UPPER PLATTE RIVER BASIN-WIDE PLAN DEVELOPMENT

SPG Meeting #10

March 21, 2018

ESTABLISHED MAY 2017

Water Management Planning Values

- ☑ Generational Stewardship
- ☑ Maintaining the good life
- ☑ There is a space for all; willingness and interest in working together; shared burden
- ☑ Looking beyond our own fences
- ☑ Others can make good use of the water we save
- ☑ We are making a difference!
- ☑ We have a long culture of adapting and changing with the times
- ☑ "Putting water back to the river without causing economic harm"

This is an Open Meeting

Notices Were Placed in:

The Grand Island Independent

Kearney Hub

The North Platte Telegraph

Scottsbluff StarHerald.com

Sidney Sun-Telegraph
SERVING SIDNEY & CHEYENNE COUNTY SINCE 1873

SPG Decision-Making Process

- ☑ The first goal is consensus
- ☑ A majority vote is the determining factor for all sections of the plan
- ☑ If the group cannot reach a majority, the NeDNR and the NRDs will work together to resolve the disputed issues
- ☑ If the SPG is unable to come to consensus by June 2018, the NeDNR and the NRDs will work together to resolve the disputed issues and create a final plan by August 2018

January Meeting Recap

Key Discussion Highlights

Follow-Up Items

Roadmap Through July 2018

March 21, 2018

- Conservation Study
- Drought Mitigation
- Conjunctive Management

May 16, 2018

- Identification of Second Increment Intent
- Elements of Draft Second Increment Plan

July 18, 2018

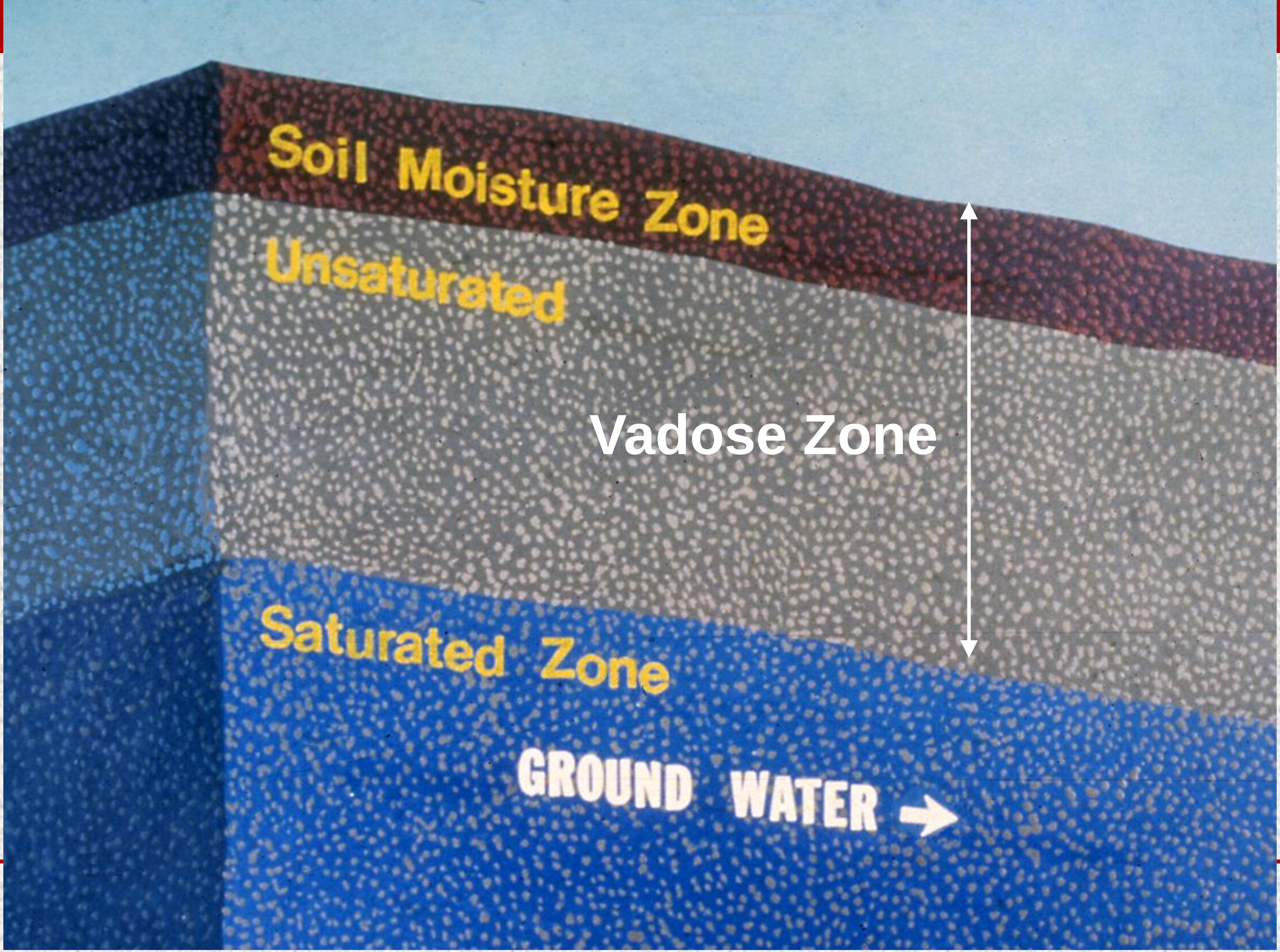
- Finalization of Second Increment Plan

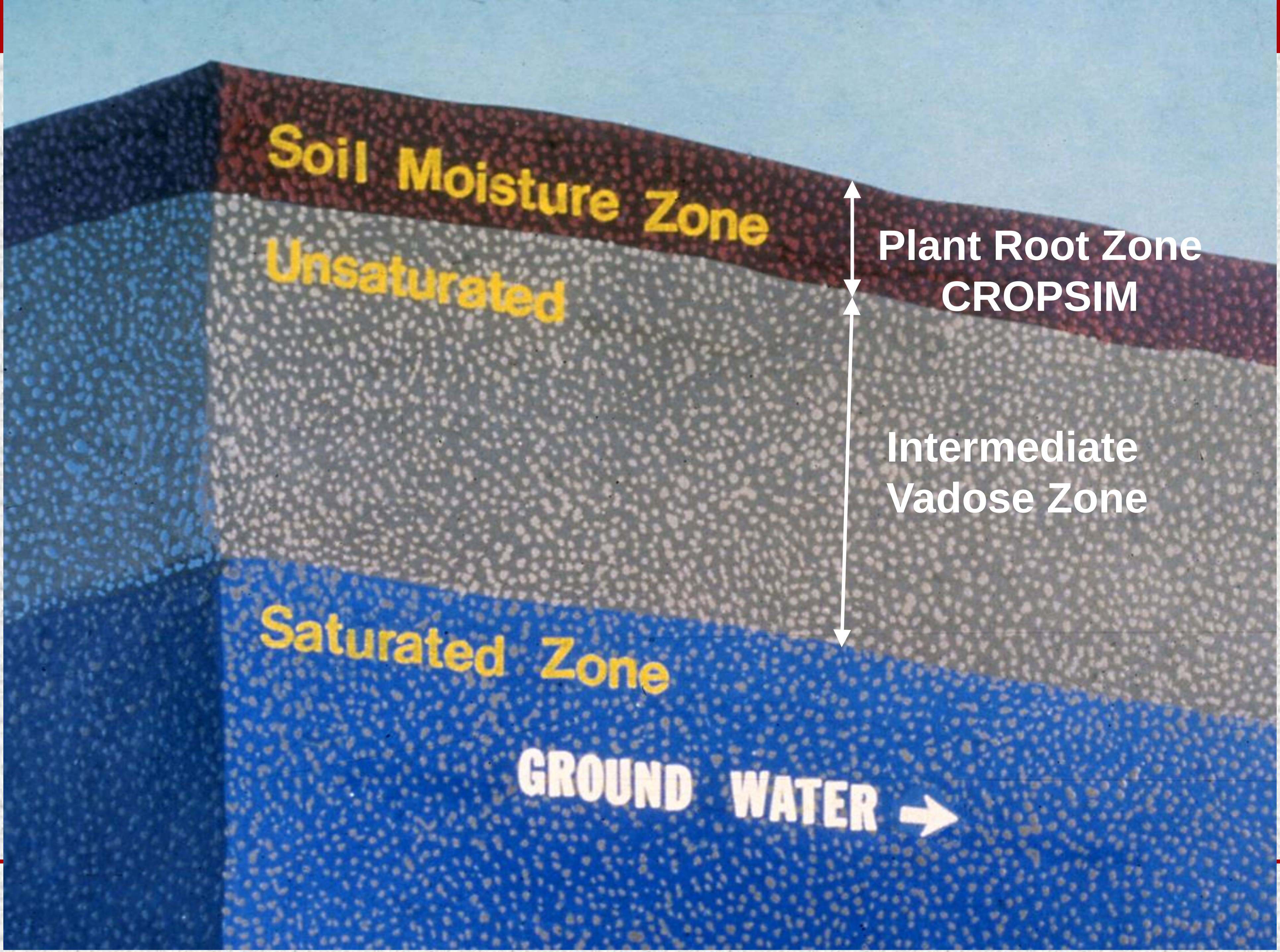
AGRICULTURAL HYDROLOGY -- THE BASICS

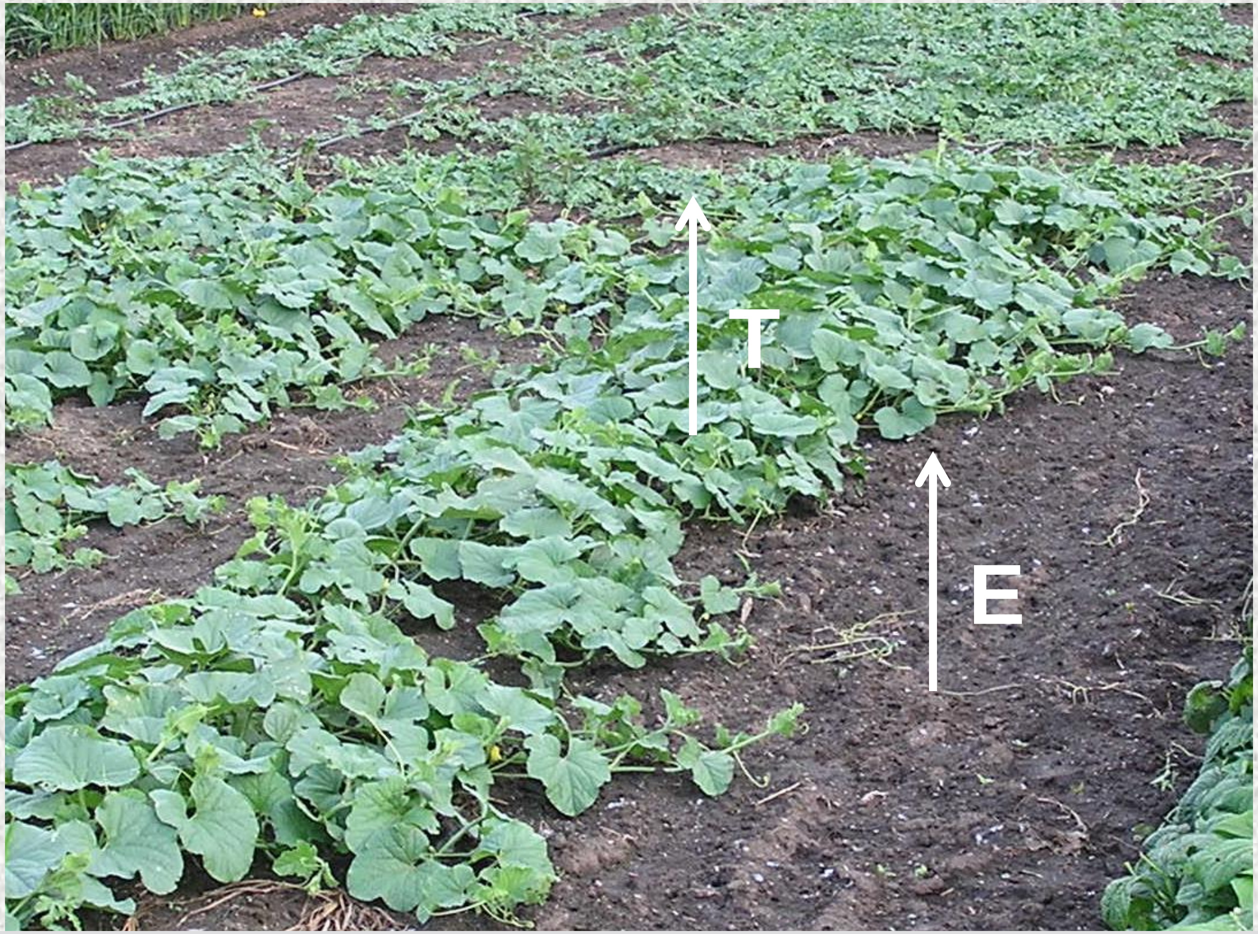
Dean E. Eisenhauer, P.E.

Marc Groff, P.E.

March 21, 2018


Soil Moisture Zone
Unsaturated
Vadose Zone
Saturated Zone
GROUND WATER


Soil Moisture Zone
Unsaturated
Saturated Zone
GROUND WATER
Plant Root Zone
CROPSIM
Intermediate
Vadose Zone



Evapotranspiration = Evaporation from Soil + Transpiration from Plants = E +T

Picture 1


Picture 2

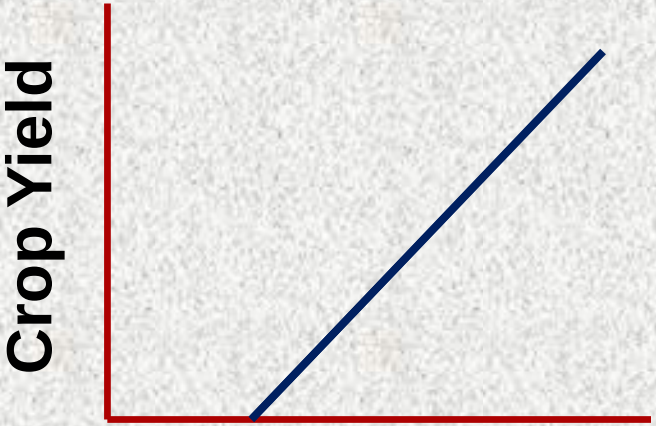

Picture 1

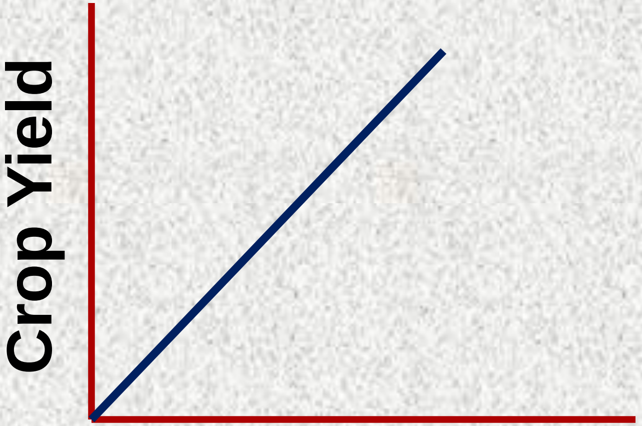
Picture 2

The Basics:

