

Effects of Landscape Changes on Stream Discharge in Iowa: Hydrologic Footprint of Annual Crops

Discharge increase correlates with annual crop increase

Direct effects of annual crops include:

Reduced precipitation interception

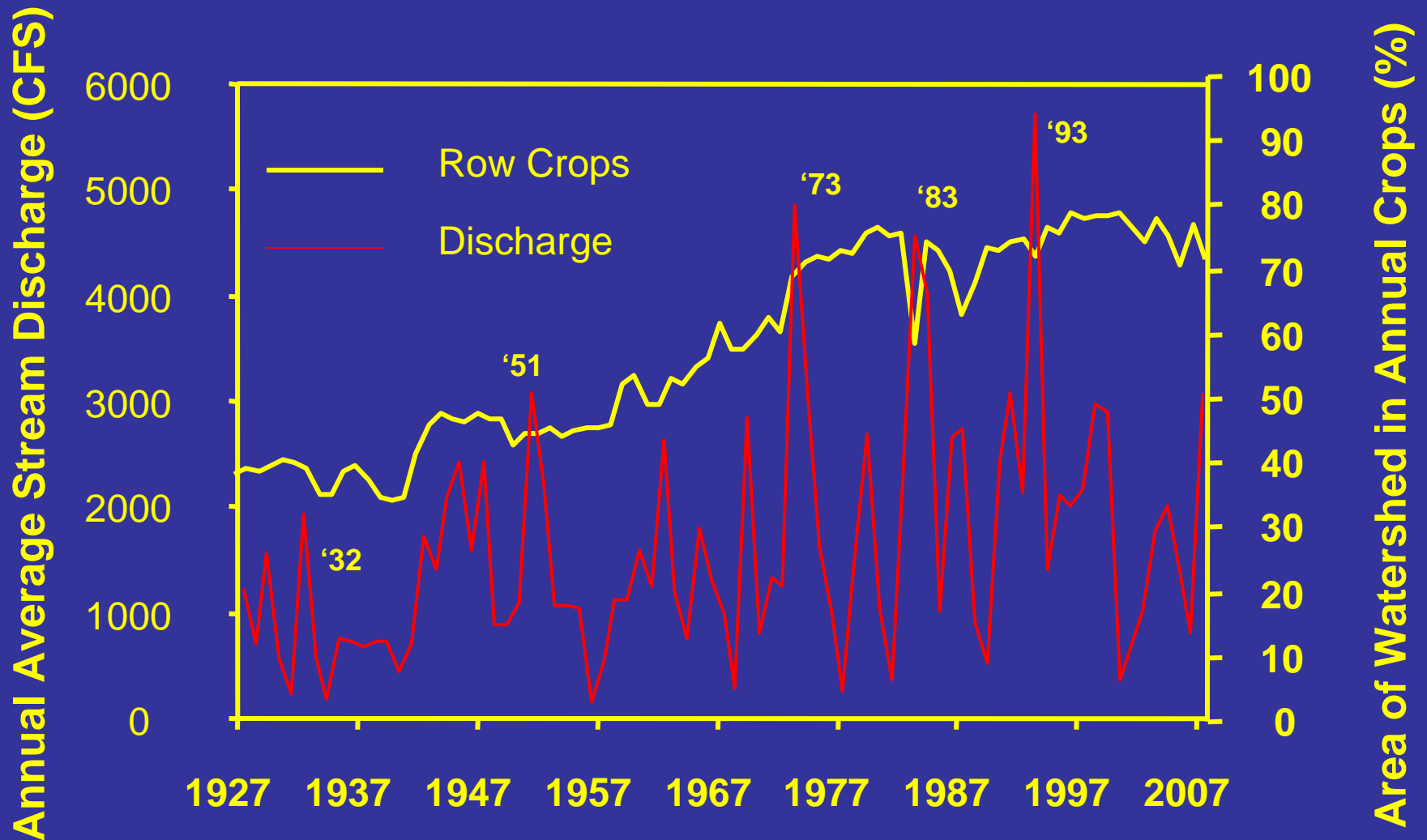
