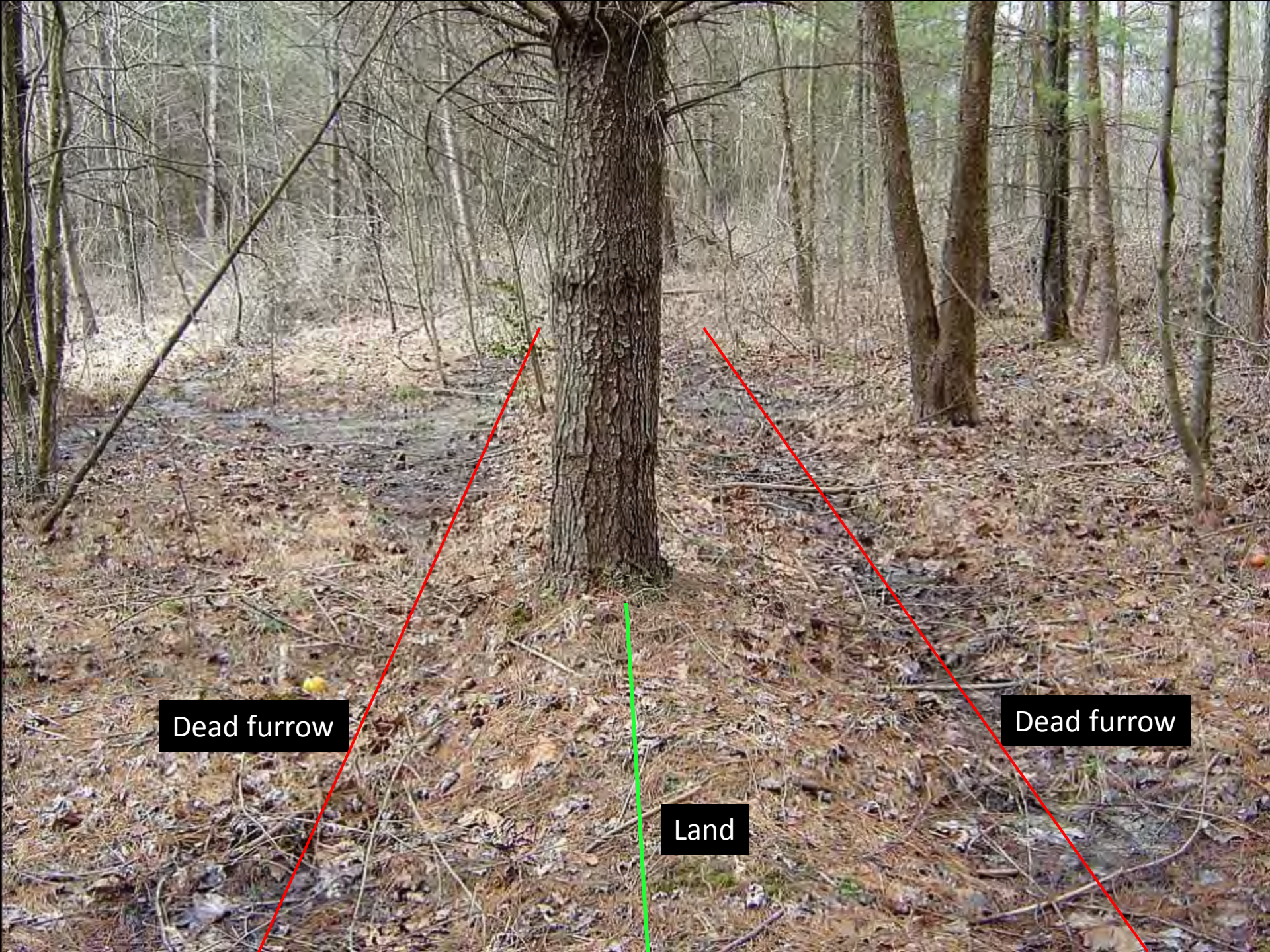

U3613


wetland
wetland
wetland
wetland
wetland
wetland
U3613

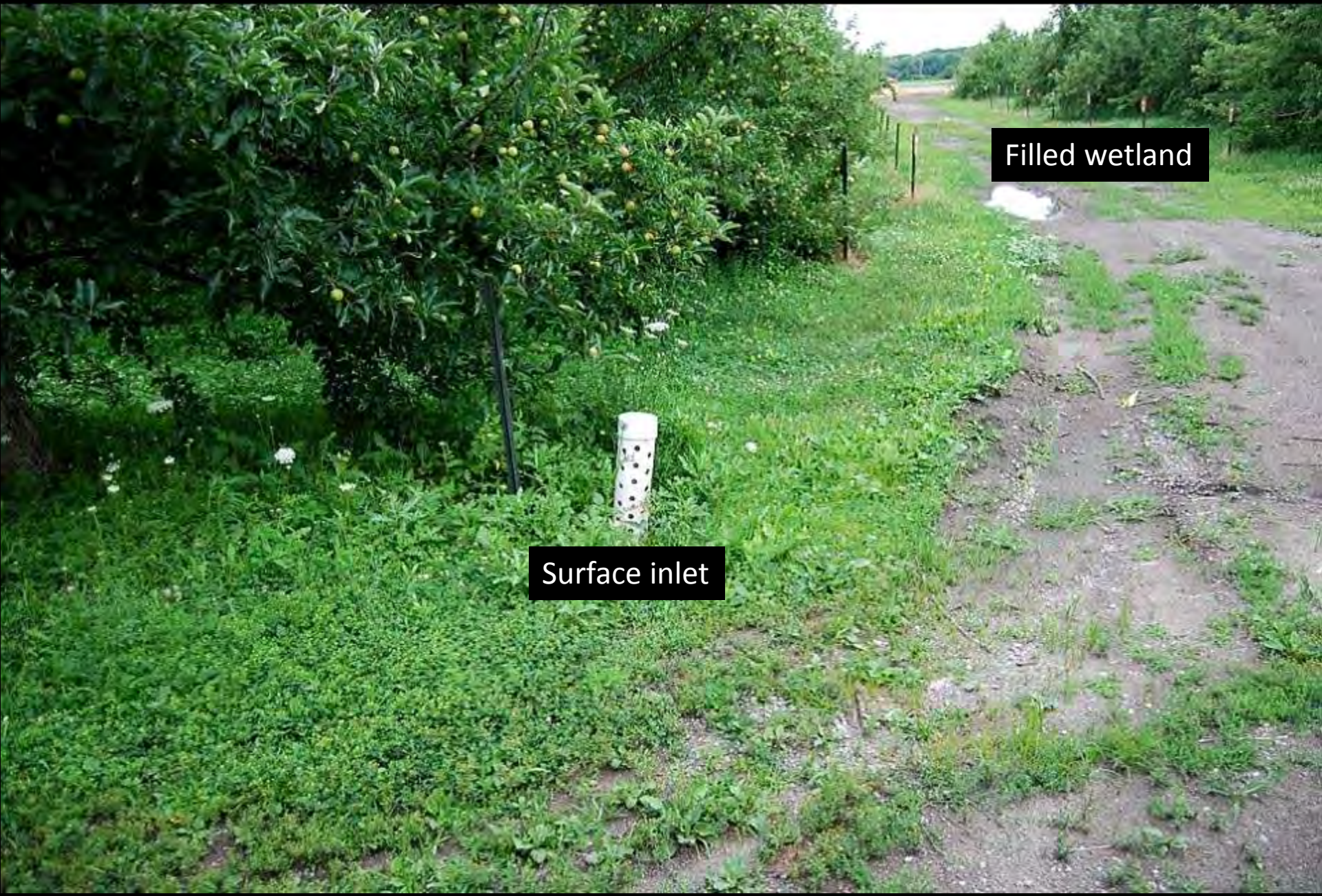