Relationship between yield, evapotranspiration and irrigation

Exercise: Choose the correct label for the horizontal axis of each graph

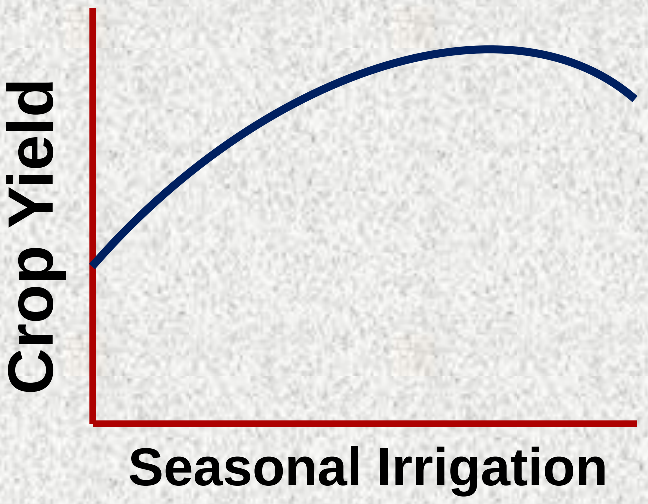


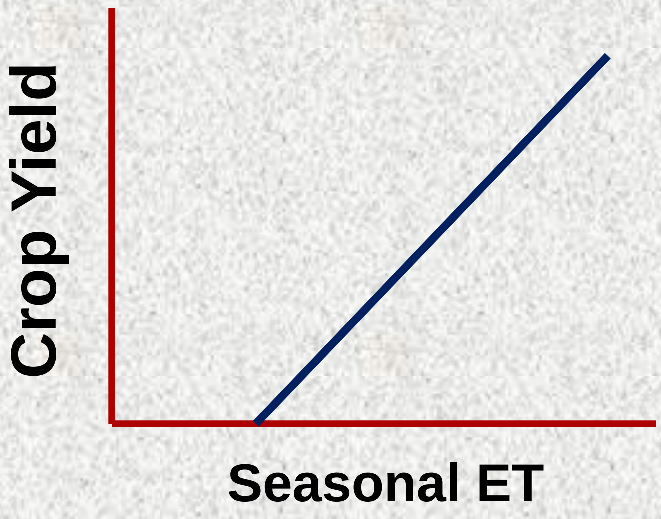


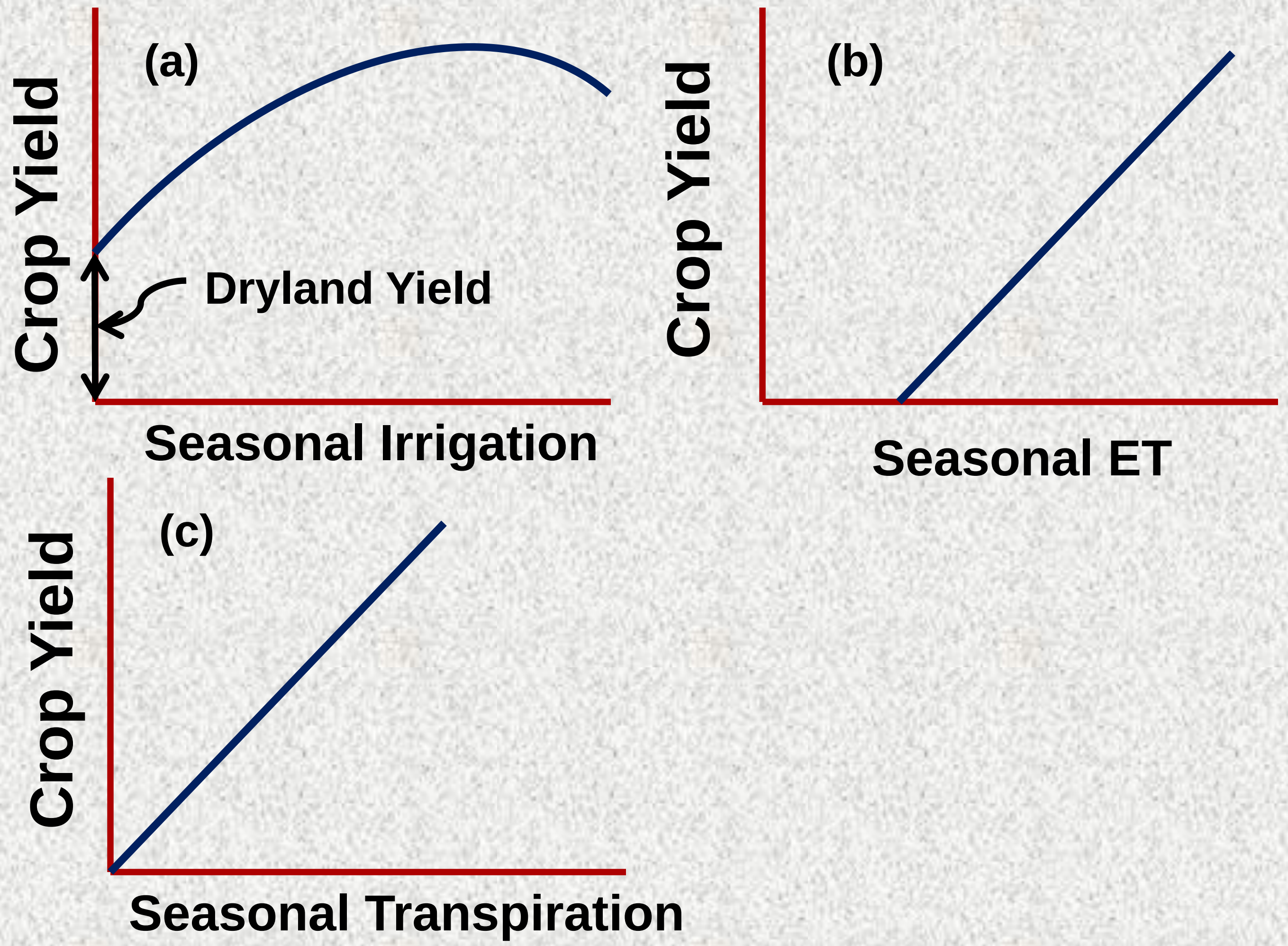
Options:

- Seasonal Irrigation
- Seasonal ET
- Seasonal Transpiration

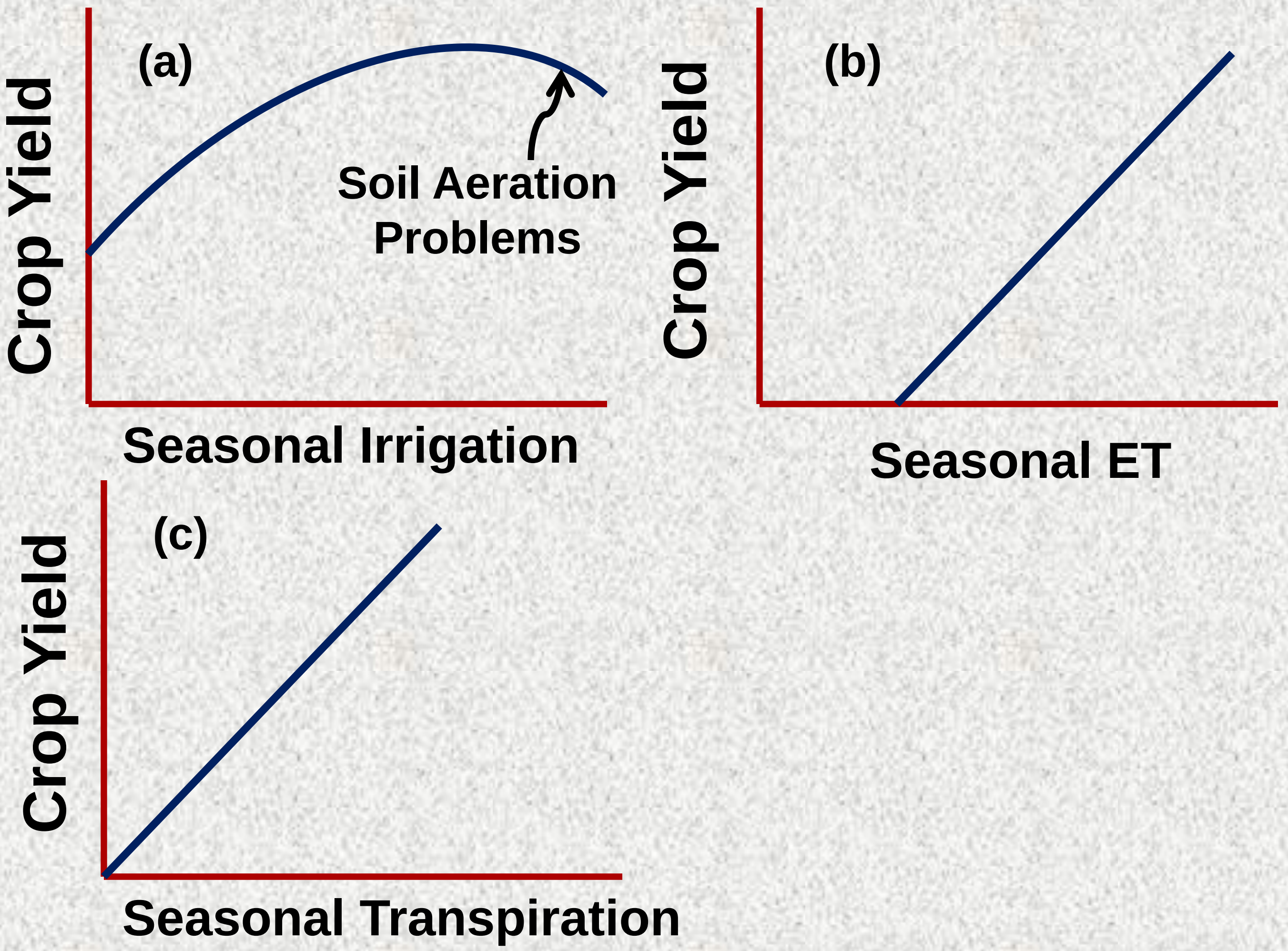
Exercise: Choose the correct label for the horizontal axis of each graph

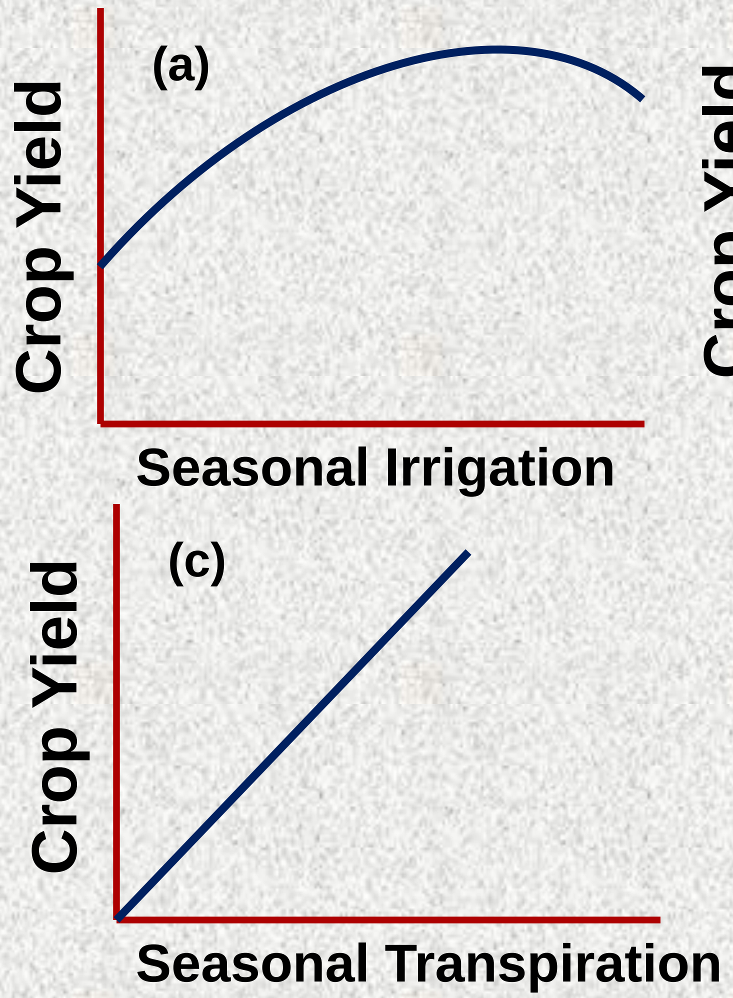


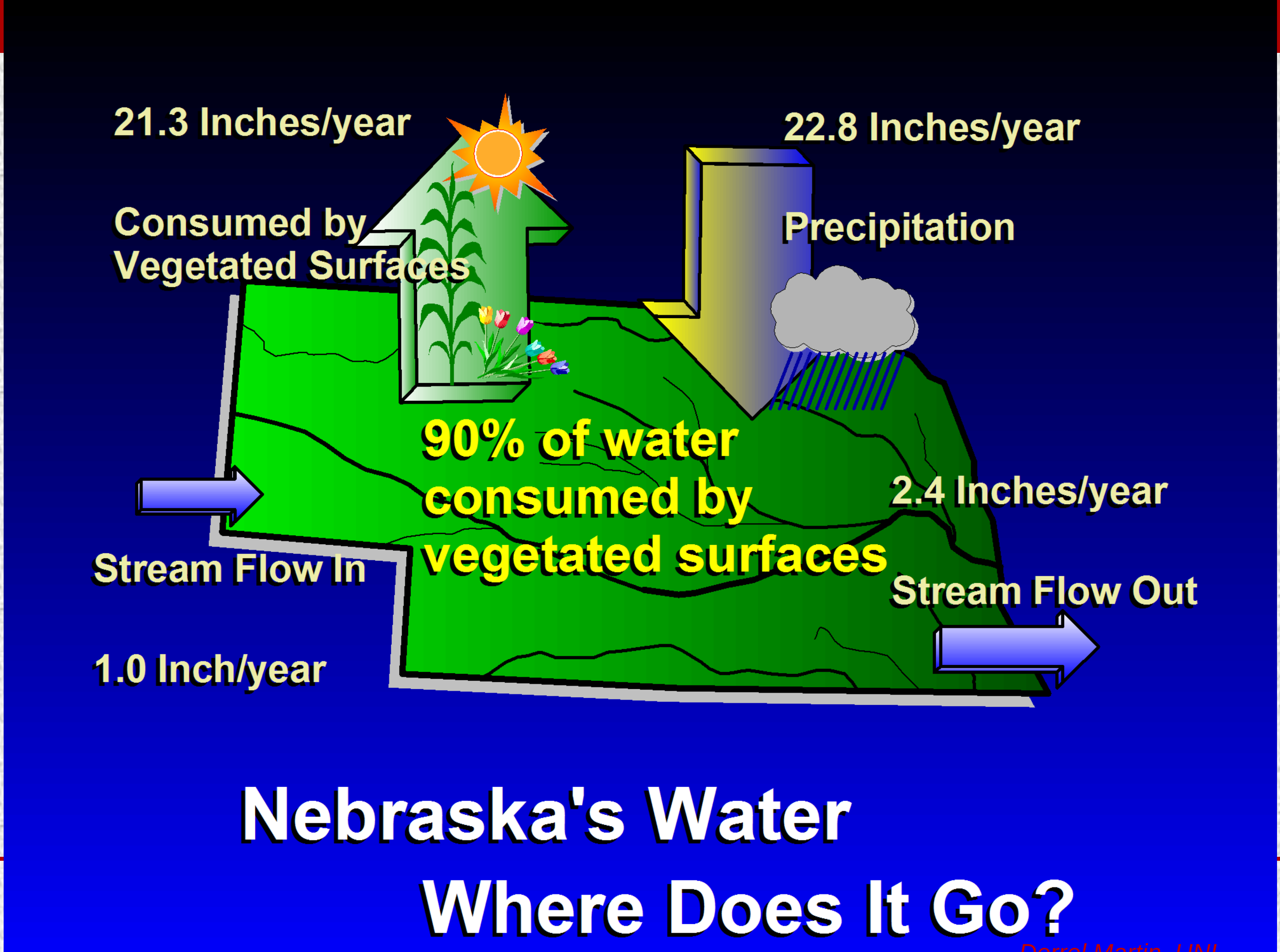




(a)
Crop Yield
Dryland Yield
Seasonal Irrigation
(b)
Crop Yield
Seasonal ET
(c)
Crop Yield
Seasonal Transpiration


(a)
Crop Yield
Soil Aeration
Problems
Seasonal Irrigation
(b)
Crop Yield
Seasonal ET
(c)
Crop Yield
Seasonal Transpiration


(a)
Crop Yield
Seasonal Irrigation
(b)
Crop Yield
Soil Water
Evaporation
Seasonal ET
(c)
Crop Yield
Seasonal Transpiration


21.3 Inches/year
Consumed by
Vegetated Surfaces
22.8 Inches/year
Precipitation
90% of water
consumed by
vegetated surfaces
2.4 Inches/year
Stream Flow Out
Stream Flow In
1.0 Inch/year
Nebraska's Water
Where Does It Go?

