EFFECTIVENESS OF FILTER STRIPS FOR NUTRIENT REMOVAL

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WHAT IS A RIPARIAN FILTER STRIP

- **A PLANTED OR NATURAL VEGETATIVE BUFFER IN THE AREA THAT LINKS TERRESTRIAL AND AQUATIC HABITATS**
- **SERVES AS:**
  - **– FILTER**
  - **– TRANSFORMER**
  - **– SINK**

FEATURES BENEFITING FROM VEGETATIVE FILTER STRIPS

- **PERENNIAL AND EMPHEMERAL STREAMS OR DITCHES**
- **LAKES AND PONDS**
- **WETLANDS**
- **KARST FEATURES AND CREVICED BEDROCK**
- **WELLS**


FILTER STRIP GOALS
-FILTER SEDIMENT
-STABILIZE BANKS
-WILDLIFE HABITAT

FILTERING SEDIMENT IS THE MOST IMPORTANT FUNCTION

- **AS FLOW VELOCITY SLOWS, SEDIMENT SETTLES OUT**
- **SHEET FLOW REQUIRED**
- **NEED TO REMOVE SUSPENDED CLAY**
- **FILTERING AFFECTED BY:**
  - **SOIL POROSITY**
  - **VEGETATION TYPE**
  - **SLOPE**
  - **AGE**
  - **MANAGEMENT**
  - **RUNOFF VOLUME**


FILTER STRIPS ARE
A LIVING SILT FENCE

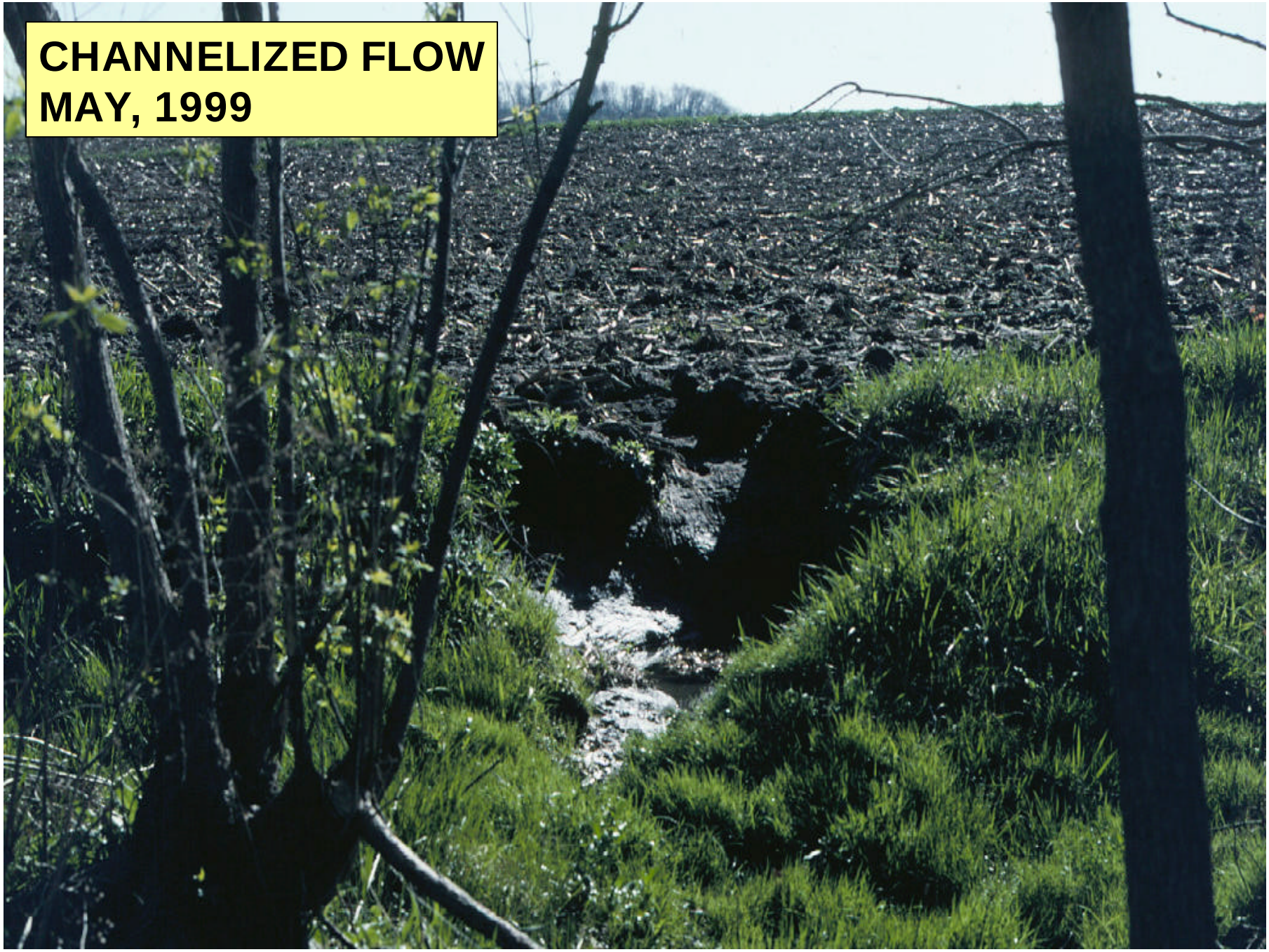
MECHANISMS THAT REMOVE POLLUTANTS IN FILTER STRIPS