Water use/storage limited to 3-4 months

Engineered hydrologic changes to support annual crops

Artificial drainage systems

Stream channel modifications

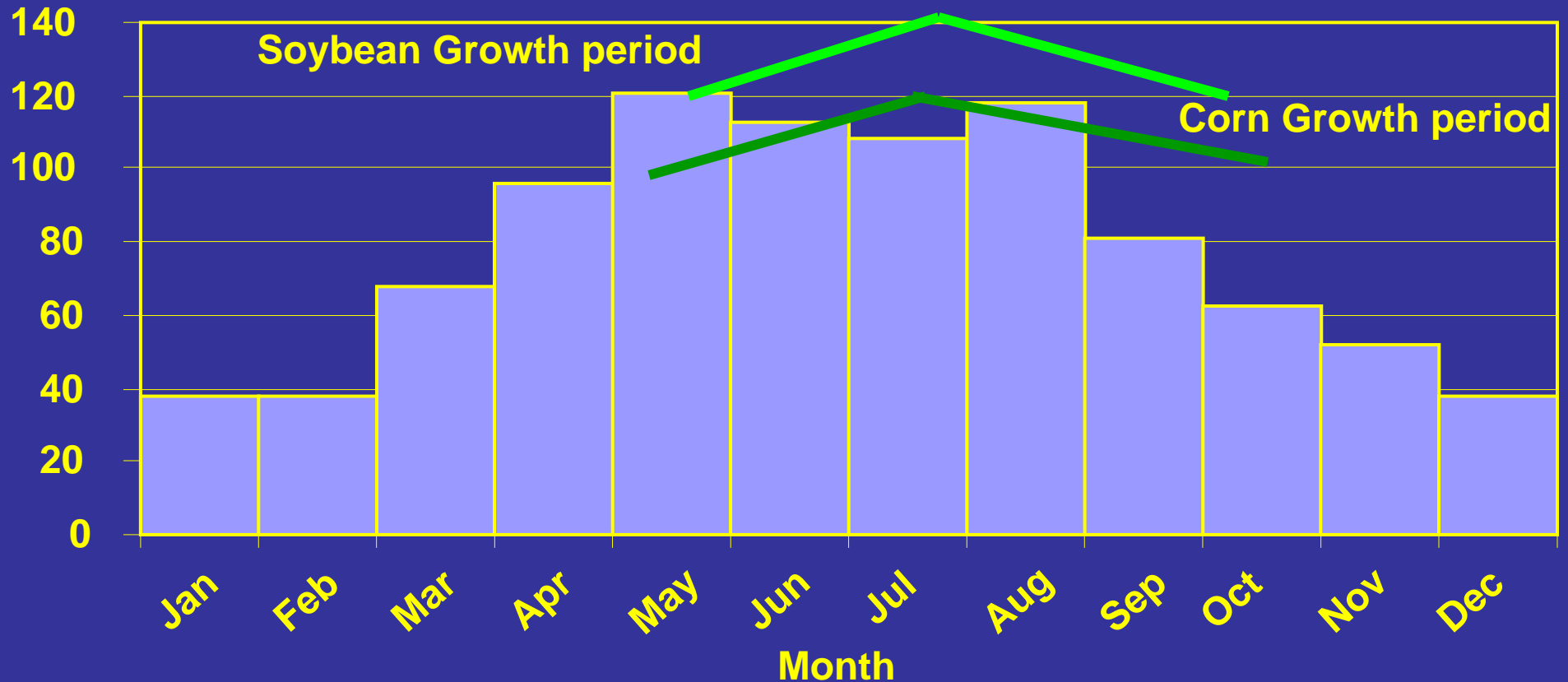
Discharge and Row Crop History Raccoon River at Van Meter