Dead furrow
Land

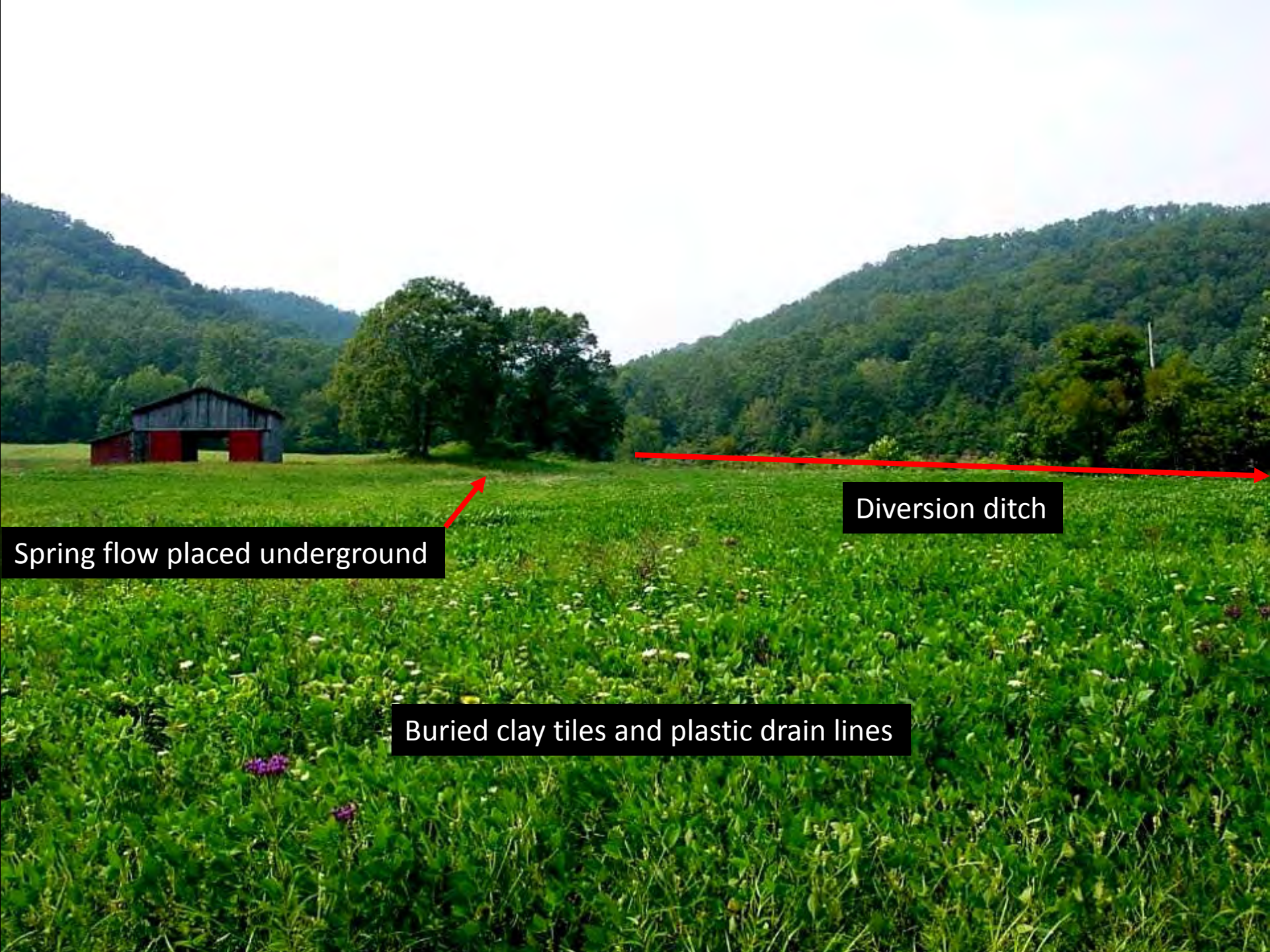

Channeled stream
Moved stream
Filled dead furrow
Buried drain lines
Filled dead furrow