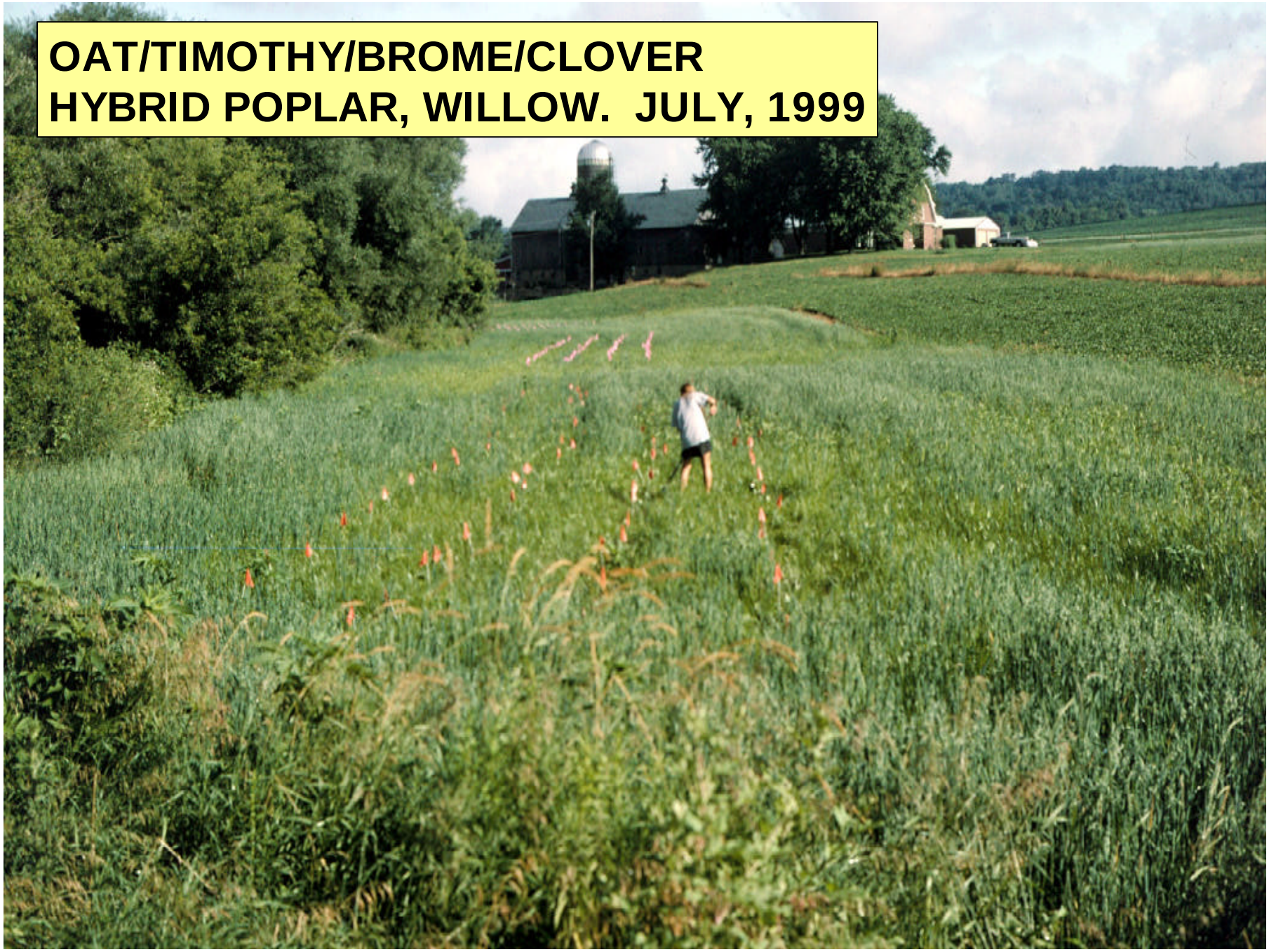
- NUTRIENTS STORED IN SOIL
- PHOSPHORUS FIXED ON MINERAL SITES
- NITRATE-N DENITRIFIES
- PLANT UPTAKE
- STORAGE IN PLANT TISSUE (ESPECIALLY TREES)
  - HARVESTED AND REMOVED
  - MAY BE RELEASED FROM VEGETATION
- MICROBES BREAKDOWN ORGANICS