Impacts of Water Conservation Practices on Stream Hydrology

Goal:

- **Discuss the question:** ***Do water conservation practices make more water available for other uses in a watershed?***

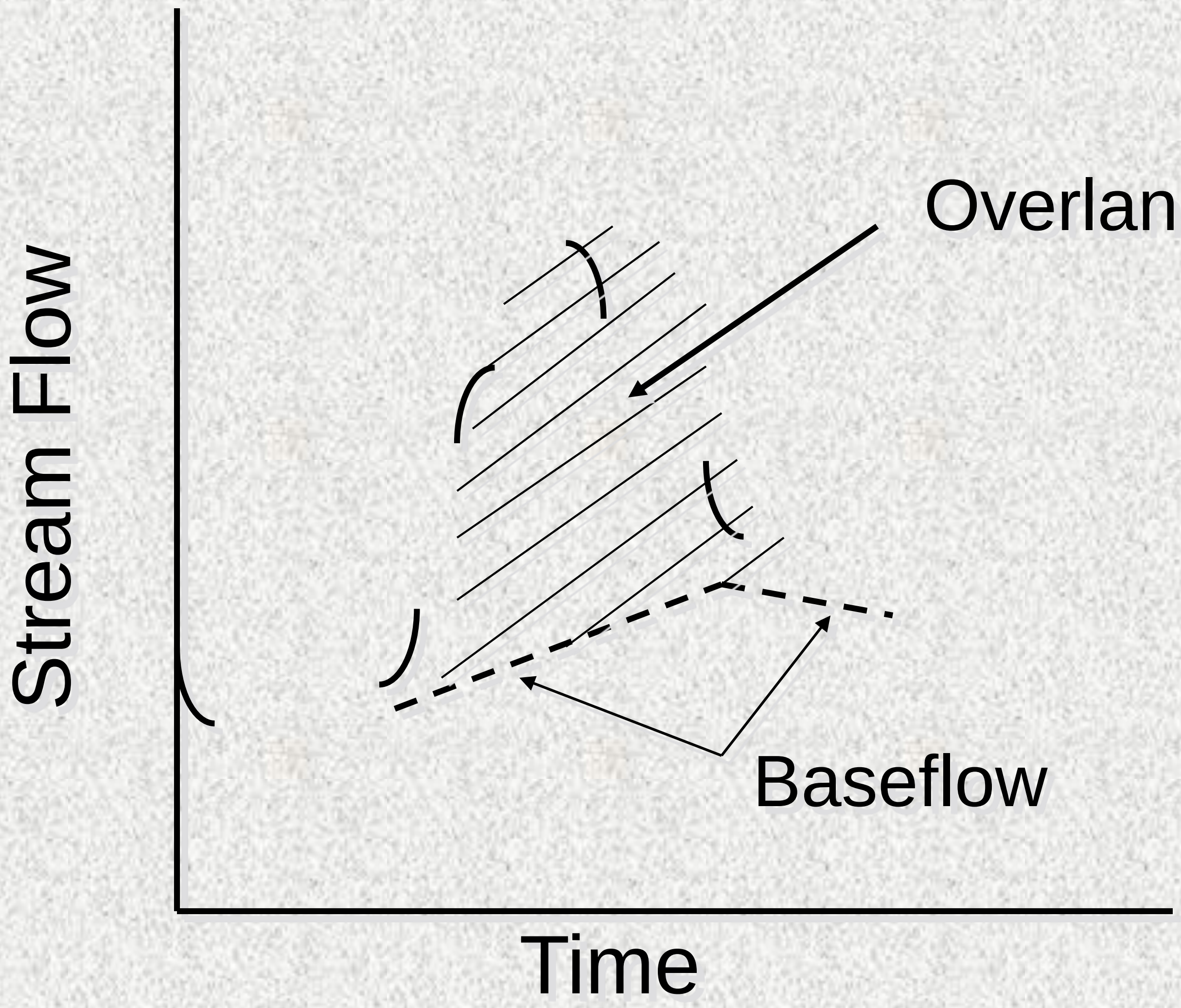
Setting the Stage

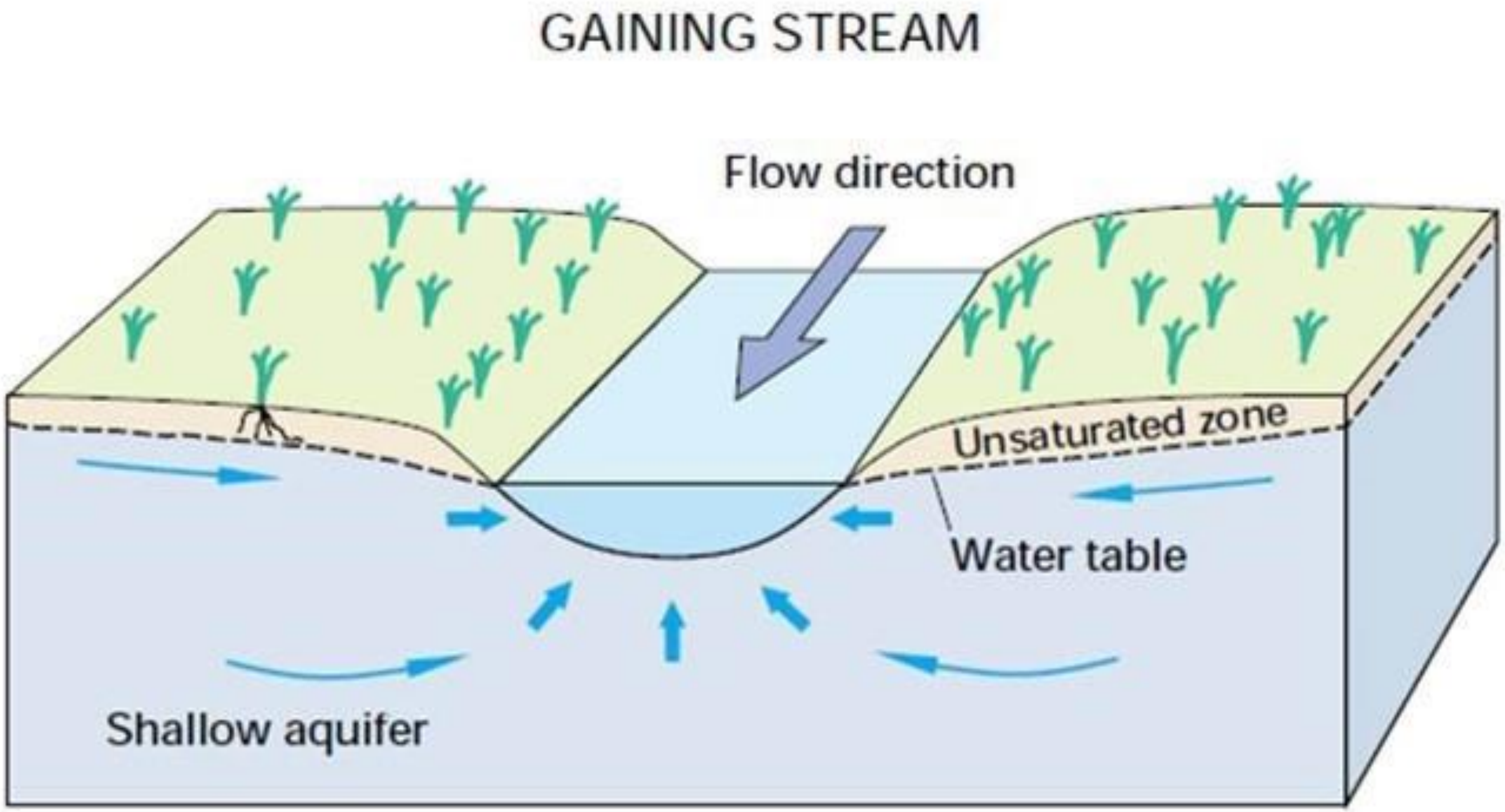
- **Surface water and groundwater are connected**
- **The goal is to conserve "wet" water**
- **Irrigation increases ET**
- **Time and location factors are acknowledged but not emphasized**

Definitions

- Water conservation practice
  - less diversion/less pumpage
  - keep the water on the land
  - ????
- Irrigation efficiency
  - beneficially used/applied