Linear correlation with $R^2 = 0.21$

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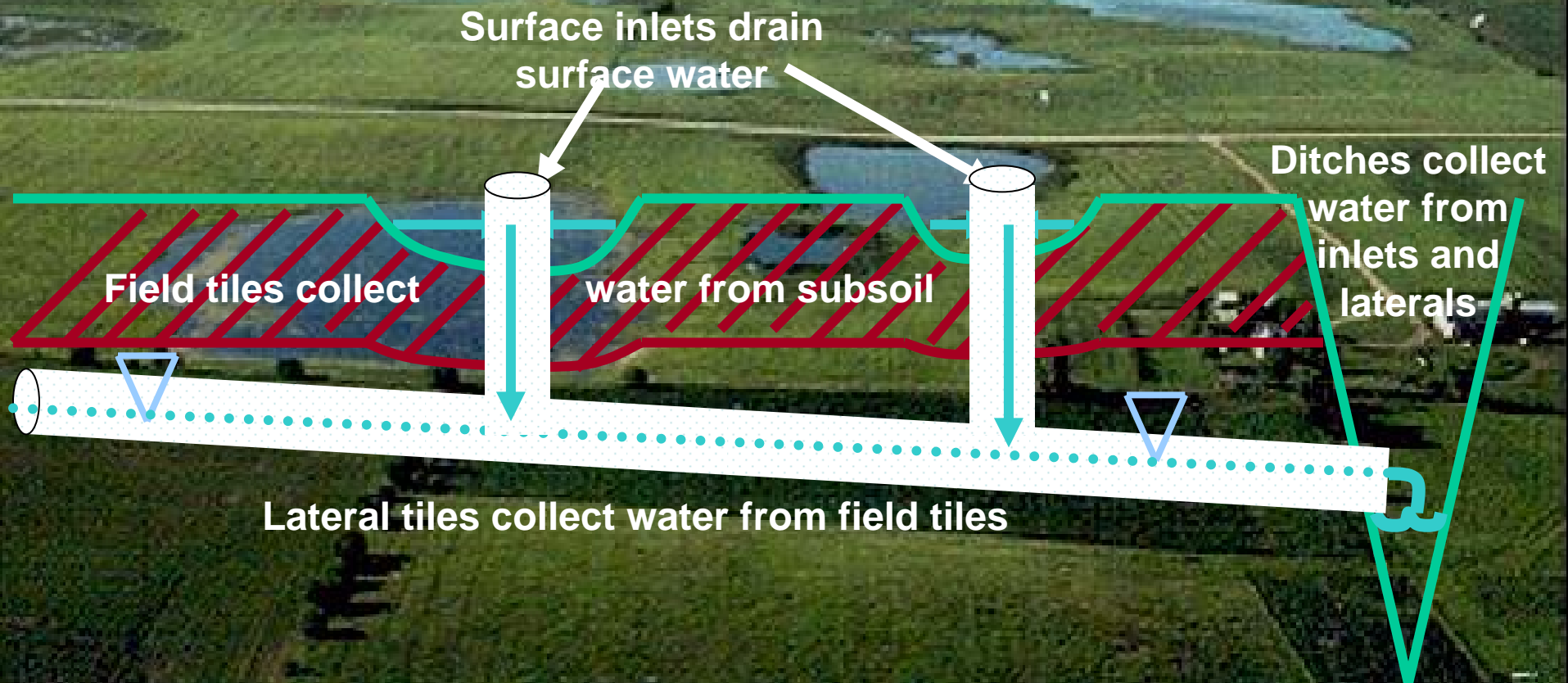
Monthly Precipitation (mm) at Van Meter and Annual Crop Growth Periods