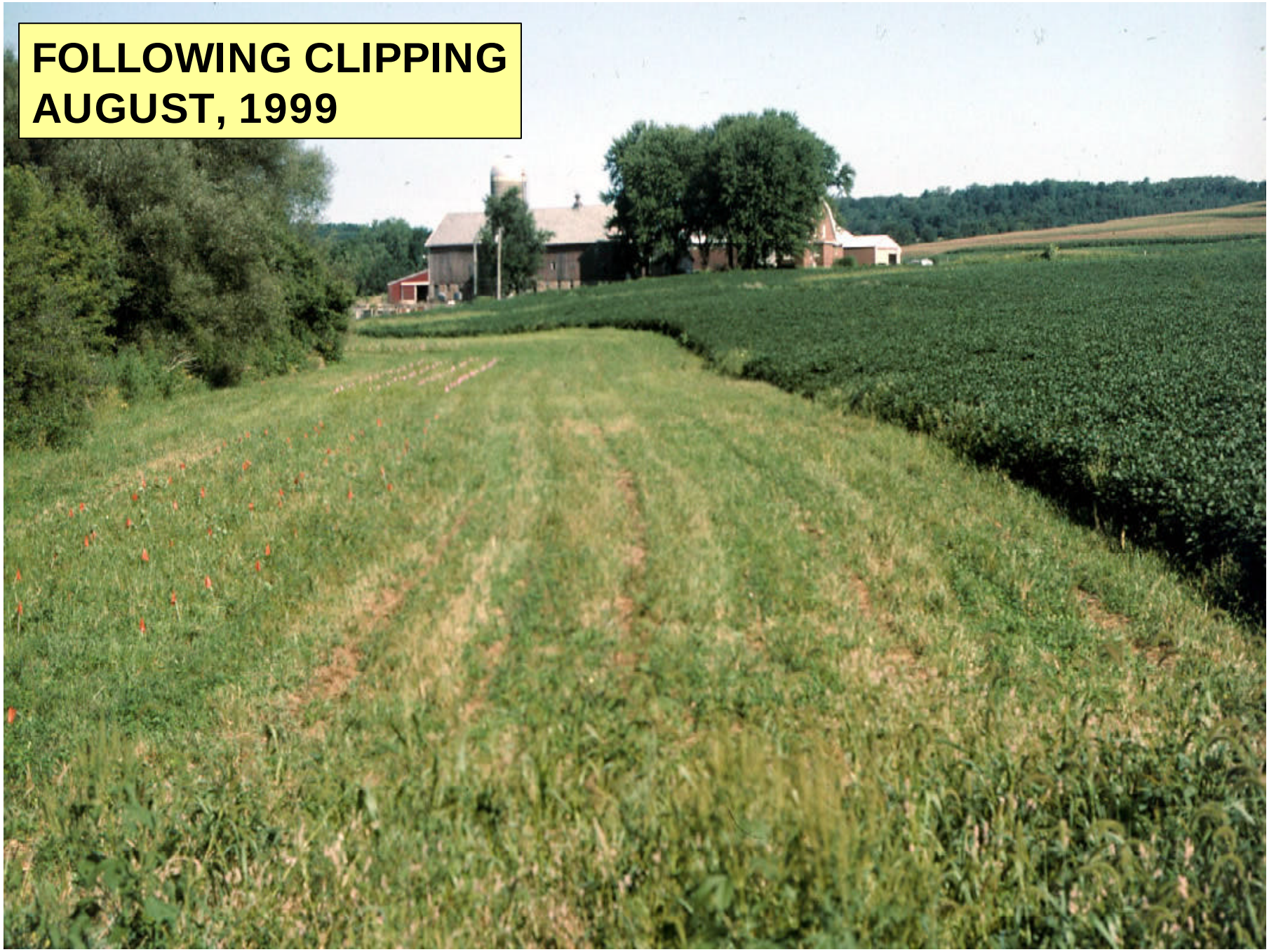
EXAMPLE 1: RIPARIAN FILTER STRIP INSTALLATION

- **WESTERN SAUK CO.**
- **CROPPED UP TO STREAM EDGE**
- **CHANNELIZED UPLAND RUNOFF**
- **AREA CONSISTENTLY WET**
- **COST SHARING >$100/ACRE/YR**
- **60 FT. FILTER STRIP**