Diversion ditch
Channeled stream
Diversion ditch


Dead furrow
Land
Dead furrow

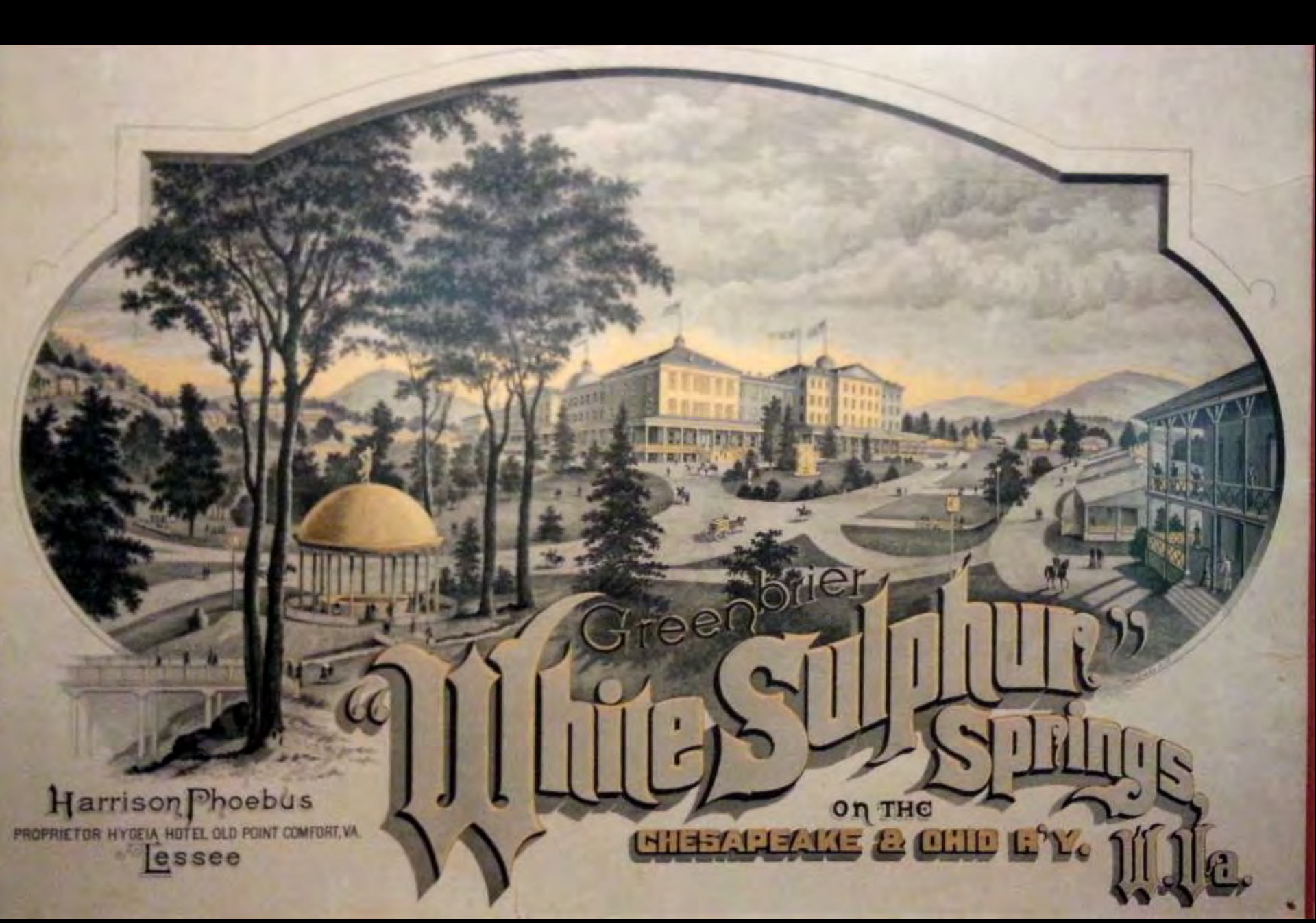

Diversion Ditch


Filled wetland
Surface inlet