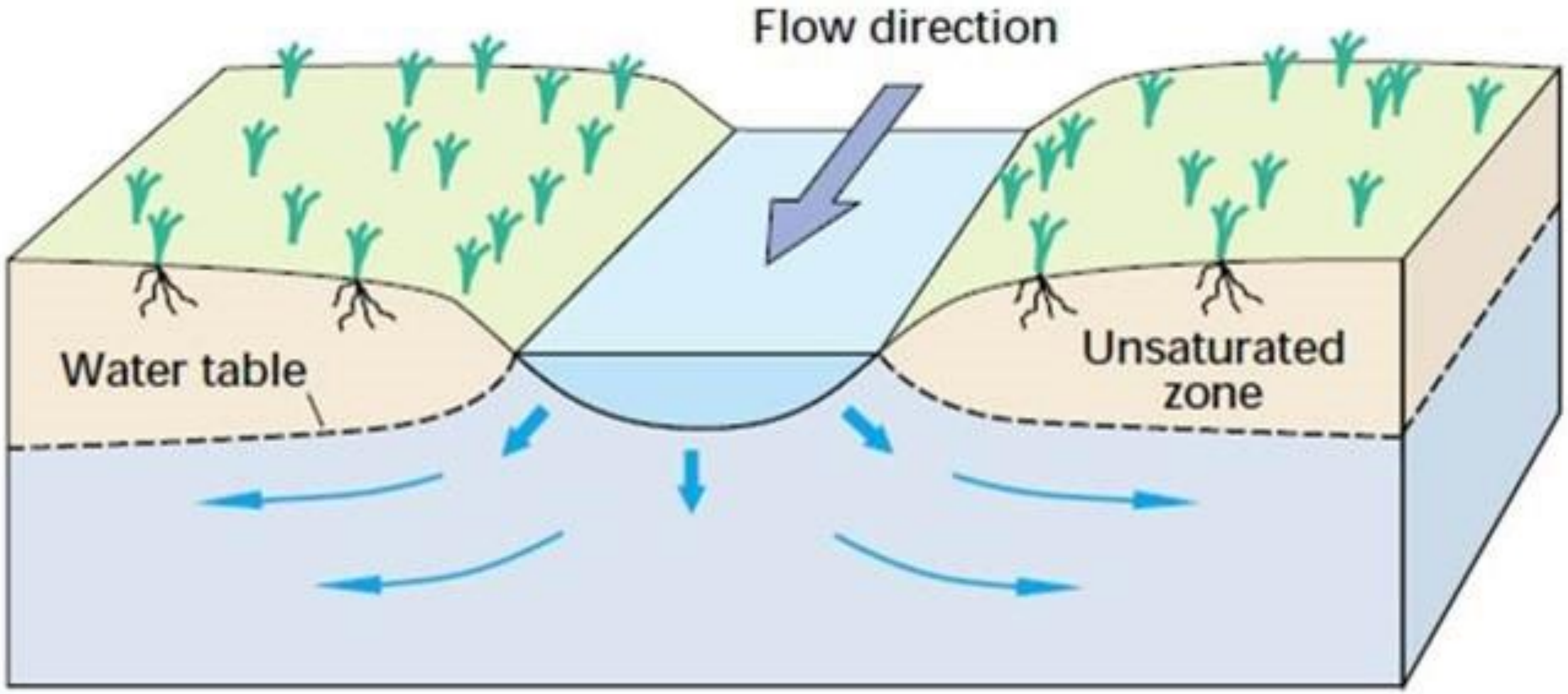

Sources of Water
to a Stream


Overland Runoff
Stream Flow
Baseflow
Time


GAINING STREAM
Flow direction
Unsaturated zone
Water table
Shallow aquifer

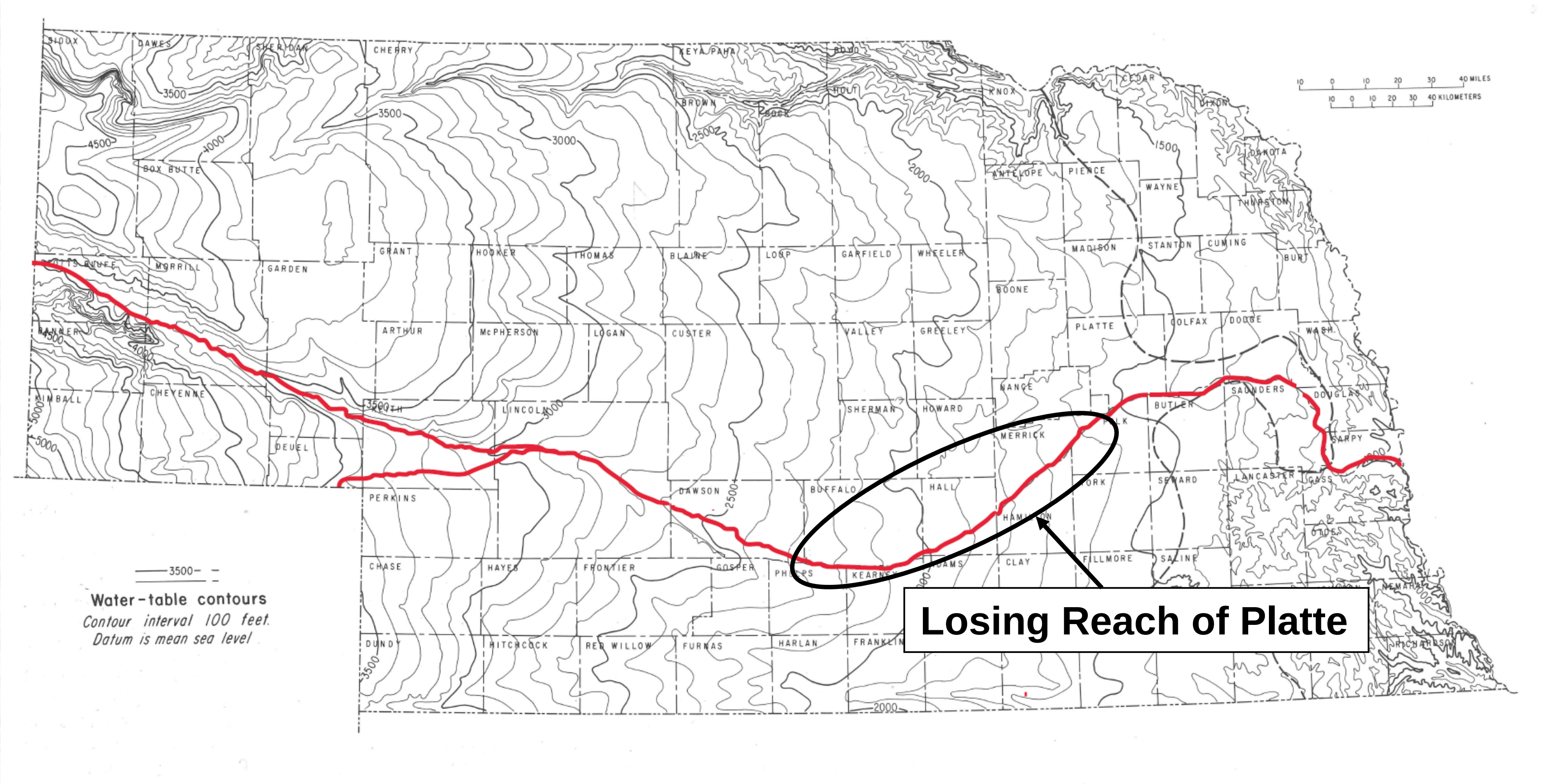
USGS

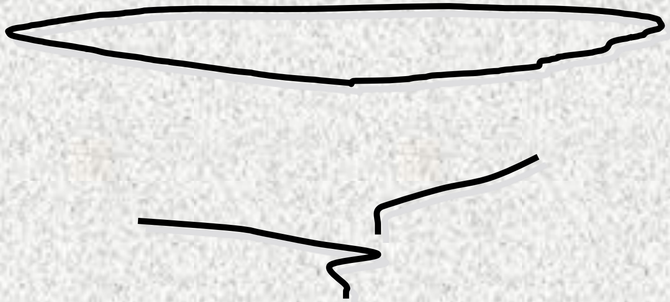
LOSING STREAM



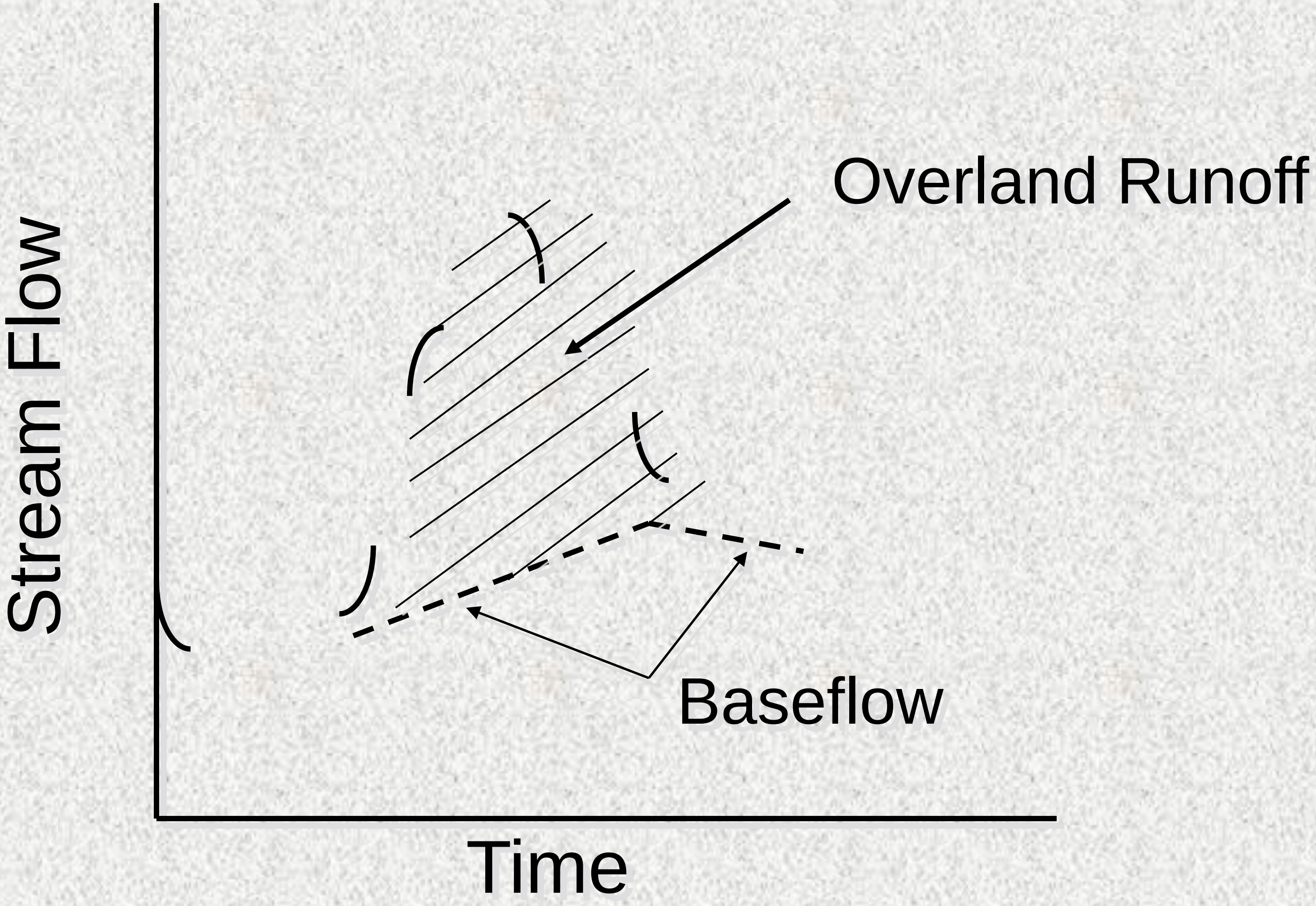
USGS

Groundwater Contours in Nebraska

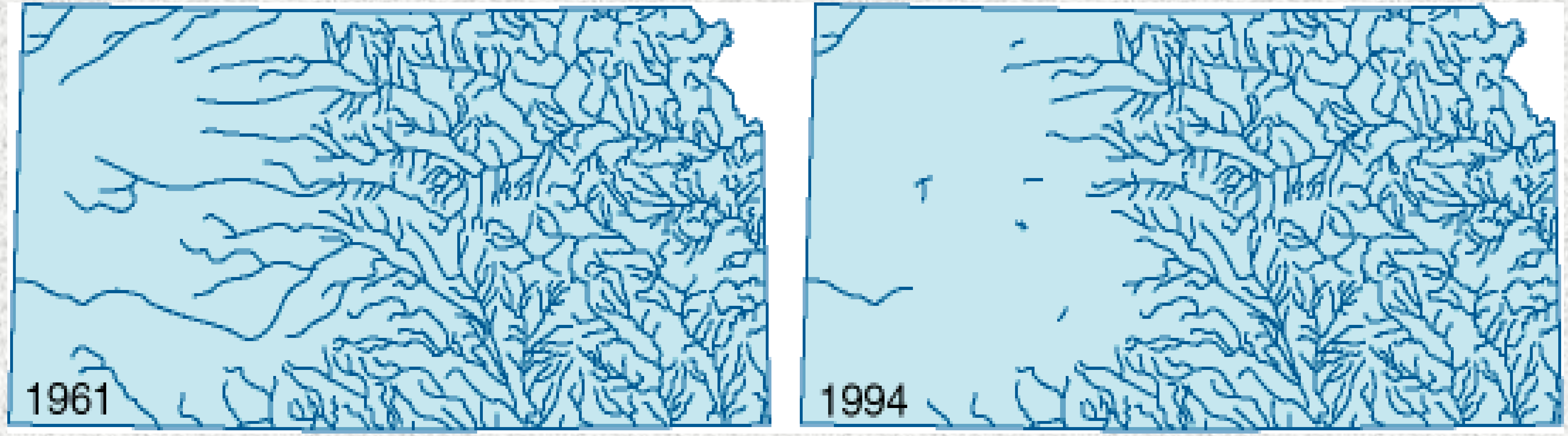




Watershed – Land area that contributes water to the stream


Overland Runoff
Stream Flow
Baseflow
Time

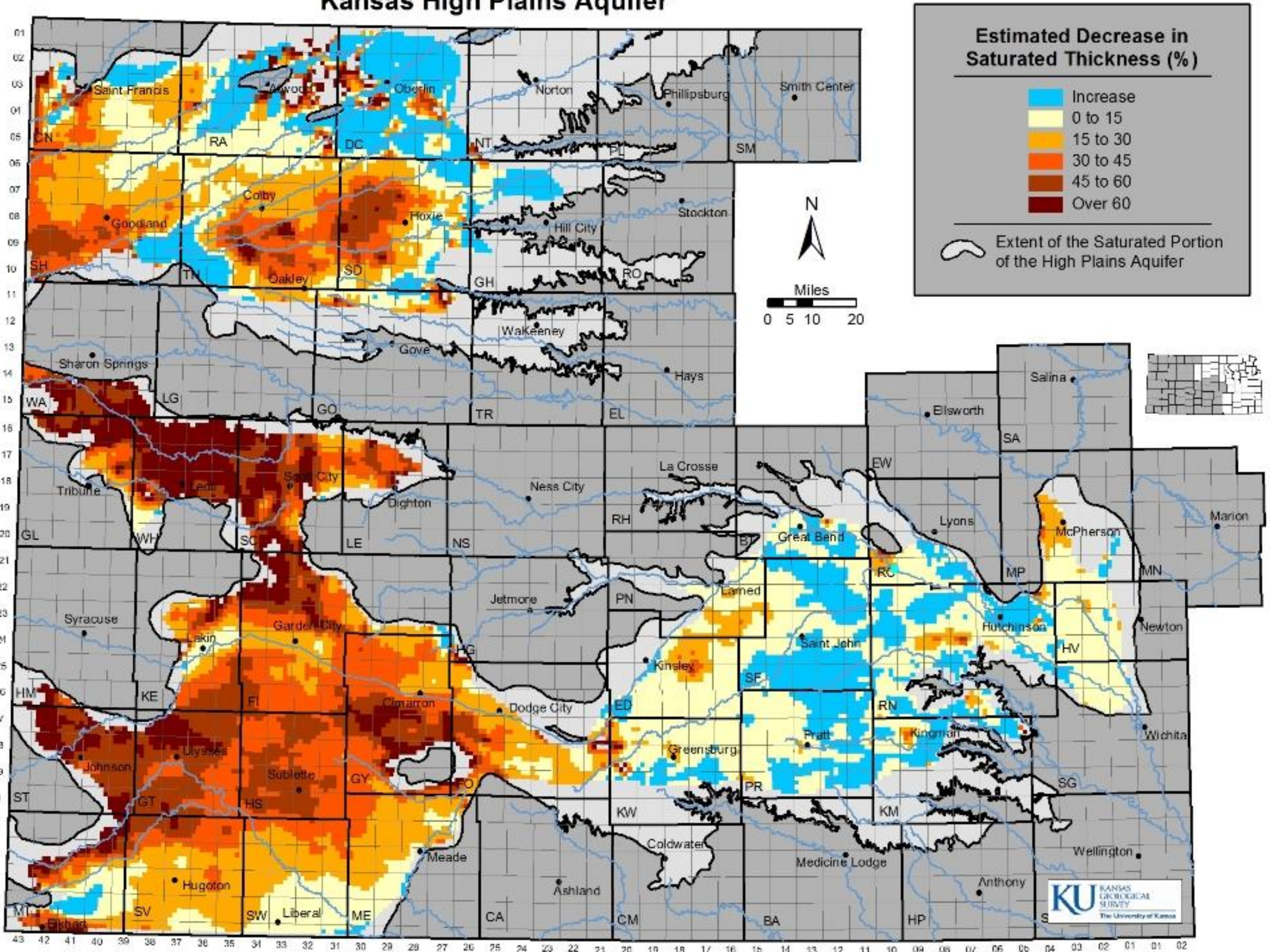
Perennial Streams in Kansas

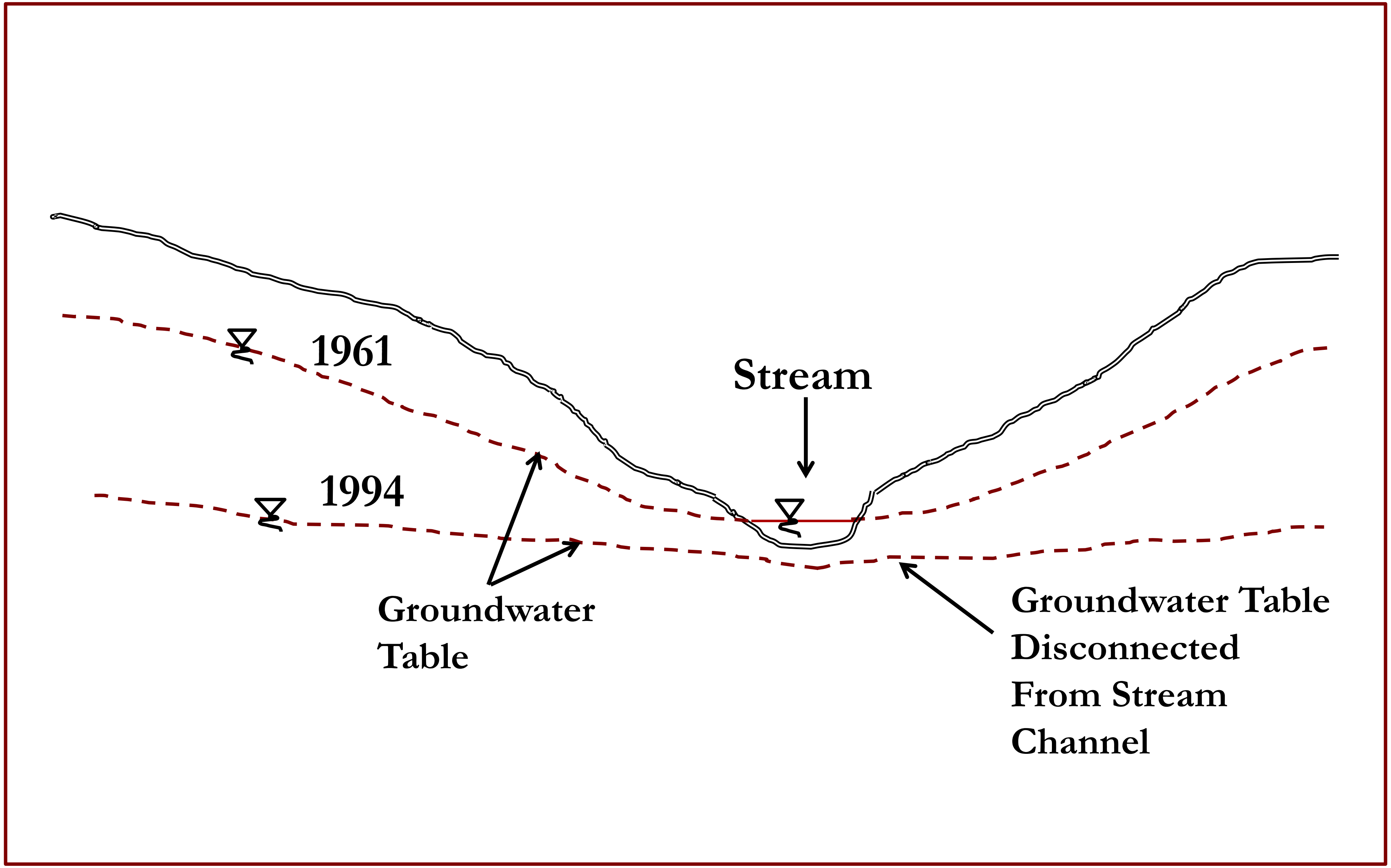


Sophocleous, KGS

A perennial stream is a stream has
continuous flow in parts of its bed all year round ………..

Percent Change in Saturated Thickness, Predevelopment to Average 2010 - 2012, Kansas High Plains Aquifer