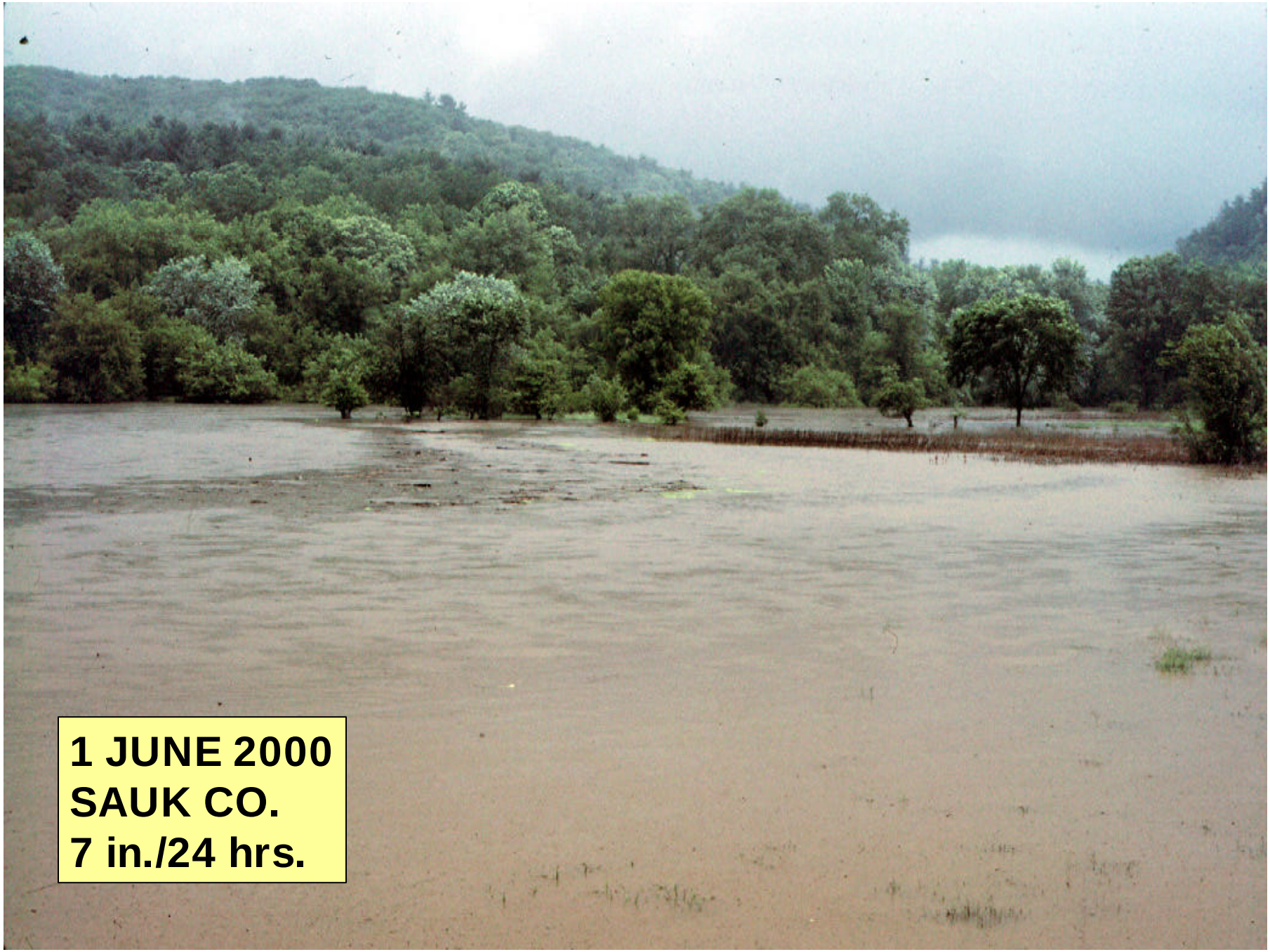

SITE PRIOR TO ESTABLISHMENT
MAY, 1999


CHANNELIZED FLOW
MAY, 1999


OAT/TIMOTHY/BROME/CLOVER
HYBRID POPLAR, WILLOW. JULY, 1999


FOLLOWING CLIPPING
AUGUST, 1999


FILTER STRIP
OCTOBER, 2001


1 JUNE 2000
SAUK CO.
7 in./24 hrs.

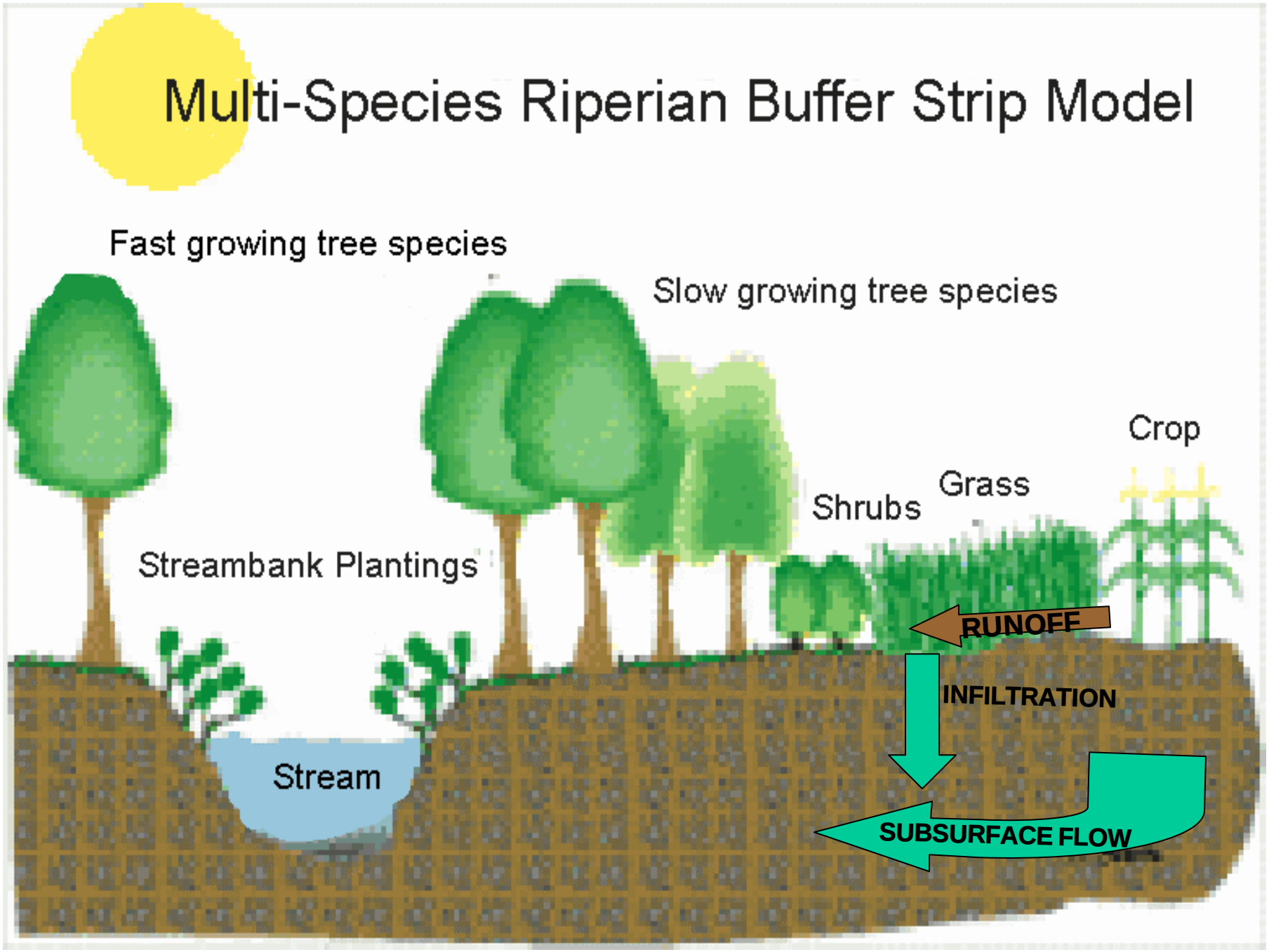