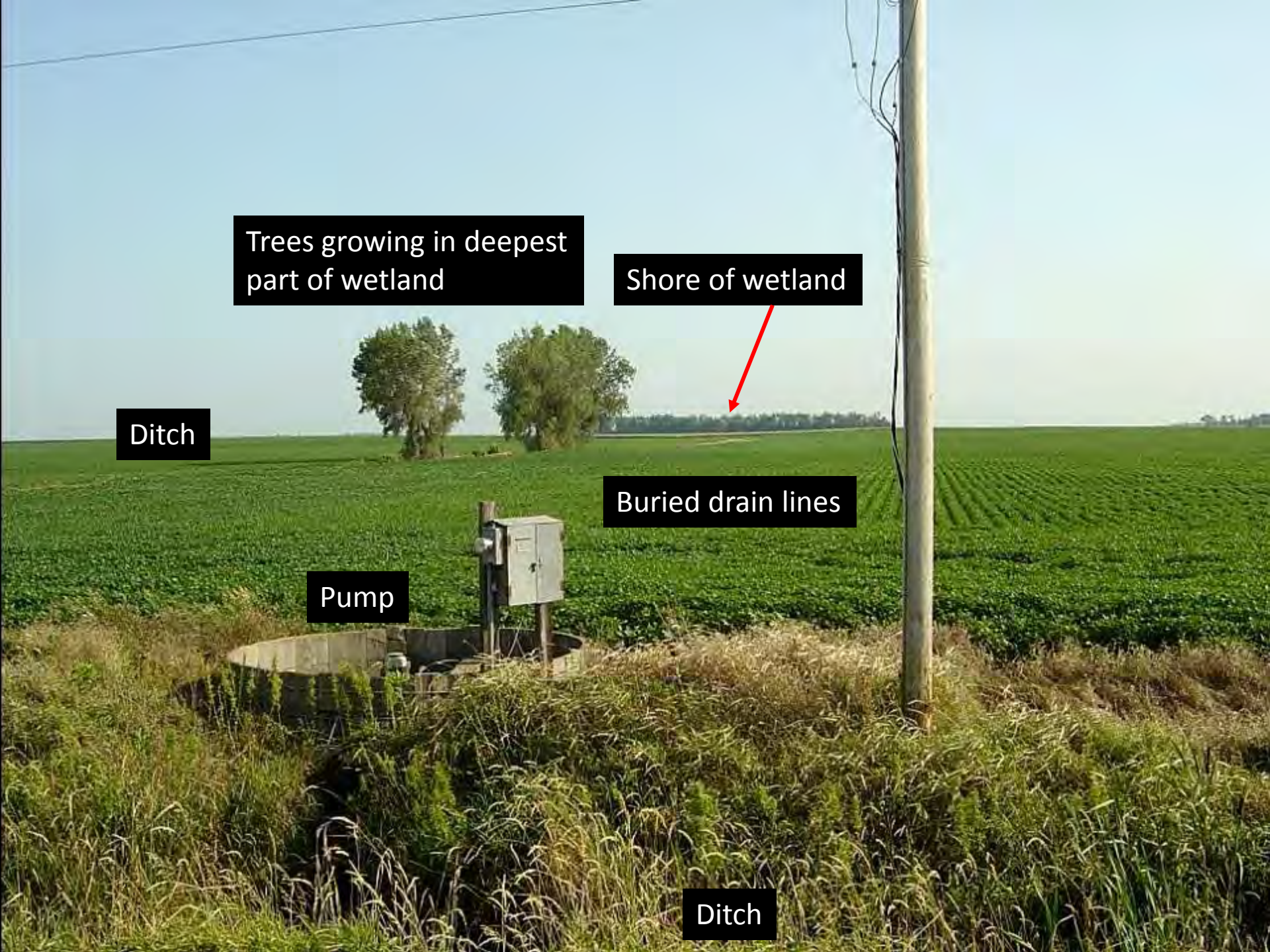

Diversion ditch
Spring flow placed underground
Buried clay tiles and plastic drain lines


Many wetland “creation” projects are actually