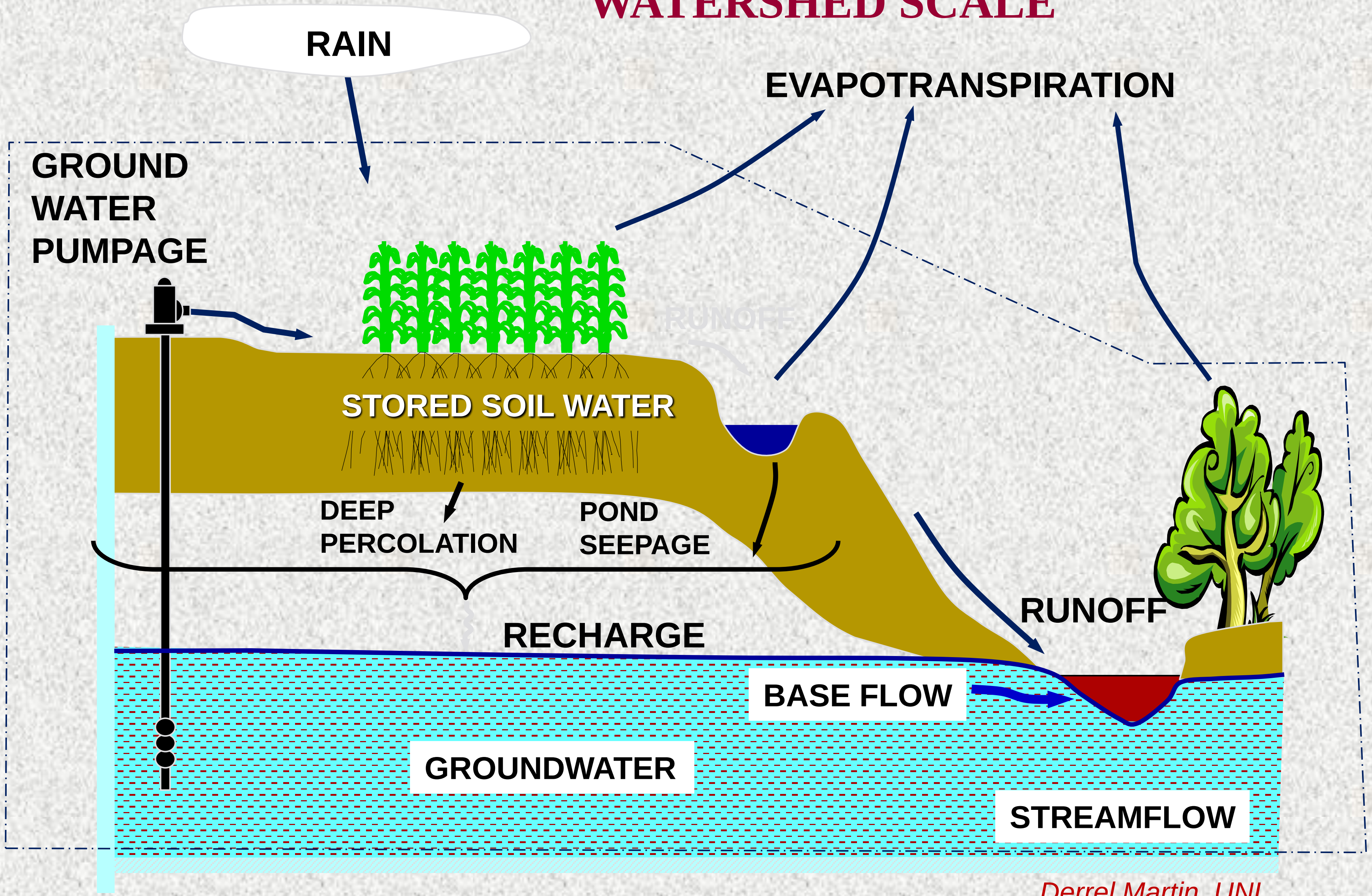



1961
Stream
1994
Groundwater
Table
Groundwater Table
Disconnected
From Stream
Channel

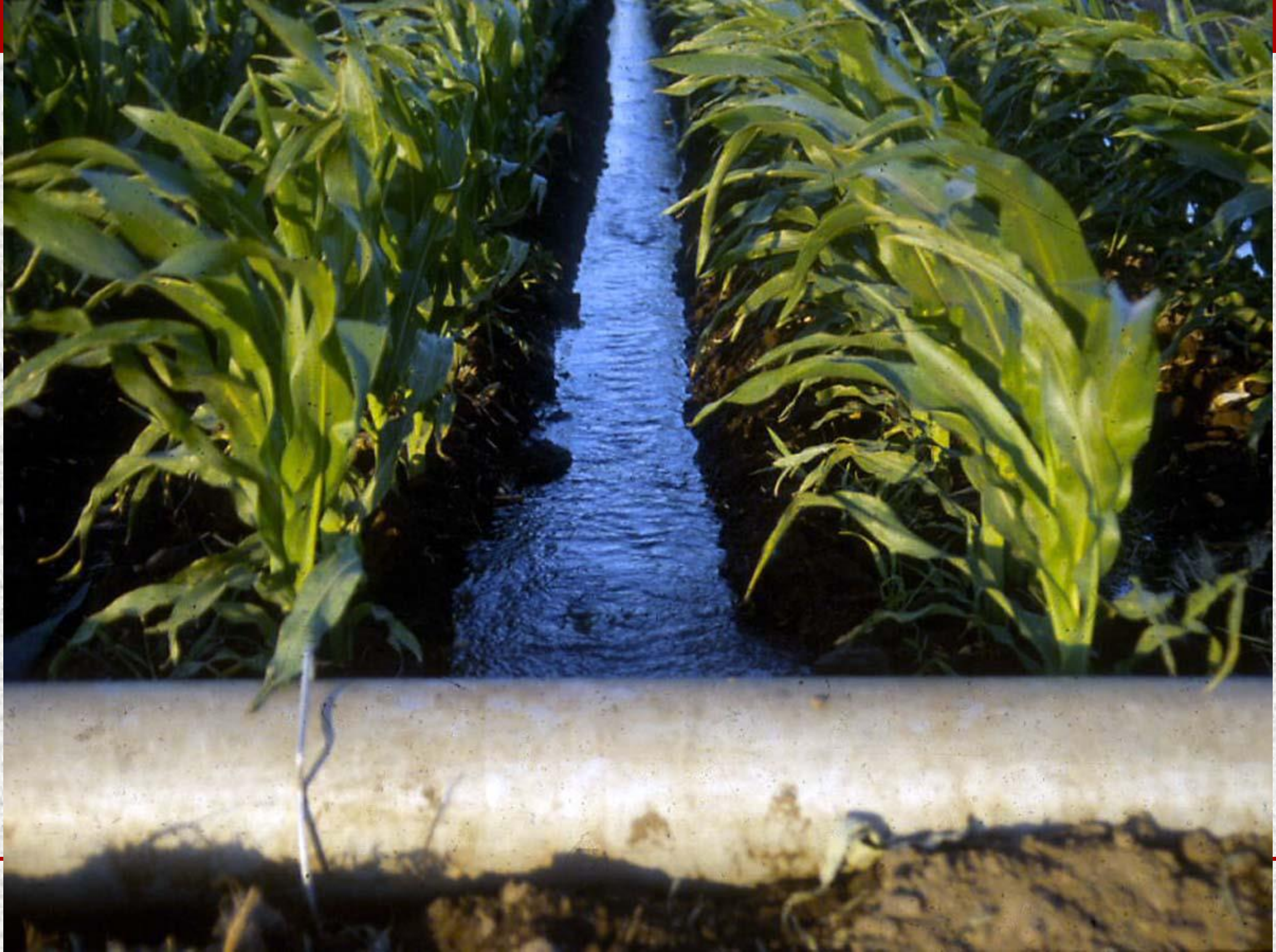

AB

GROUNDWATER IRRIGATED CONDITIONS

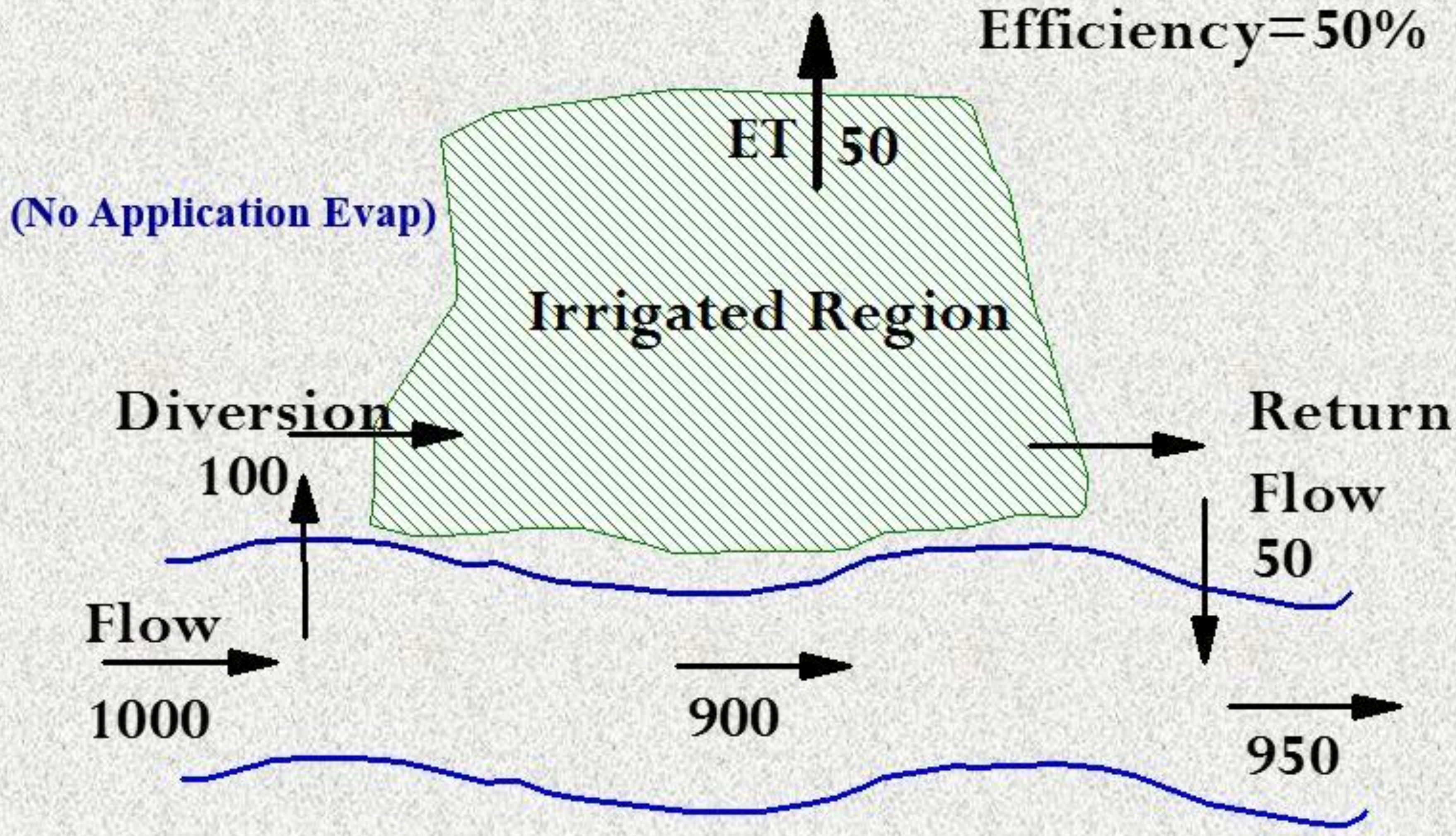
WATERSHED SCALE



Derrel Martin, UNL



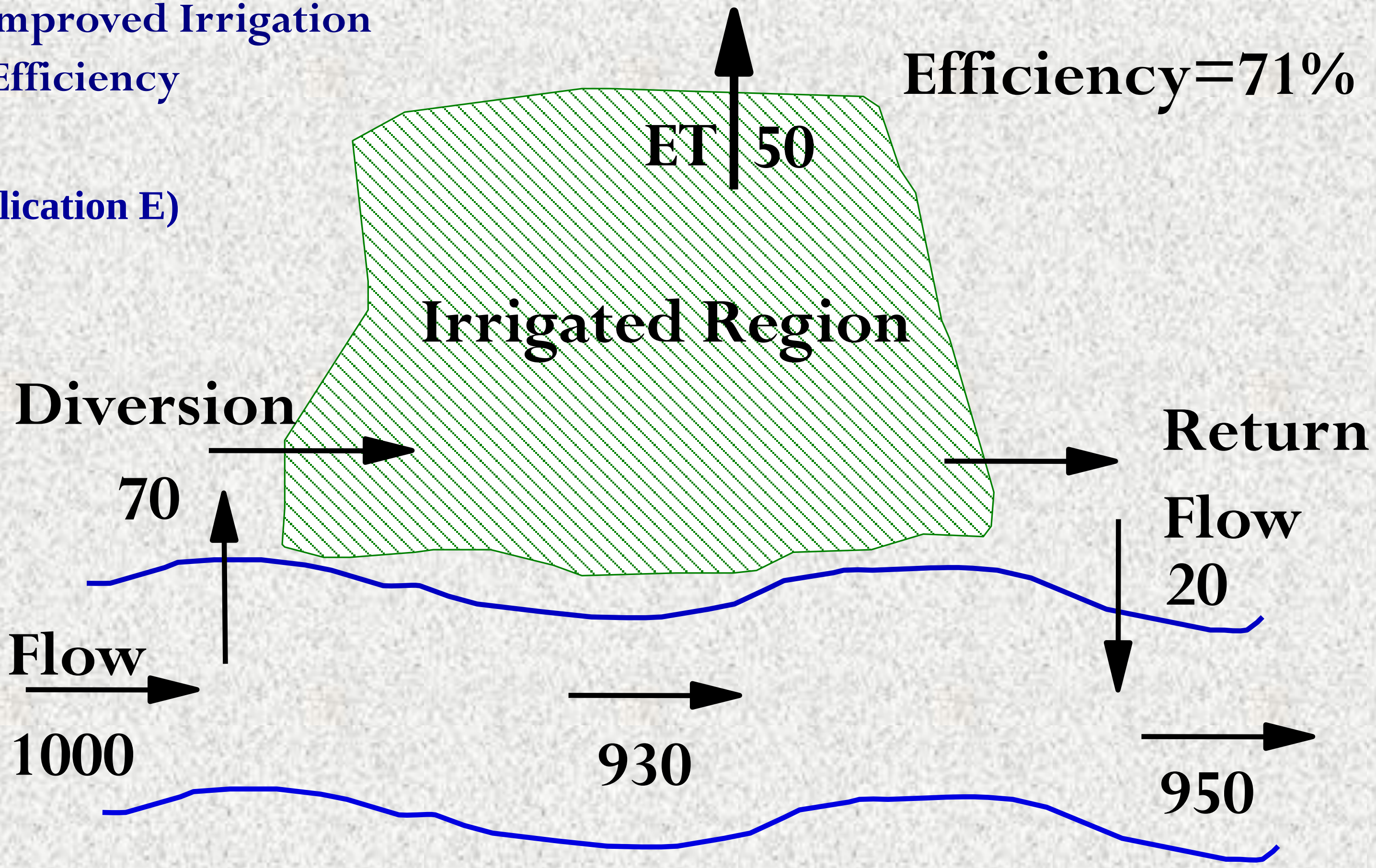
Water Conservation



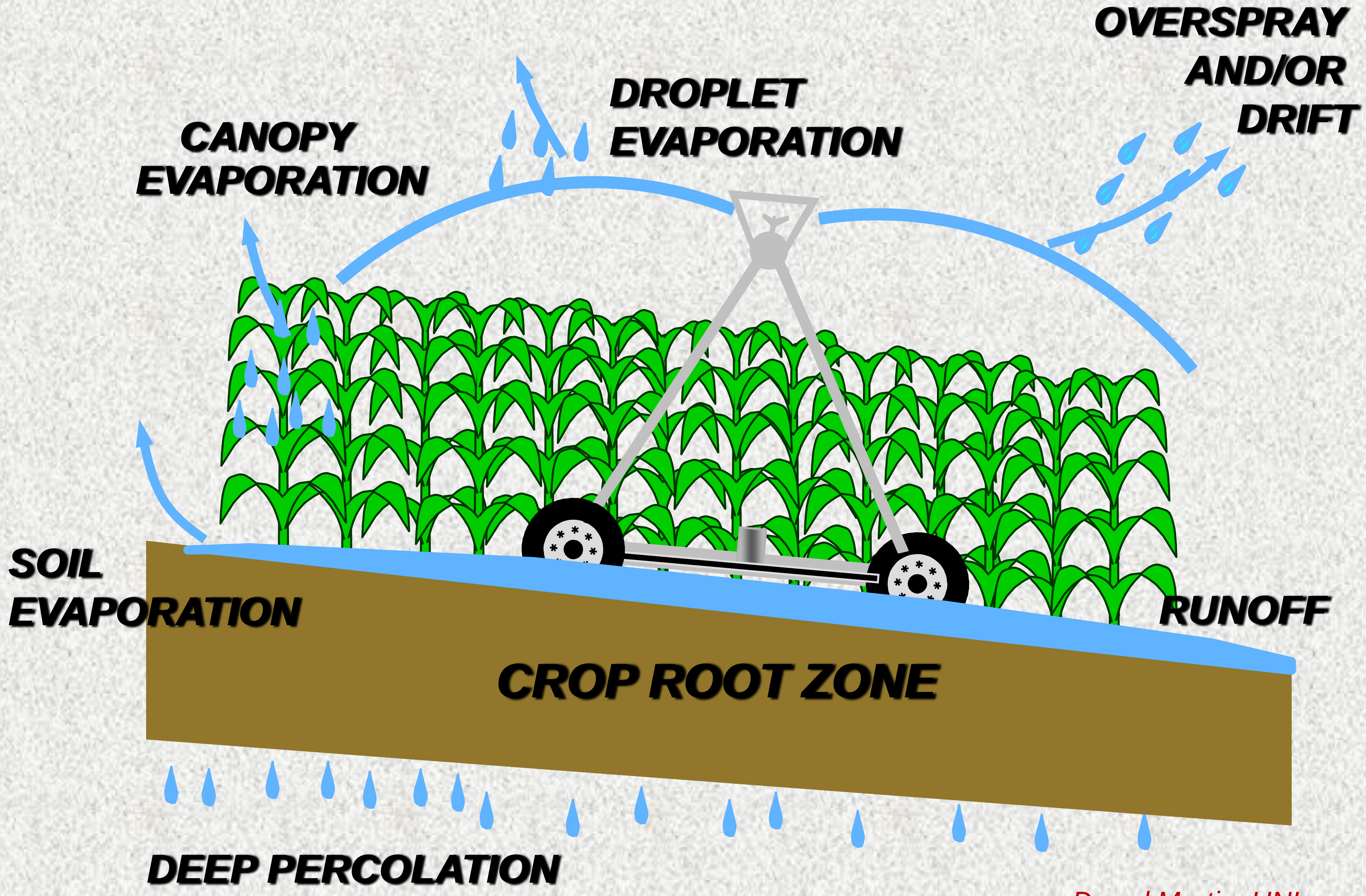
Water Conservation

Improved Irrigation Efficiency

(No Application E)