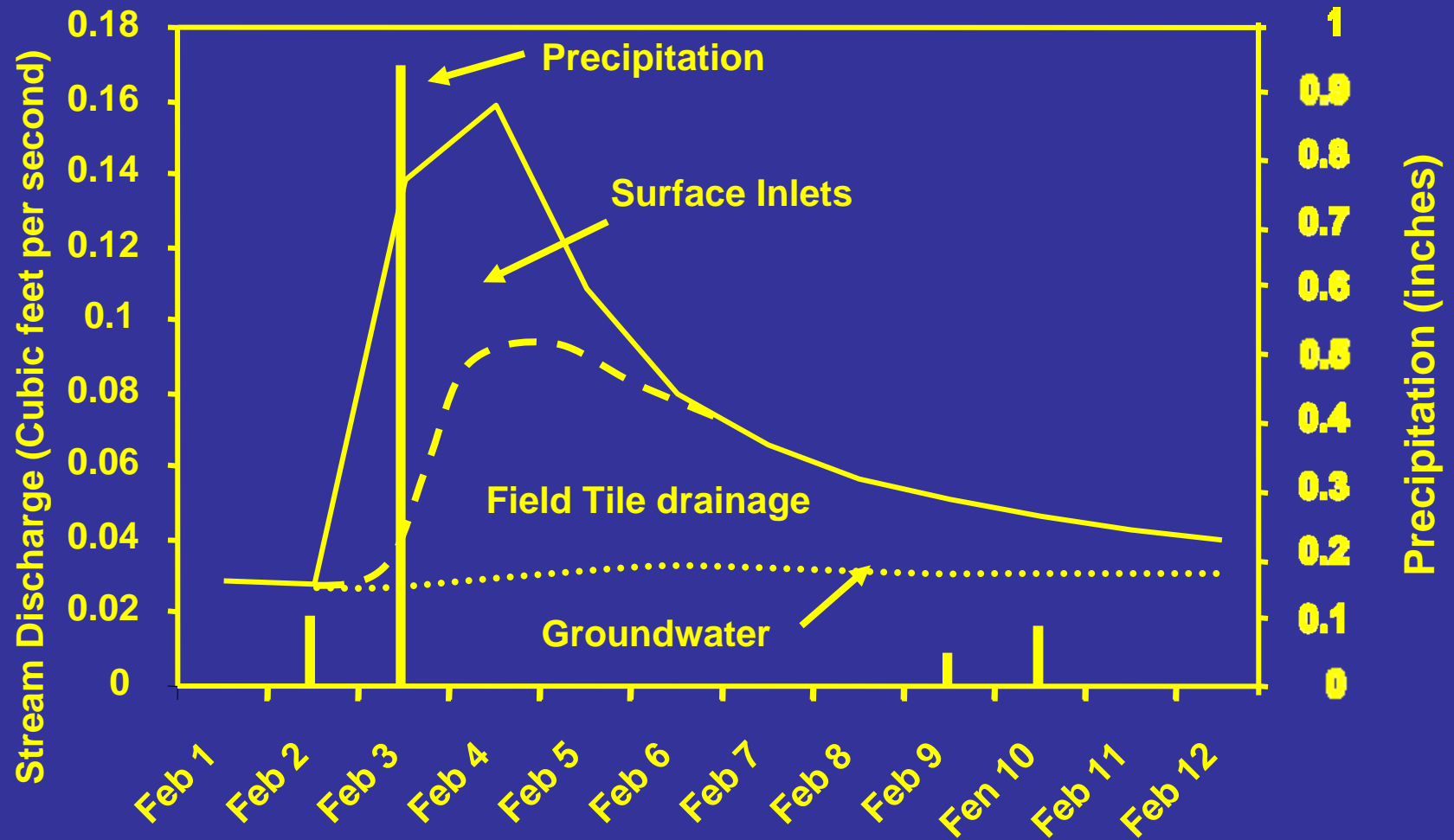
42% annual precip falls outside the corn growth period