wetland restoration projects, where someone has done an A+ job draining the wetland

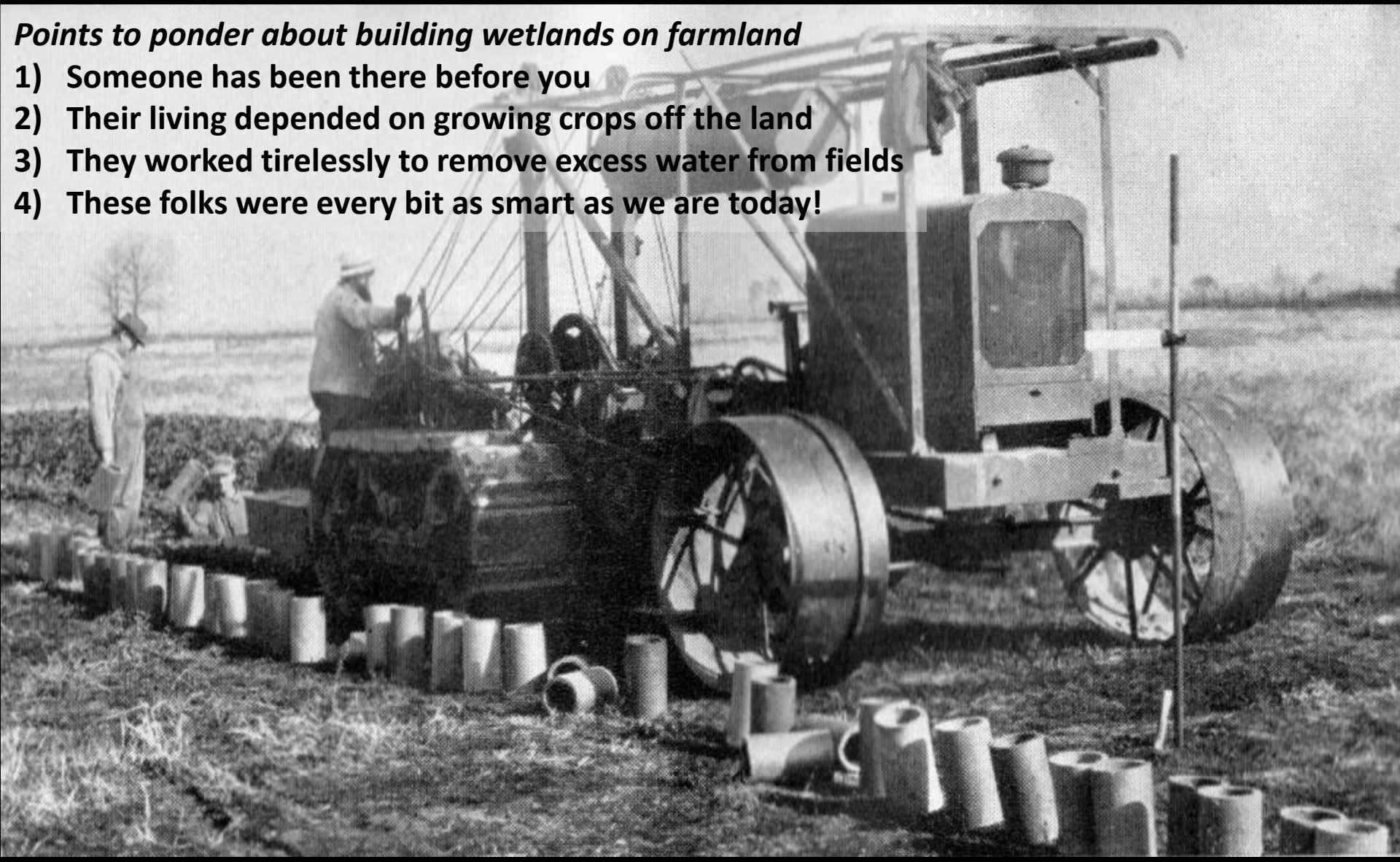
Greenbrier Inn
White Sulphur Springs, West Virginia