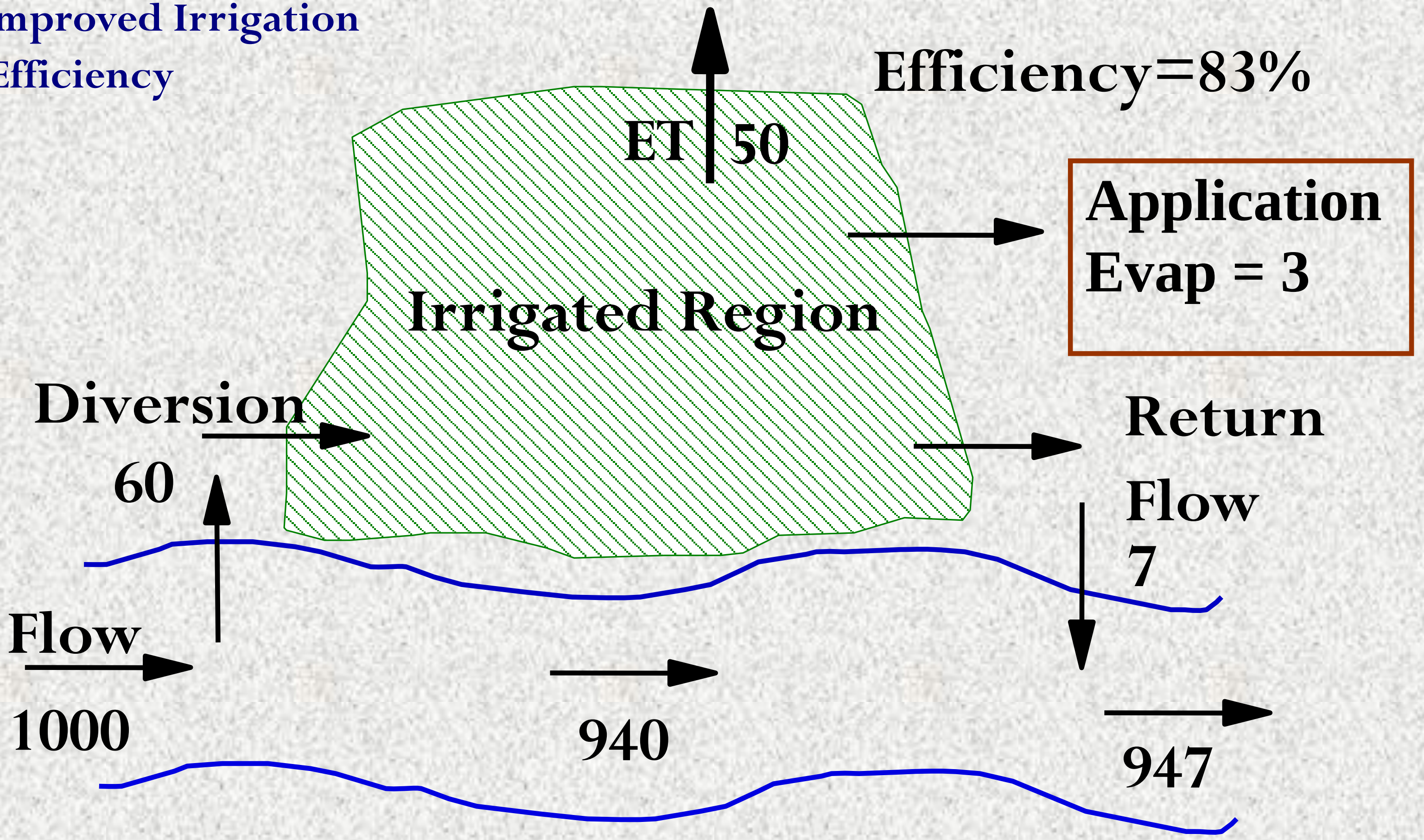
WATER "LOSSES" FROM SPRINKLER SYSTEMS



Derrel Martin, UNL

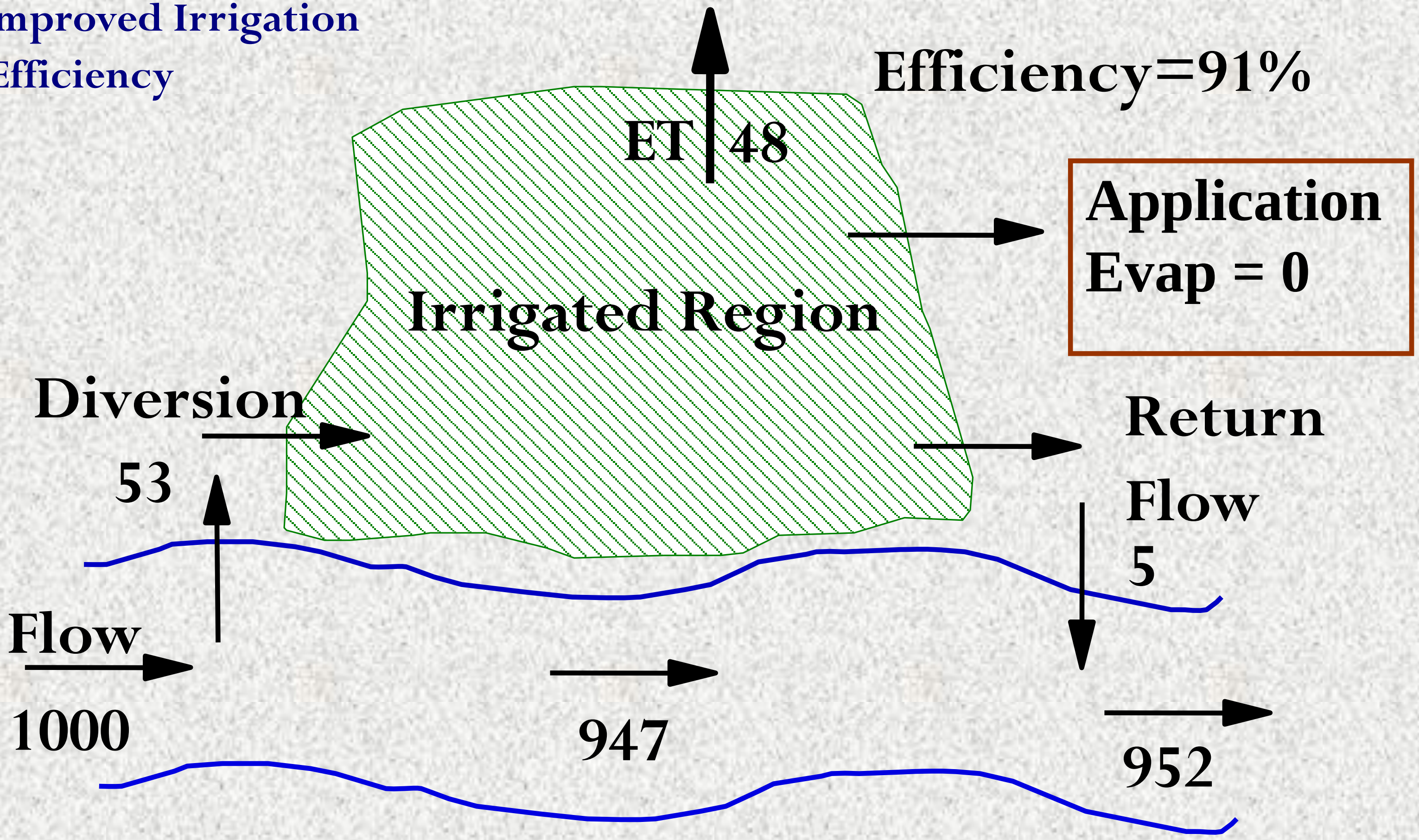
Water Conservation

Improved Irrigation
Efficiency



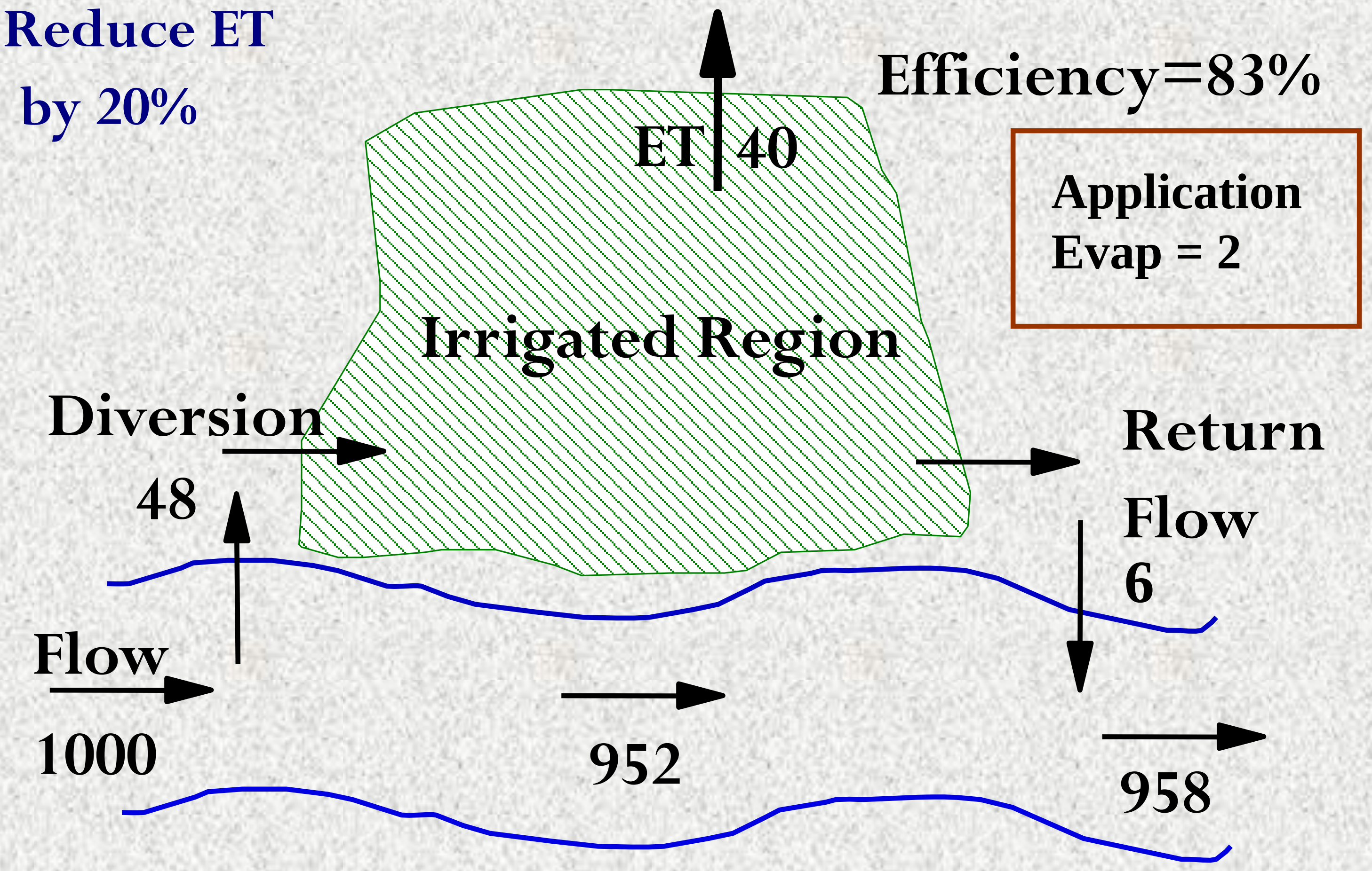
Water Conservation

Improved Irrigation Efficiency



Water Conservation

Reduce ET by 20%

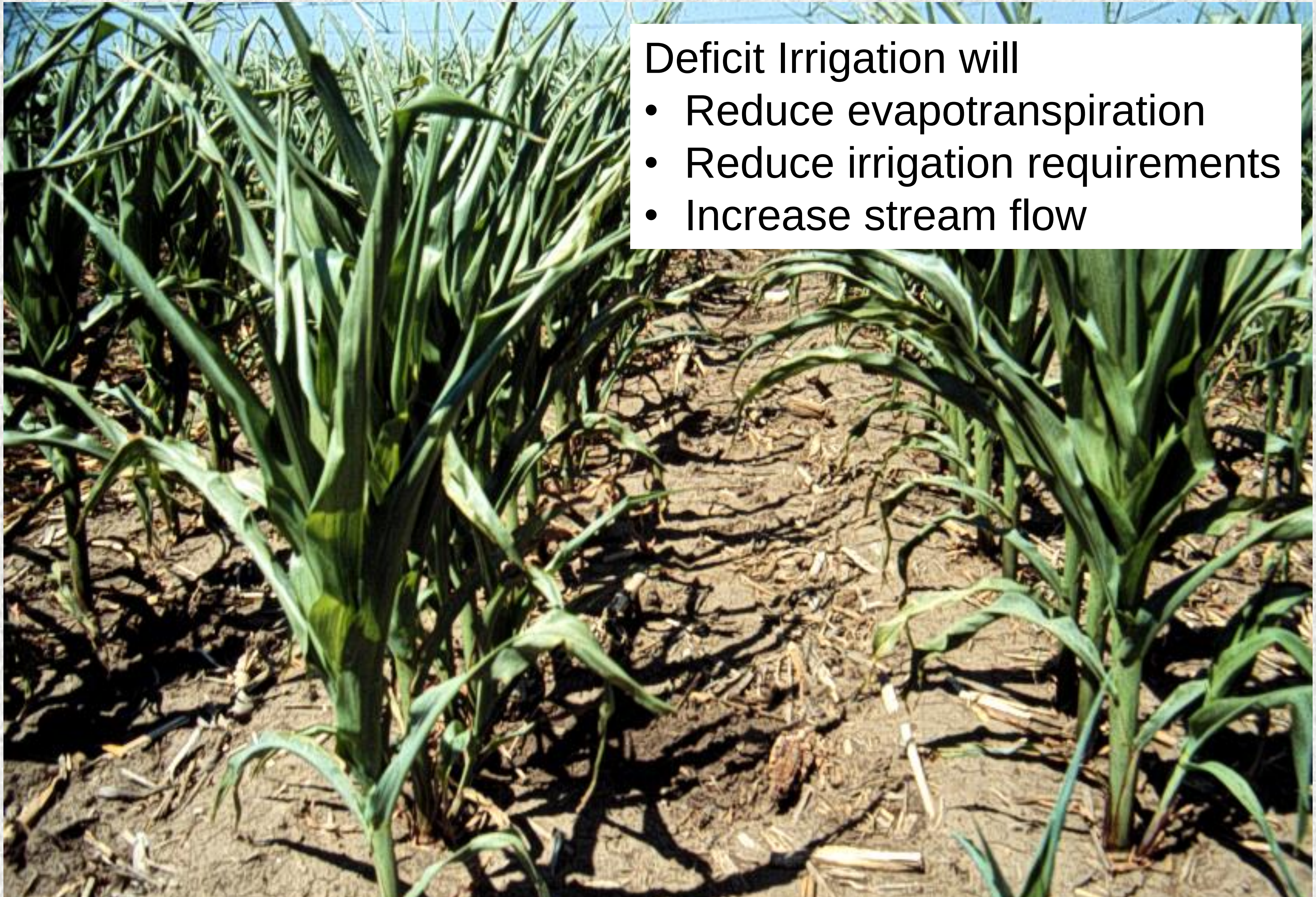


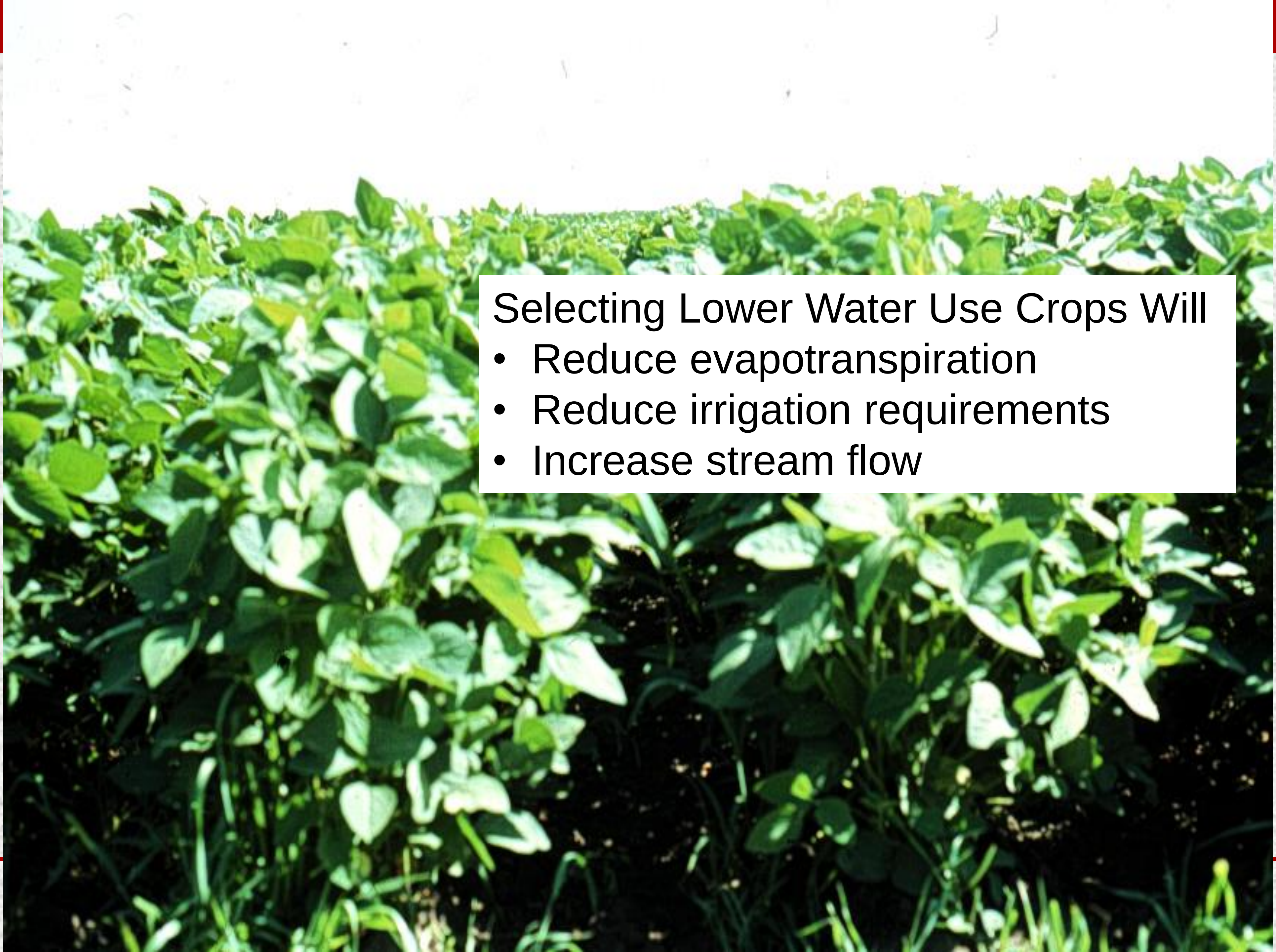
Mulching with Crop Residue will
- Reduce soil water evaporation
- Reduce irrigation requirements?
- Increase stream flow