EXAMPLE 2: FENCING, STREAMBANK STABILIZATION, AND FILTER STRIP INSTALLATION

- **BROWN CO., 200 MILES**
- **$500/A PERMANENT EASEMENTS**
- **LIVESTOCK IN RIPARIAN AREA**
- **STREAM BANK STABILIZED**
- **FILTER STRIP INSTALLED**
- **LANDSCAPE RECOVERS QUICKLY**

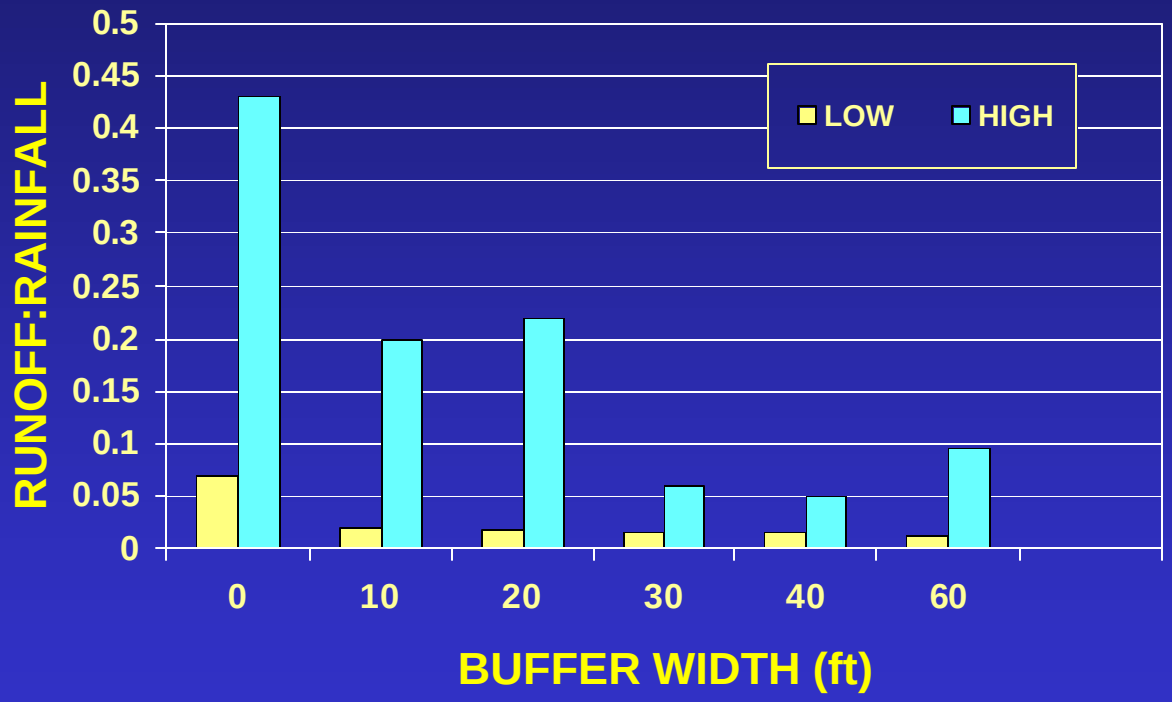
Ashwaubenon Creek Tributary, Brown Co. (Source: Bill Hafs)