Greenbrier
"White Sulphur Springs"
on the
Chesapeake & Ohio R'y.
W. Va.
Harrison Phoebus
Proprietor Hygeia Hotel Old Point Comfort, Va.
Lessee


Drain pipes

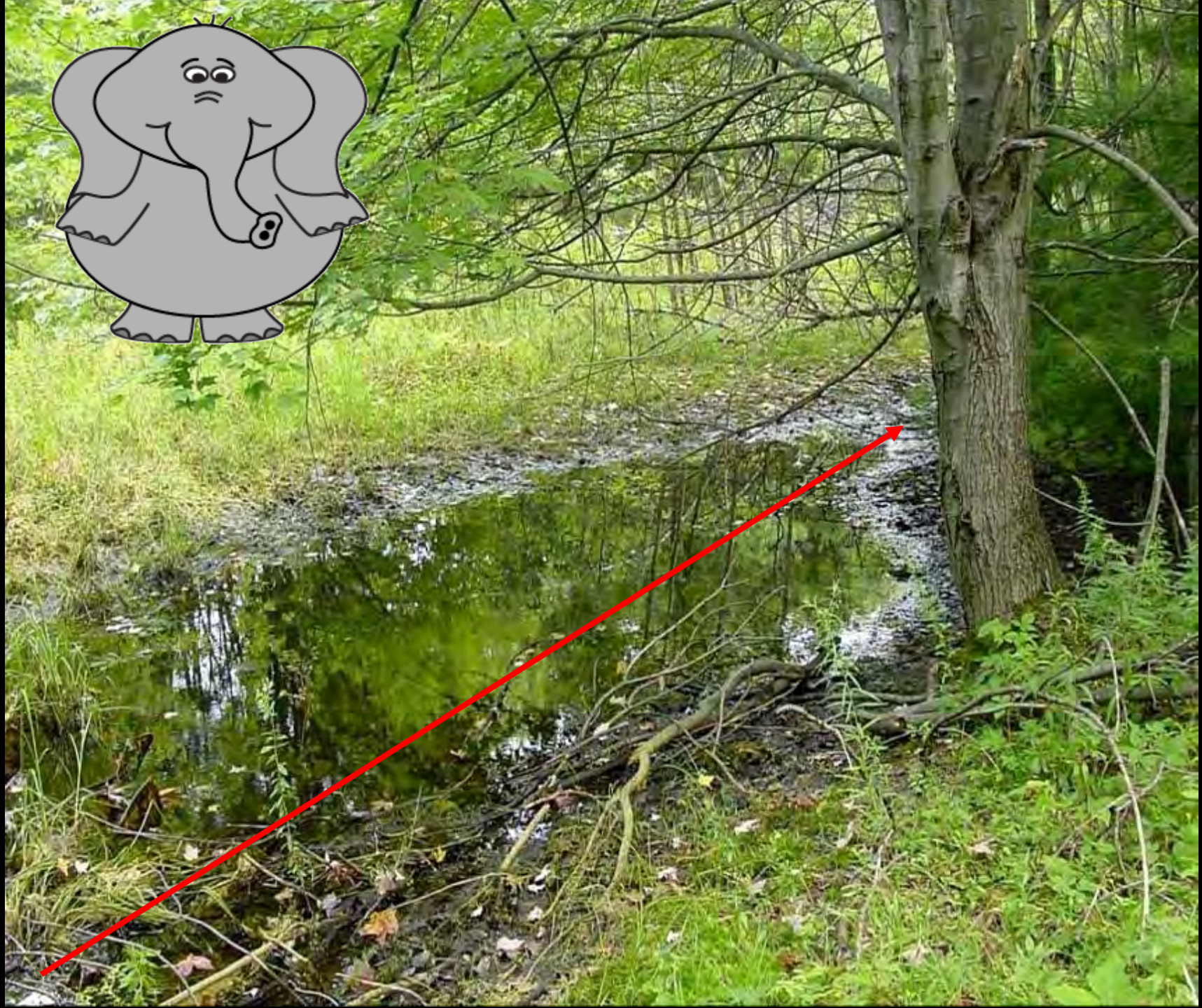

Trees growing in deepest part of wetland
Shore of wetland
Ditch
Buried drain lines
Pump
Ditch


Diversion ditch at base of hill
Buried drain lines & leveled field