50% annual precip falls outside the soybean growth period

Components of an artificially drained landscape

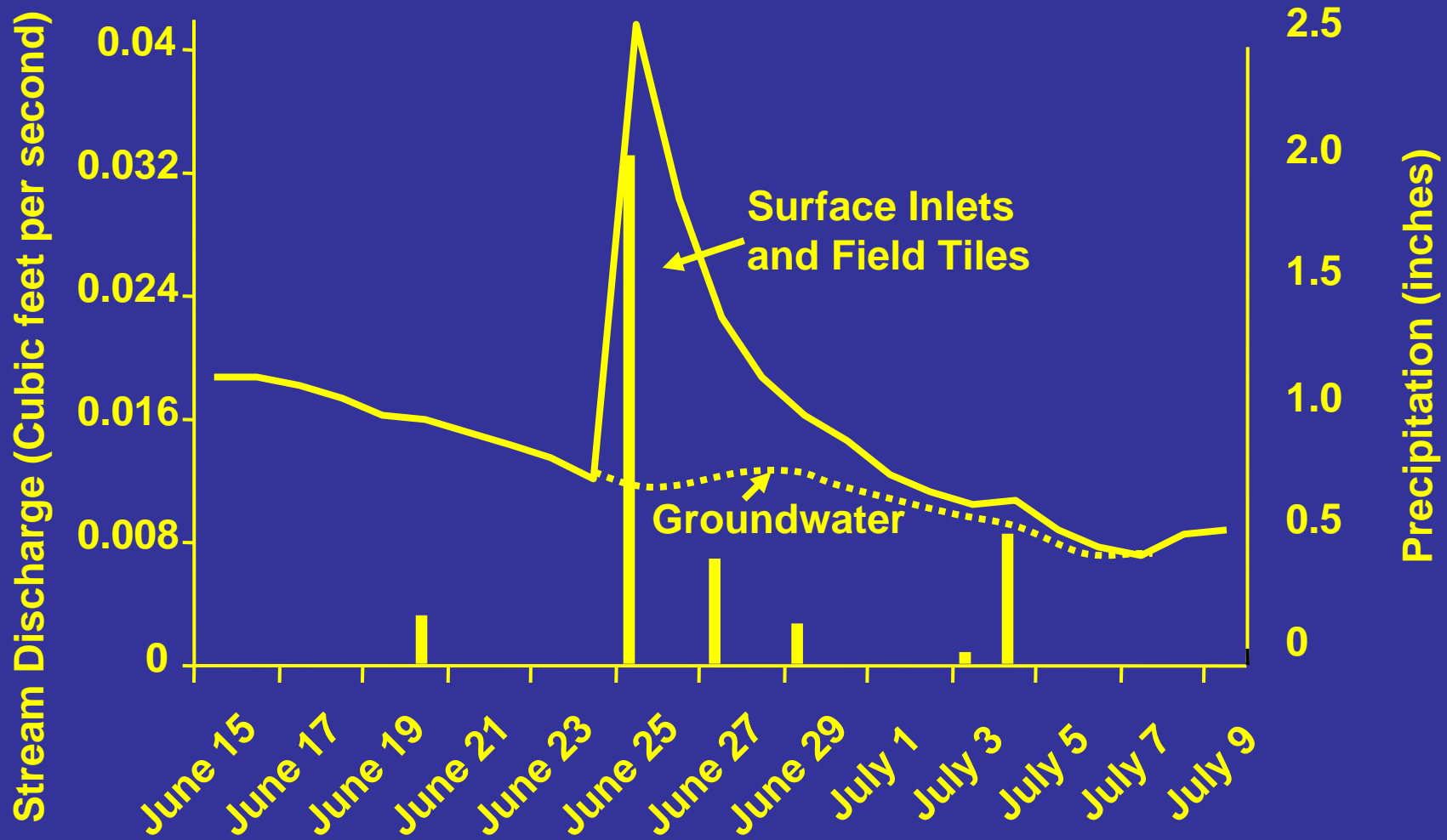


Hydrograph in Tileded Before Planting



Discharge Peaks at 6 X baseflow

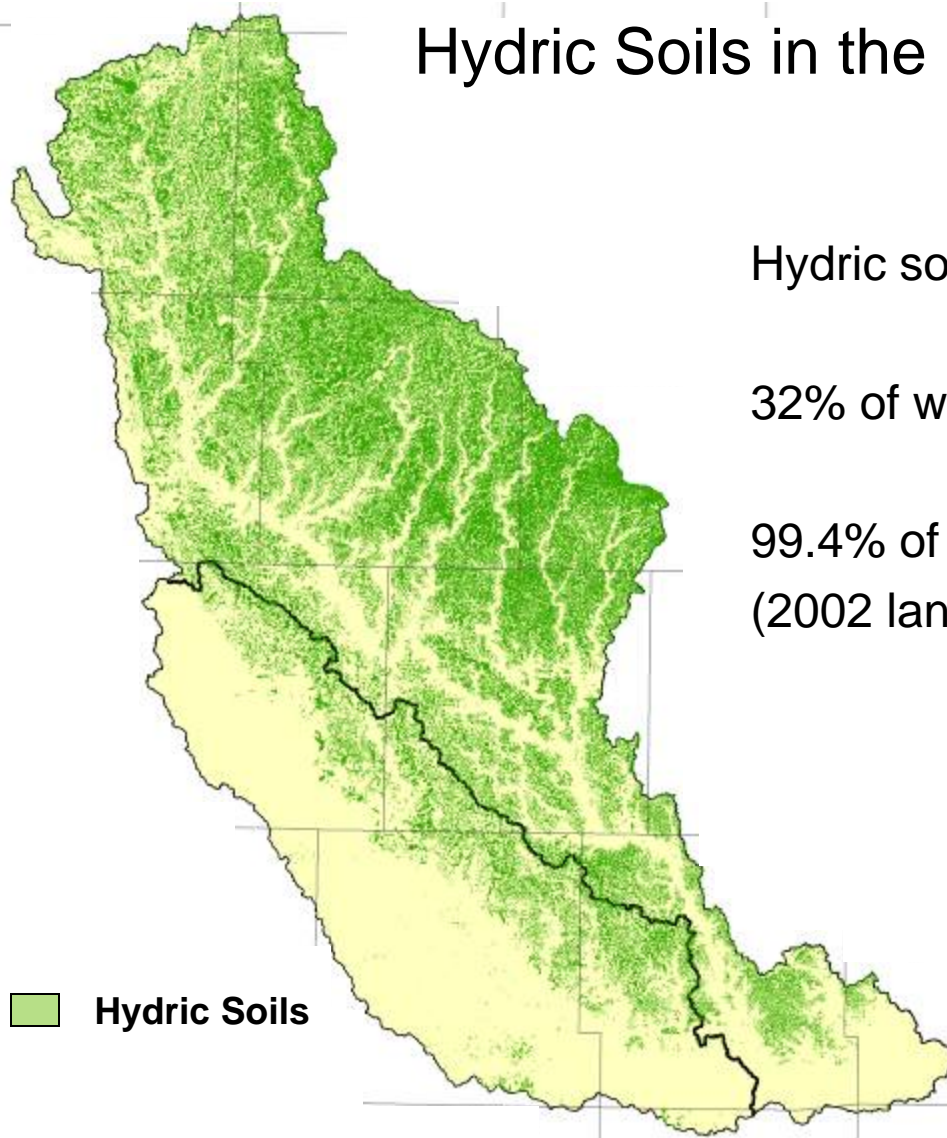
Hydrograph in Tileded During Maximum Leaf Area



Baseflow decreasing

Discharge peaks at 3 X baseflow

Hydric Soils in the Raccoon River Watershed



Hydric soils = wetlands

32% of watershed area = hydric soils/wetlands

99.4% of wetlands drained
(2002 land cover map)



Map by Calvin Wolter, IGS

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Channelized Segments of the Raccoon River