Before

Two years later

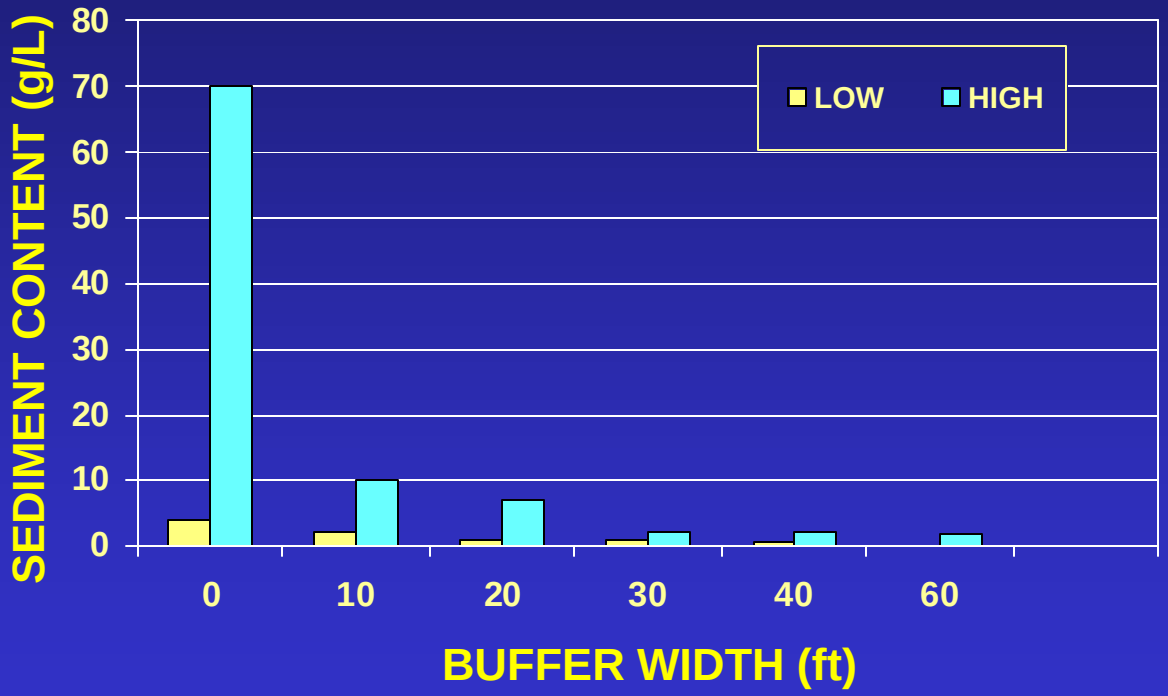

Multi-Species Riperian Buffer Strip Model
Fast growing tree species
Slow growing tree species
Crop
Grass
Shrubs
Streambank Plantings
RUNOFF
INFILTRATION
Stream
SUBSURFACE FLOW