outlet
Straightened stream



Points to ponder about building wetlands on farmland

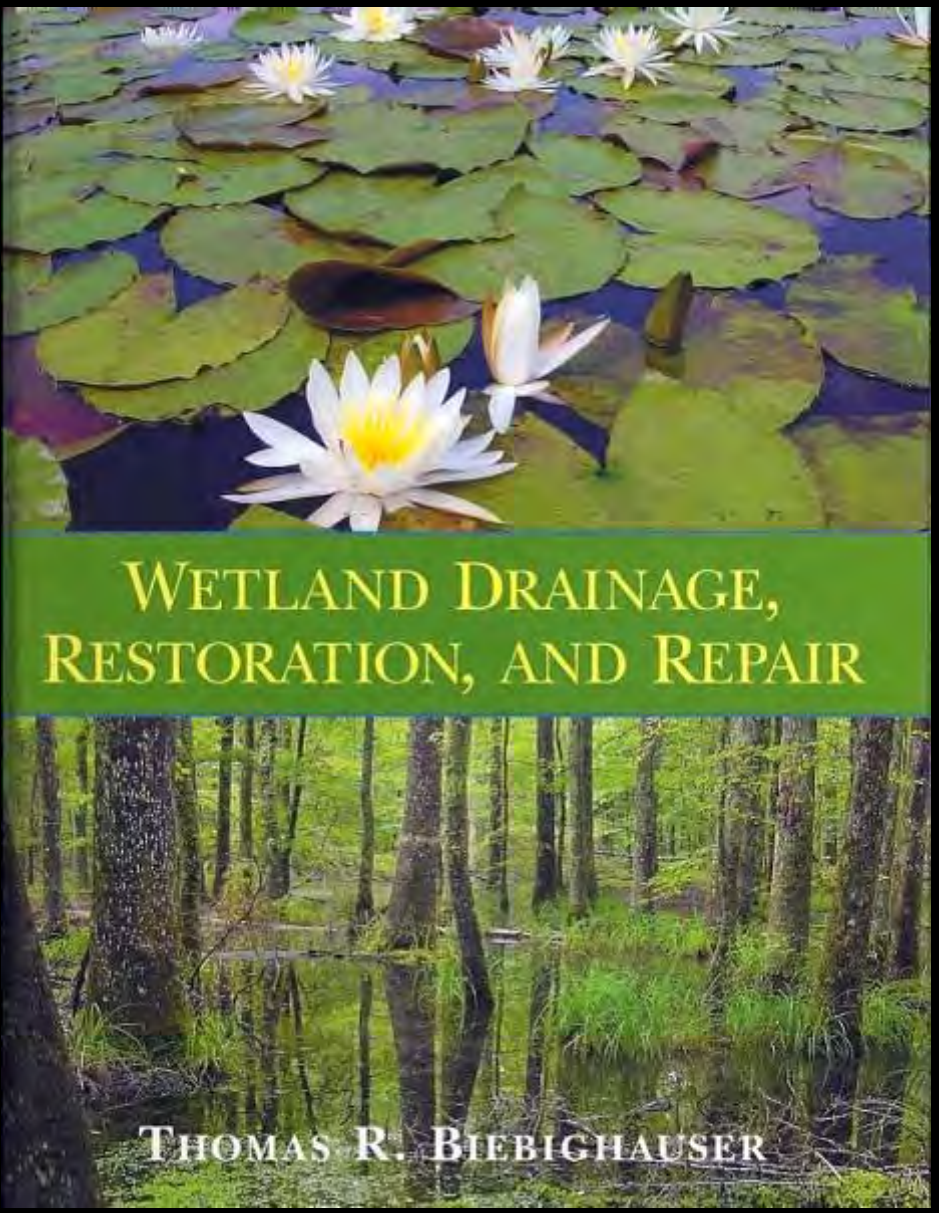
1) **Someone has been there before you**
2) **Their living depended on growing crops off the land**
3) **They worked tirelessly to remove excess water from fields**
4) **These folks were every bit as smart as we are today!**