With Deficit Irrigation We Purposely Allow Crop Stress

Deficit Irrigation will

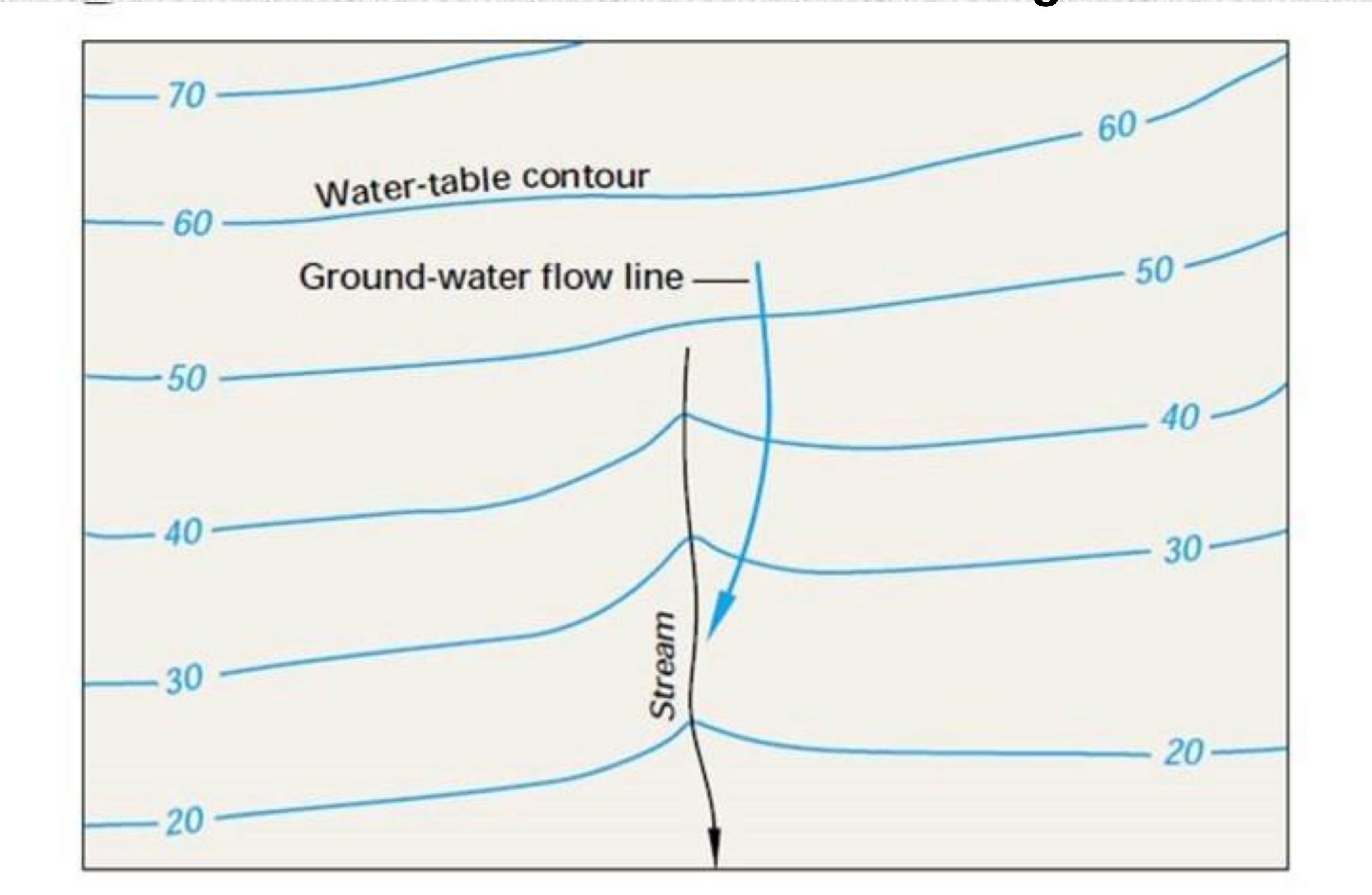
- Reduce evapotranspiration
- Reduce irrigation requirements
- Increase stream flow



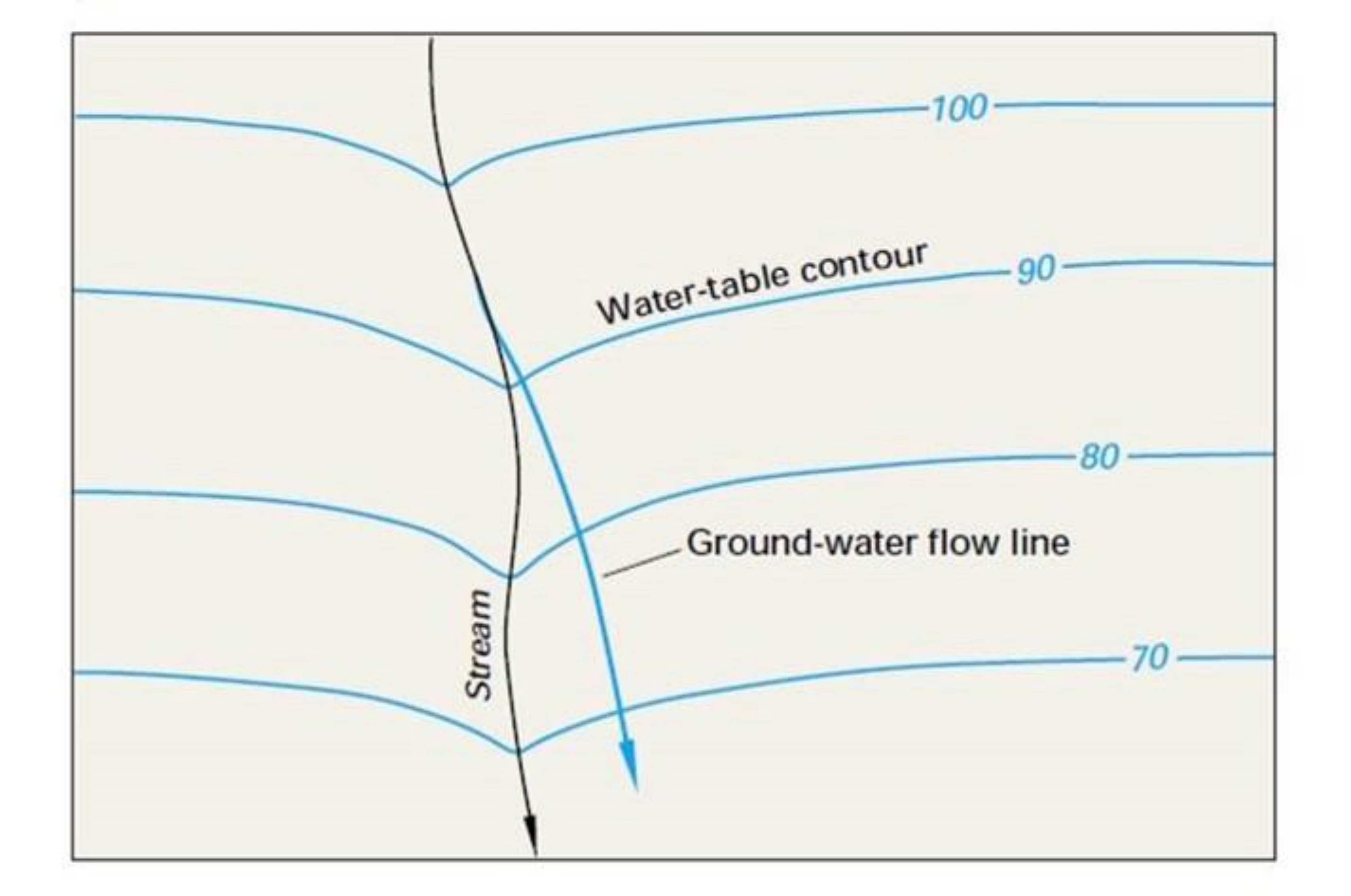


Selecting Lower Water Use Crops Will
- Reduce evapotranspiration
- Reduce irrigation requirements
- Increase stream flow

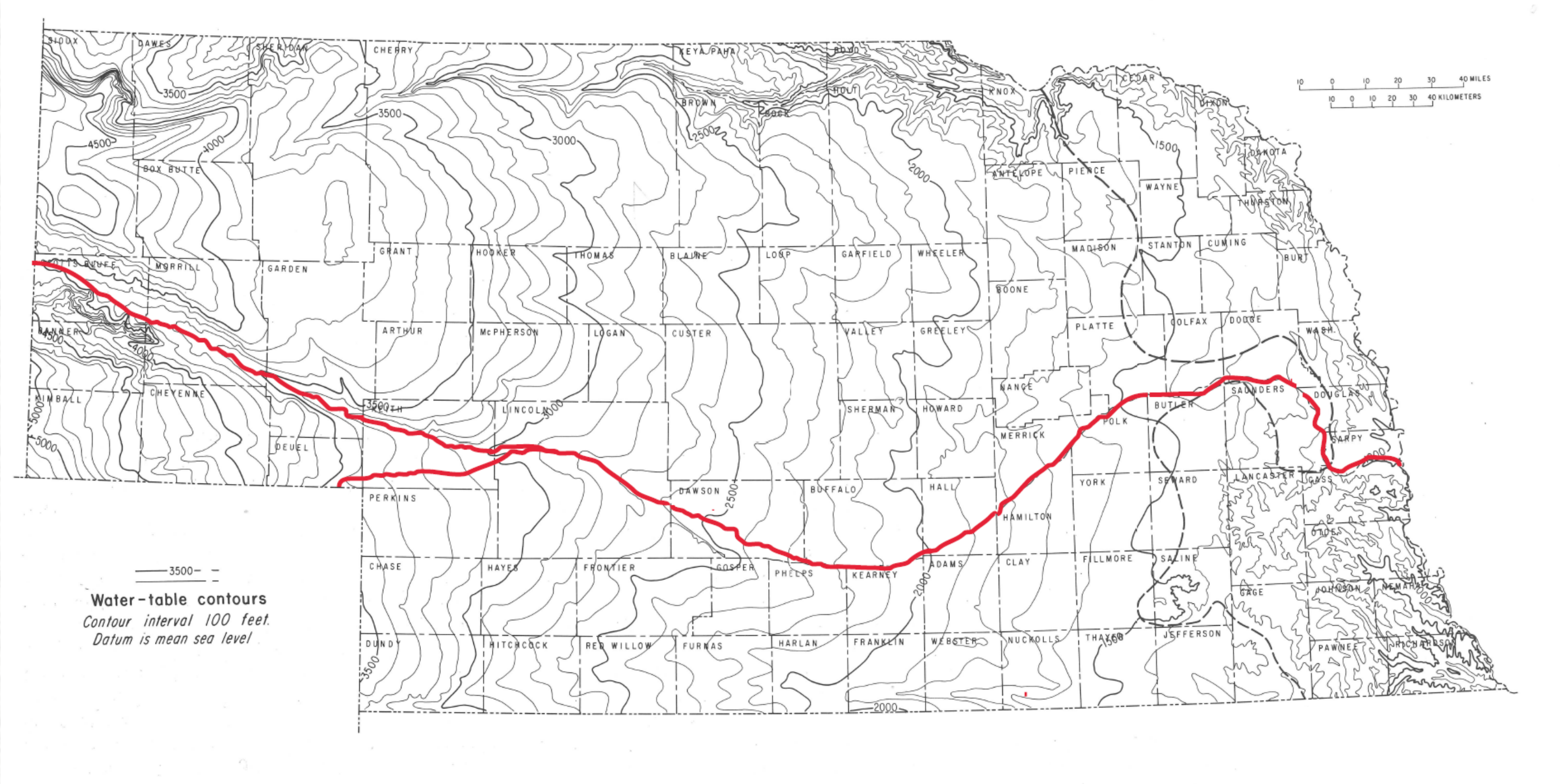
Groundwater Contours Near Gaining Stream



Groundwater Contours Near Losing Stream



Groundwater Contours in Nebraska



Where does extra irrigation vapor go?

DeAngelis and others (2010), *Evidence of enhanced precipitation due to irrigation over the Great Plains of the United States.*

"over the 20th century. Increases in precipitation of 15-30% were detected during July from the easternmost part of the aquifer (Ogallala) to as far downwind as Indiana"

"evapotranspiration over the Ogallala Aquifer contributes to downwind precipitation and that the contribution is greater when the evapotranspiration is higher"

Where does extra irrigation vapor go?