RELATIONSHIP BETWEEN STORM INTENSITY AND RUNOFF AMOUNT



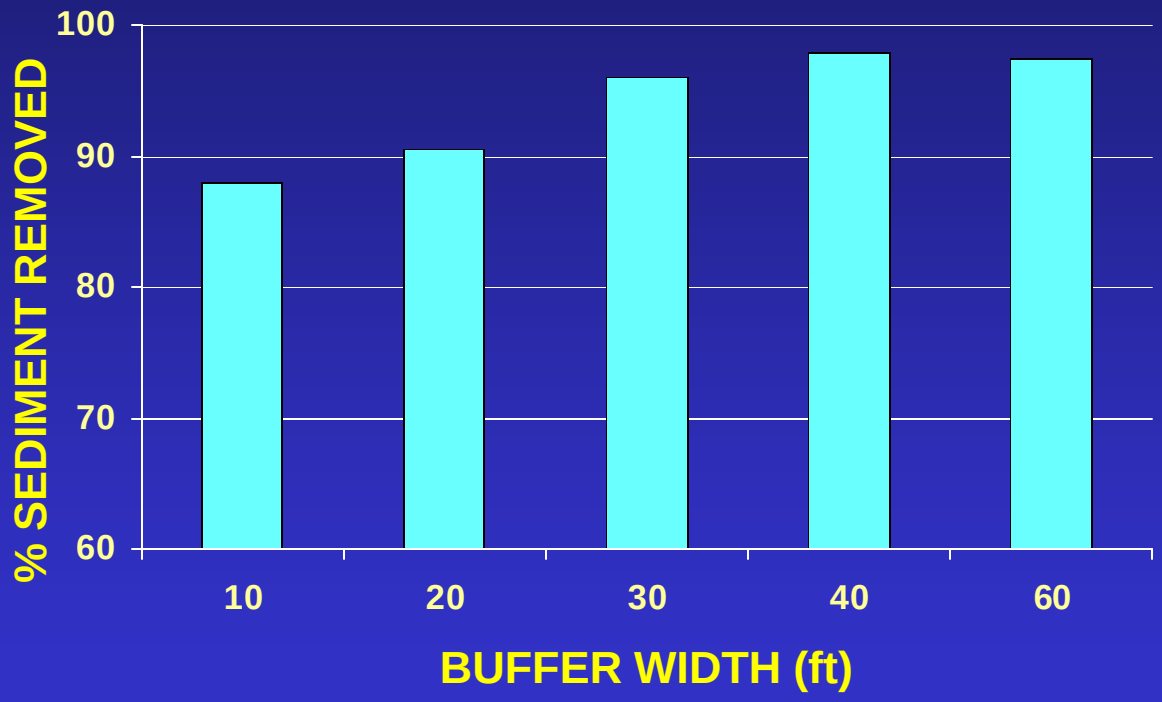
ROBINSON et al., 1996

RELATIONSHIP BETWEEN STORM INTENSITY AND RUNOFF SEDIMENT CONTENT



ROBINSON et al., 1996

EFFECT OF BUFFER WIDTH ON SEDIMENT DEPOSITION



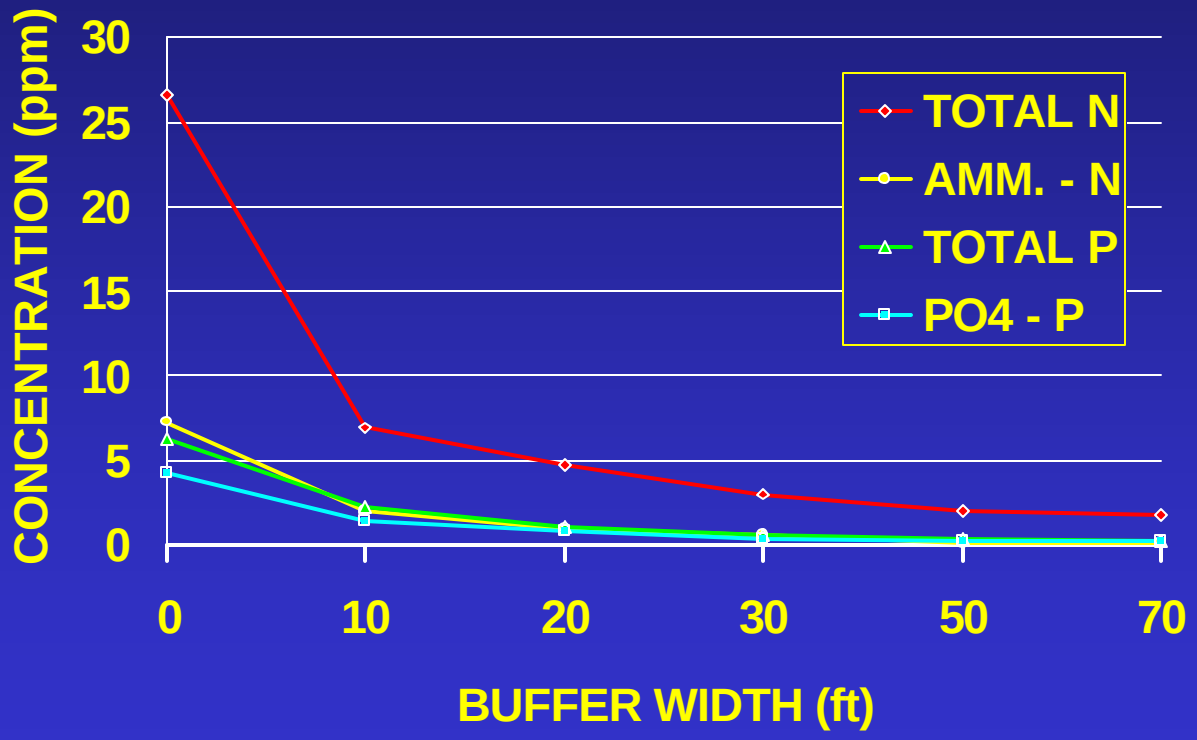
Smith, 1992

VEGETATION TYPE AND NUTRIENT REMOVAL

WIDTH	GRASS	SEDI-MENT	TOTAL N	TOTAL P	PO_4-P
ft.		---------- % REMOVED ----------			
10	SWITCH	69	32	40	38
	COOL SEASON	62	24	35	30
20	SWITCH	78	51	55	46
	COOL SEASON	75	41	49	39