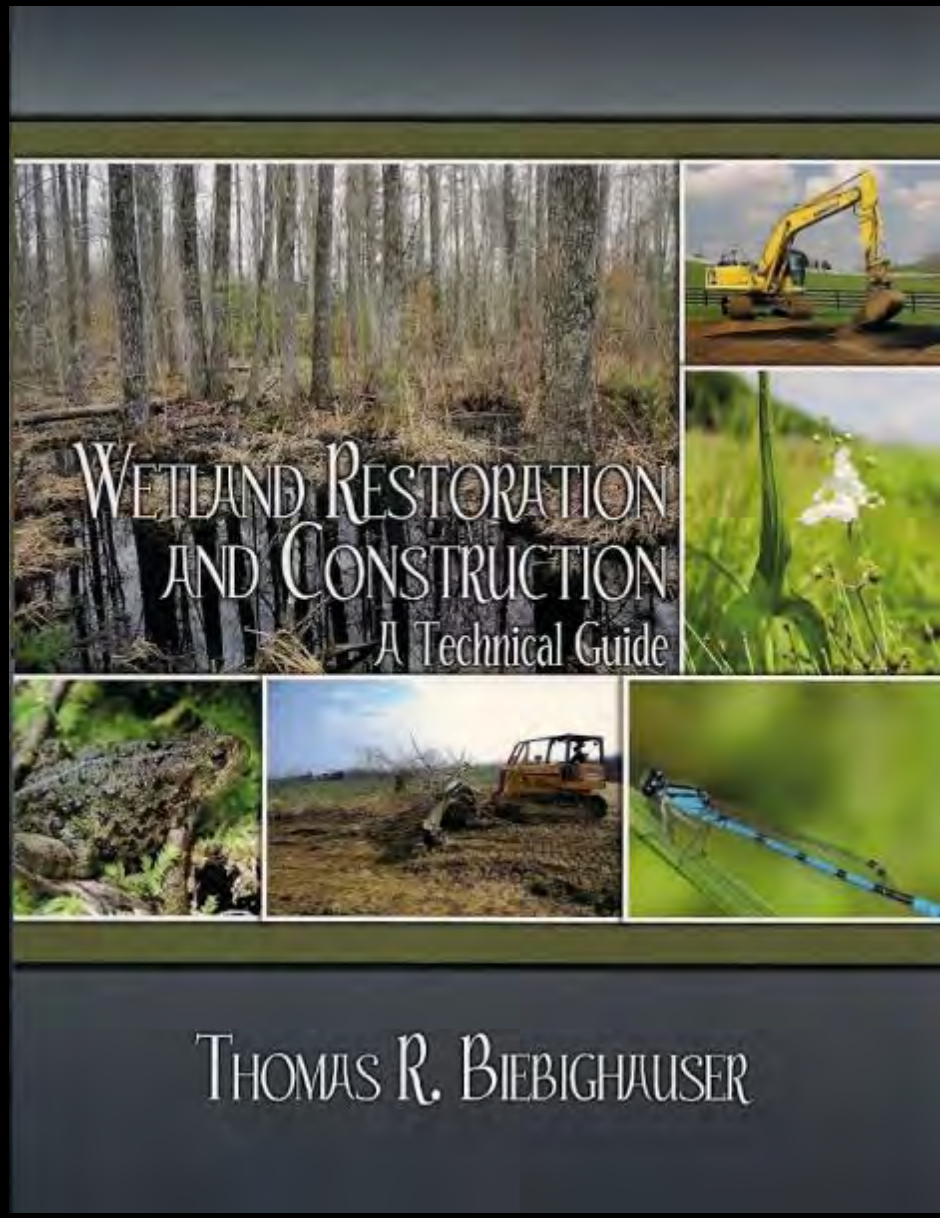


One must take action to disable historic drainage practices to be successful

Attempting to build a wetland without addressing historic drainage is like trying to cure cancer with a Band-Aid


FASTPITCH


WETLAND DRAINAGE,
RESTORATION, AND REPAIR
THOMAS R. BIEBIGHAUSER


WETLAND RESTORATION
AND CONSTRUCTION
A Technical Guide
THOMAS R. BIEBIGHAUSER

A History of Wetland Drainage…How They Pulled the Plug©

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