30% straightened and/or deepened
Meander removal

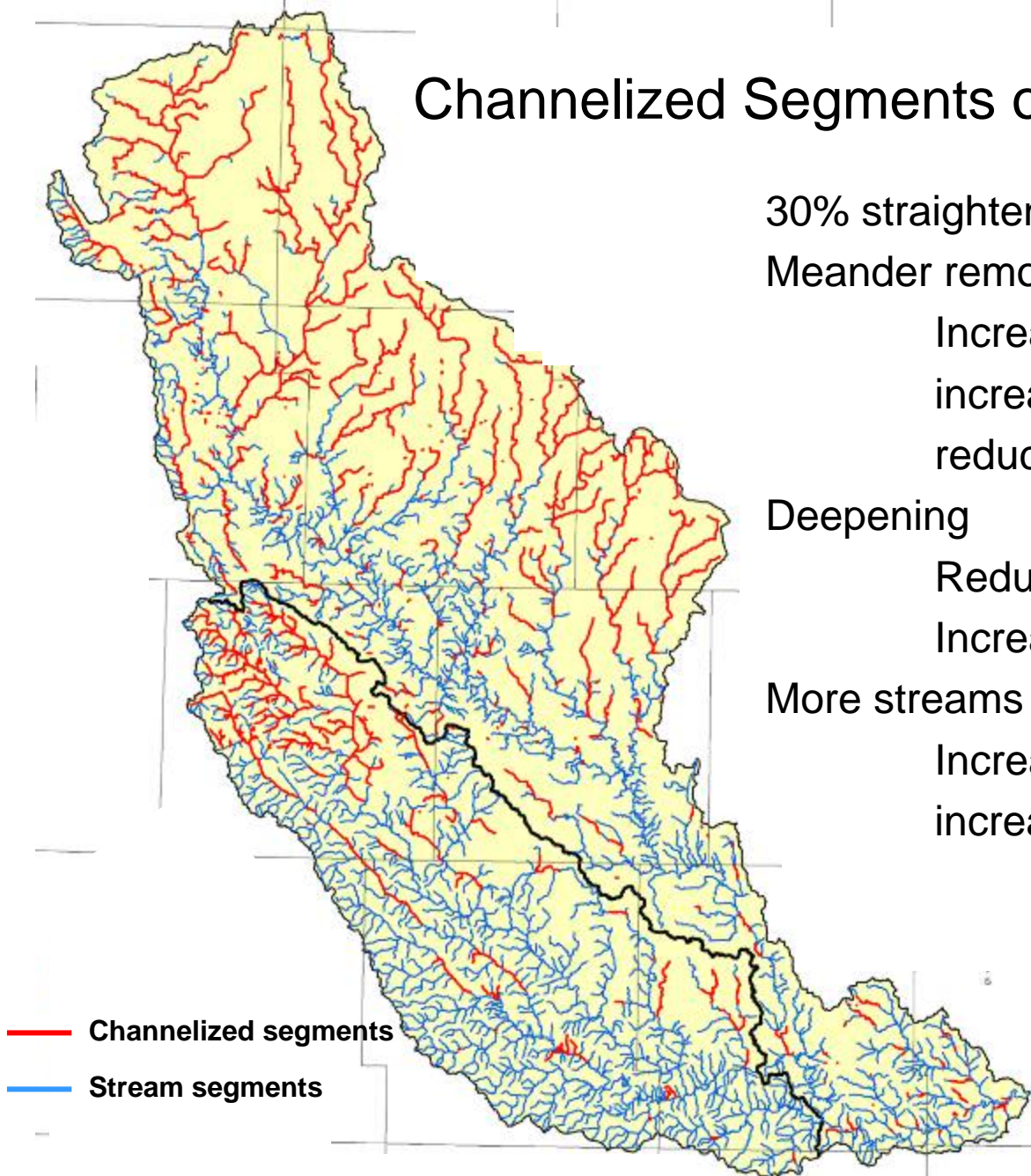
Increased velocity
increased upstream erosion
reduced instream storage

Deepening

Reduced instream storage
Increased baseflow

More streams (ditches) – 2 to 6 x since 1887

Increased discharge
increased baseflow



— Channelized segments
— Stream segments

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