LEE et al., 1999

BUFFER EFFECT ON NUTRIENT REMOVAL FOLLOWING MANURE APPLICATION

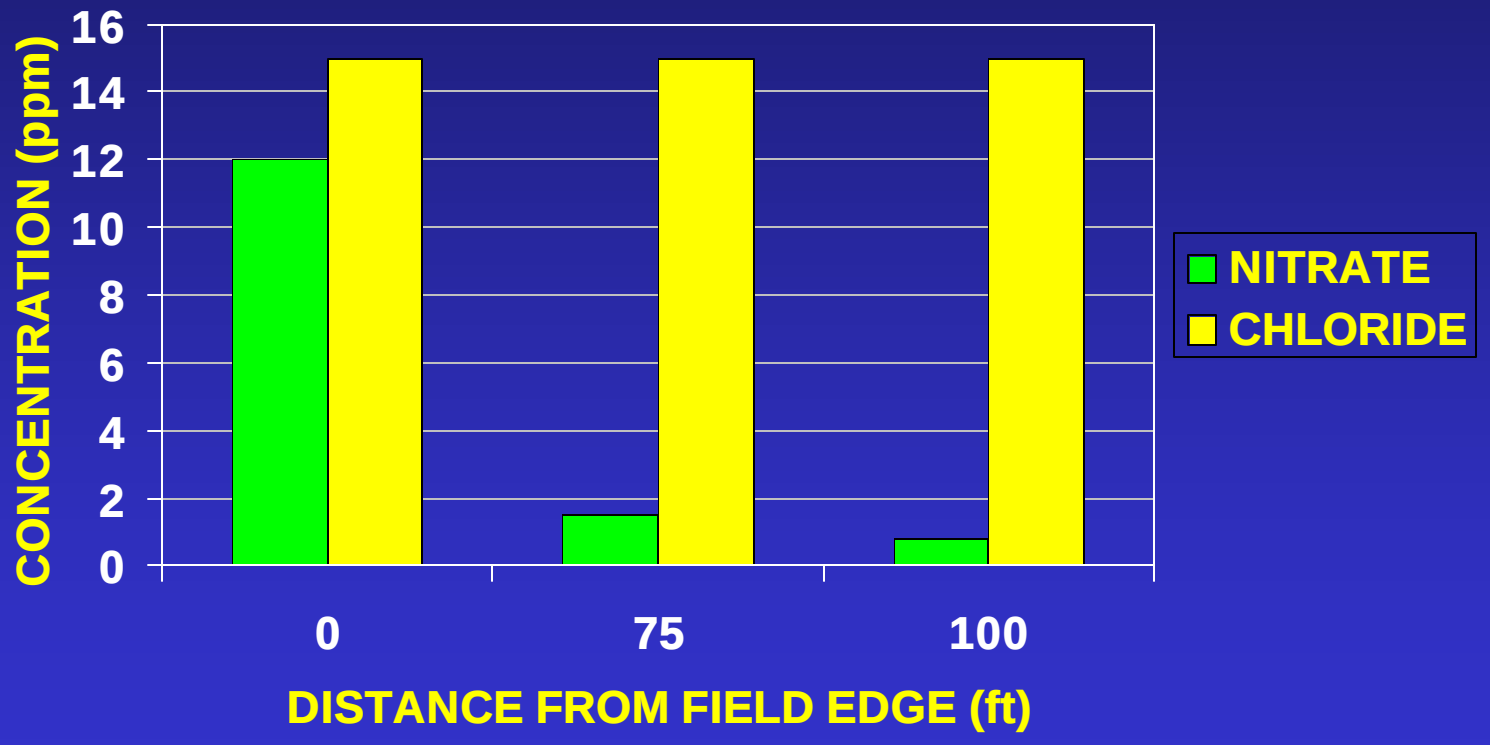


Chaubey et al., 1995

DENITRIFICATION IS A MAJOR PROCESS

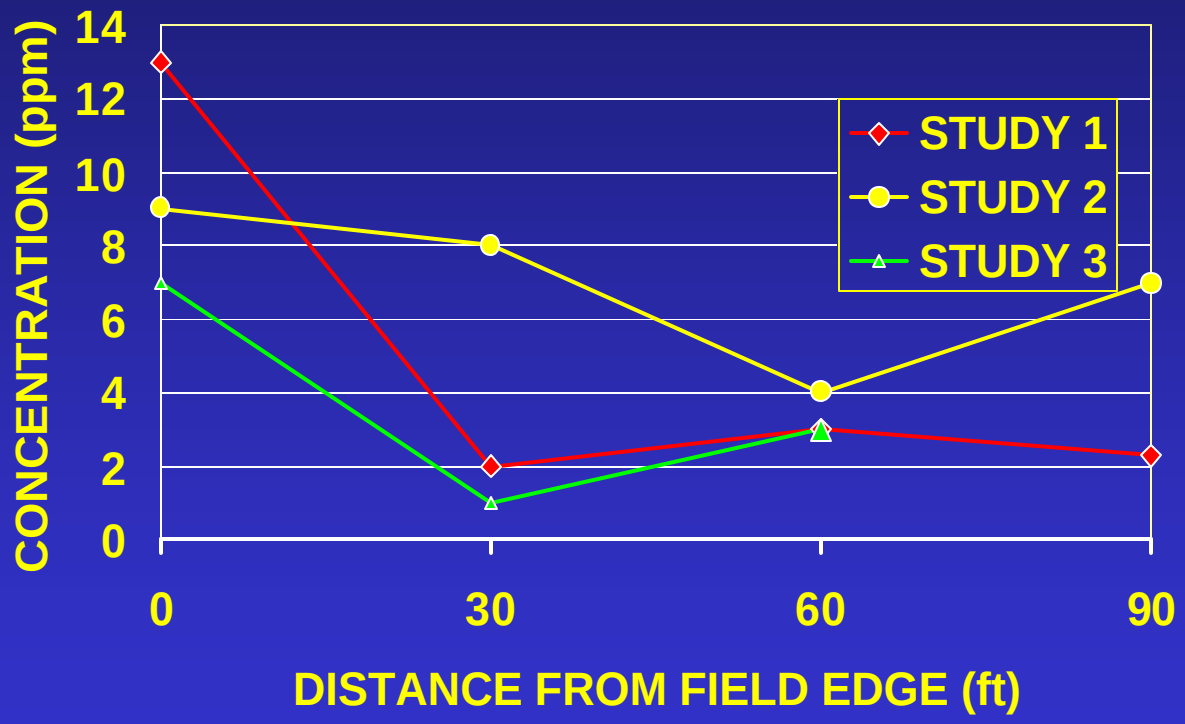
- **OCCURS IN ROOTZONE AREA WHERE CARBON IS AVAILABLE**
- **MOST ACTIVE IN THE FIRST 15-30 FT.**
- **RANGE 18 – 55 lb N/A/YR**
- **VARIES DEPENDING ON SITE CONDITIONS**
- **YEAR-ROUND IN WARMER CLIMATES**

NITRATE AND CHLORIDE IN SHALLOW GROUNDWATER MOVING FROM AN AG. FIELD



JACOBS AND GILLIAM, 1985

REMOVAL OF SUBSURFACE NITRATE-N IN RIPARIAN FORESTS FILTERS



GILLIAM et al., 1997

MANAGEMENT OF FILTER STRIPS

- **PROTECT FROM GRAZING**
  - **FENCE MAINTENANCE, FLOOD DAMAGE**
  - **CATTLE CROSSINGS**
  - **MANAGED GRAZING**
- **MOW**
  - **BRUSH CONTROL**
  - **HARVEST GRASS**
- **AVOID VEHICLE TRAFFIC IN FILTER STRIP**

OTHER CONSIDERATIONS

COMBINE WITH UPLAND PRACTICES

SITE IN THE UPPER PART OF WATERSHEDS