Szilagi (2018), *Anthopogenic hydrological cycle disturbance at a regional scale: State-wide evapotranpiration trends (1979-2015) across Nebraska, USA.*

“ET rates over irrigated crops increased by 7 mm decade^{-1} despite a -4.4 mm decade^{-1} drop in precipitation rates”

Based upon:

- ***Water conservation practices for a river valley irrigated with groundwater*, Agricultural Water Management, 1998**

- ***Effective Use of Water in Irrigated Agriculture*, CAST Report No. 113**

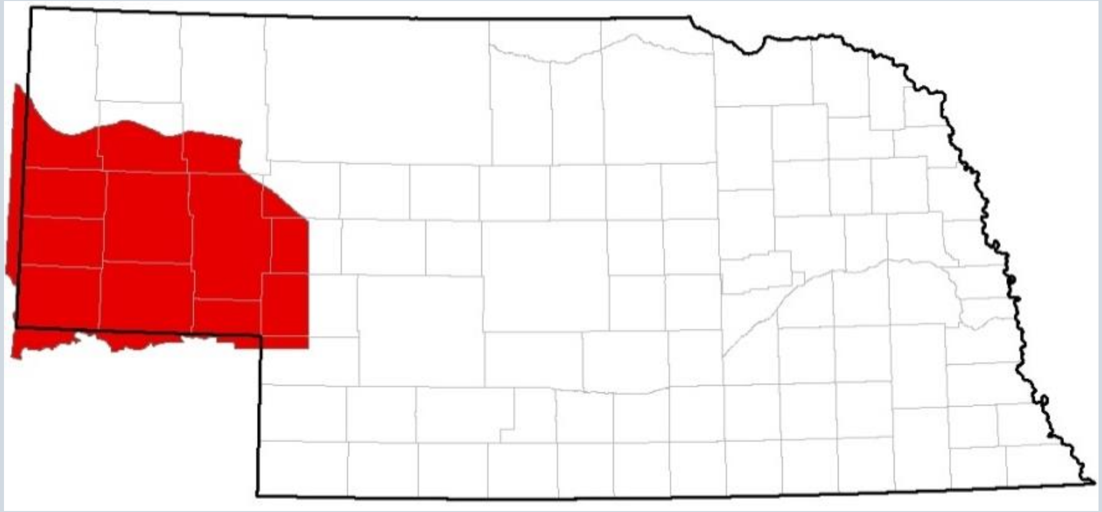
Conservation Study

Irrigation Application Efficiency & Tillage Scenarios

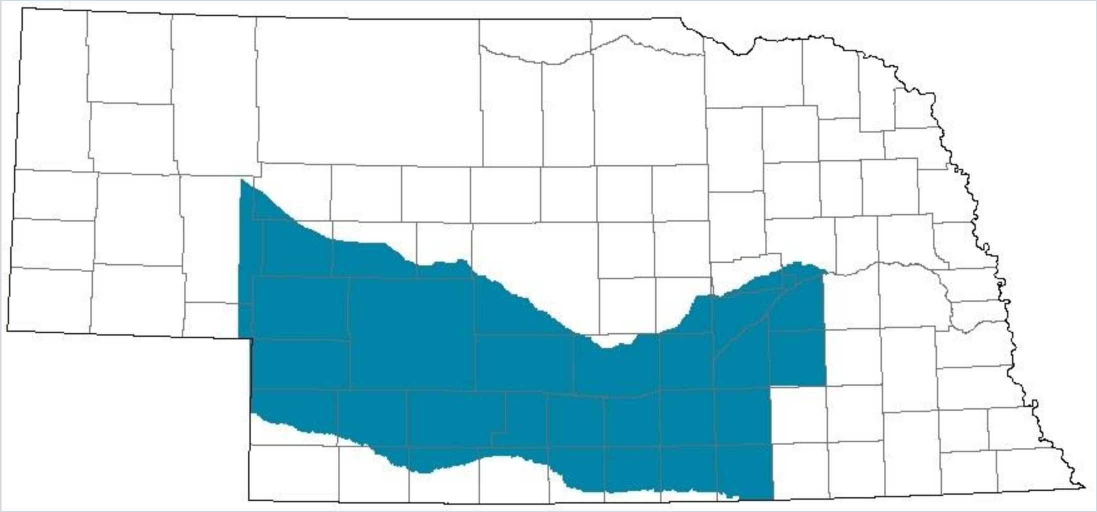
21 MARCH 2018

Modeling Tools and Process Review:

Previously developed integrated models were used to represent processes Dr. Eisenhauer discussed



Western Water Use Model
WWUM



Cooperative Hydrology Study Model
COHYST

Project Purpose:

Evaluate impacts that selected conservation practices have on aquifer conditions and streamflow

For this project, two conservation practices were selected for evaluation:

- Changes in Irrigation Application Efficiency (IAE)
- Changes in Tillage Practices (Till)

Conceptualization:

- Evaluate results at condition extremes
- Establish maximum expected envelope of results
  - **Does the envelope range indicate additional work would be beneficial?**

IAE Scenario:

Modifications for the IAE Scenario were developed by adjusting the Application Efficiency used in the models.

Irrigation Efficiency Scenario compared two model runs:

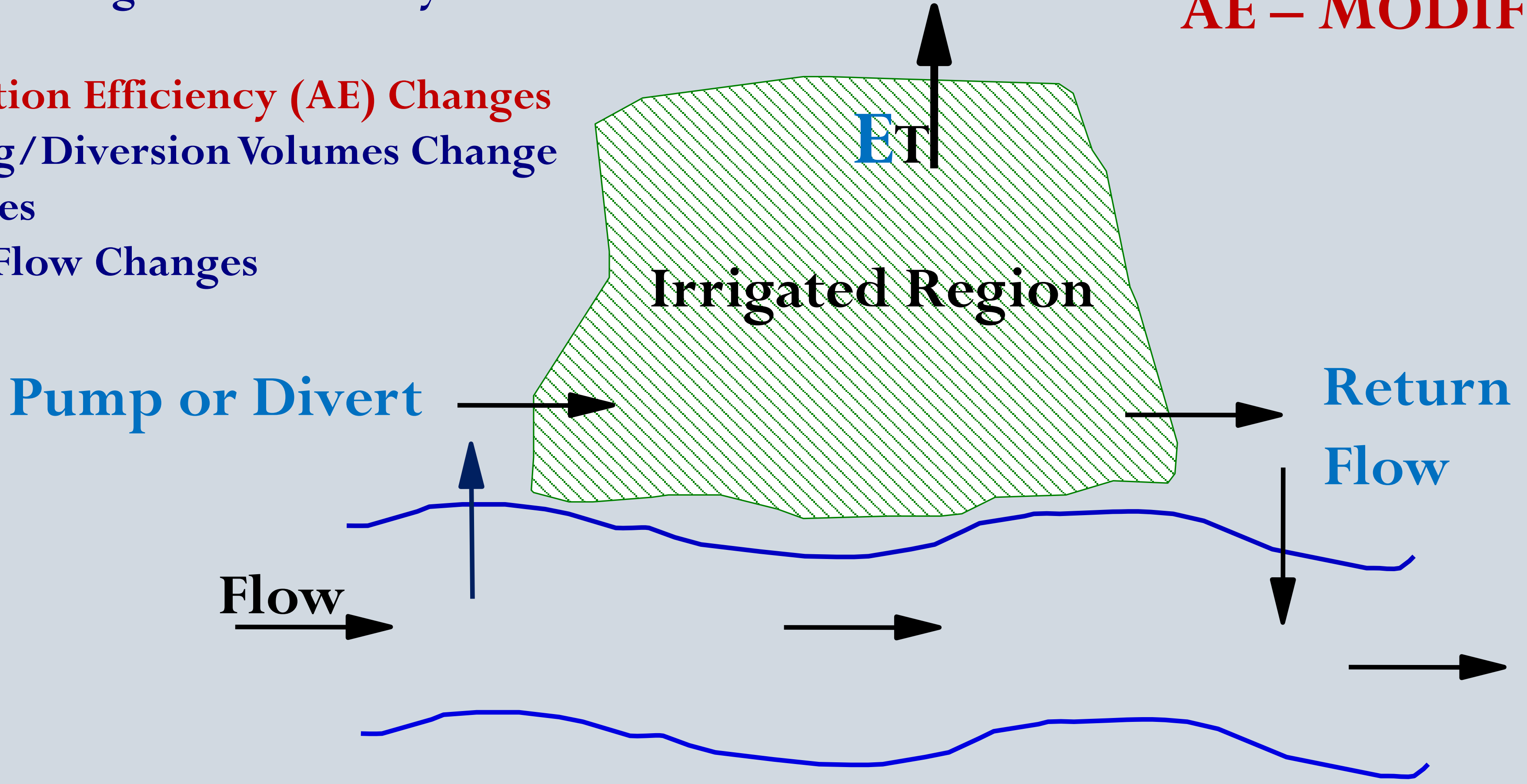
- Baseline Condition
  - Flood irrigation used an application efficiency (AE) of 65%
  - Center Pivot irrigation AE ranged from 70-85% depending on the year
- High Irrigation Efficiency Scenario
  - All irrigation applied at 95% AE rate

IAE Scenario

Improved Irrigation Efficiency

Application Efficiency (AE) Changes
Pumping/Diversion Volumes Change
E Changes
Return Flow Changes

AE – MODIFIED



Till Scenario:

Modifications for the tillage scenario were developed by modifying the tillage practices represented in the model.

Tillage Scenario compared two model runs:

- Baseline Condition
  - Tillage practices trended through time
- Minimum Tillage Scenario
  - Limited tillage practices generally to a single planting operation

Till Scenario

Minimum (Reduced) Tillage

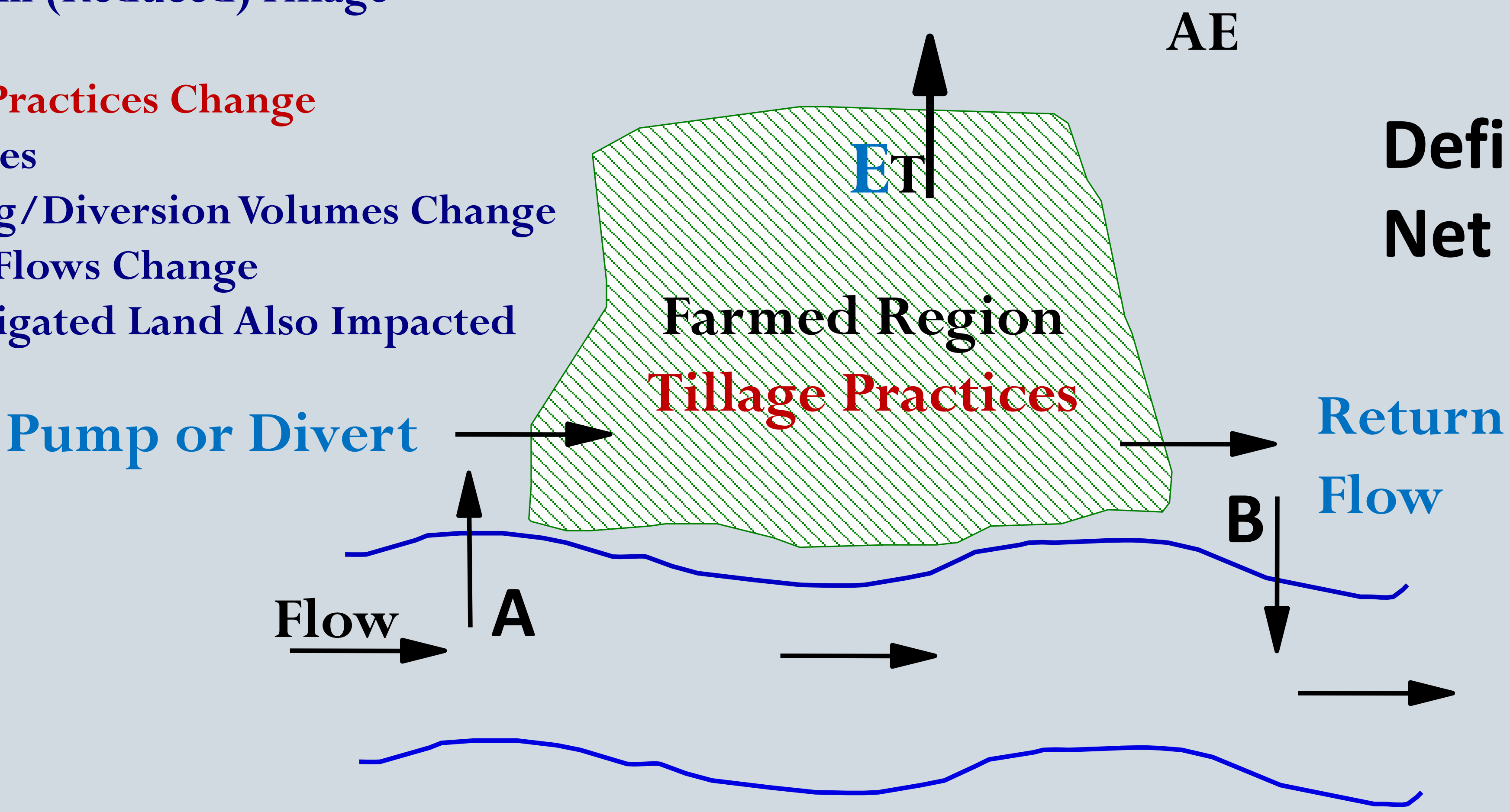
Tillage Practices Change

E Changes

Pumping/Diversion Volumes Change

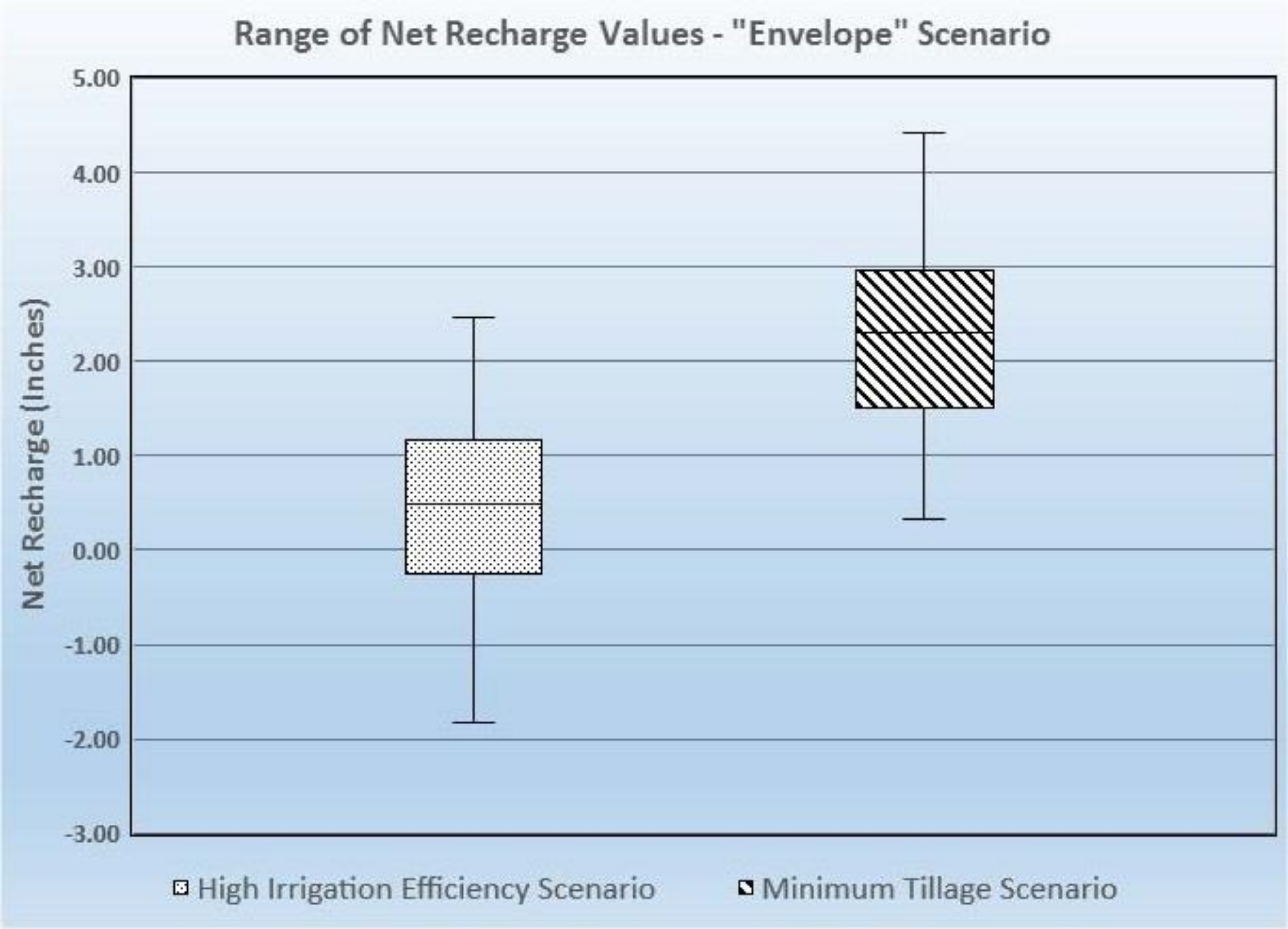
Return Flows Change

Non-Irrigated Land Also Impacted



Definition:

Net Recharge: B-A



Net Recharge:

Recharge Change
– Pumping Change

Positive = Aquifer Gaining Water
Negative = Aquifer Losing Water

Graph represents the distribution of average annual depths computed as the volumetric change divided by the acres impacted in the scenario.

Out of the 10,500,000 acres in the combined NRD areas, the scenarios impacted:

IAE Scenario: 2,350,000 acres

Till Scenario: 3,100,000 acres

Evaluation Summary

1. Results from the tillage scenario show a higher potential total impact on available water supplies compared to results from the irrigation efficiency scenario.
2. Results from the other modeling tools (surface water model and the ground water model) can provide insight to the timing and availability aspects of the water budget changes
3. Considerations for additional analysis

   Evaluate how representative modeled tillage practices are to those actually "on the ground" or are likely to become "on the ground"

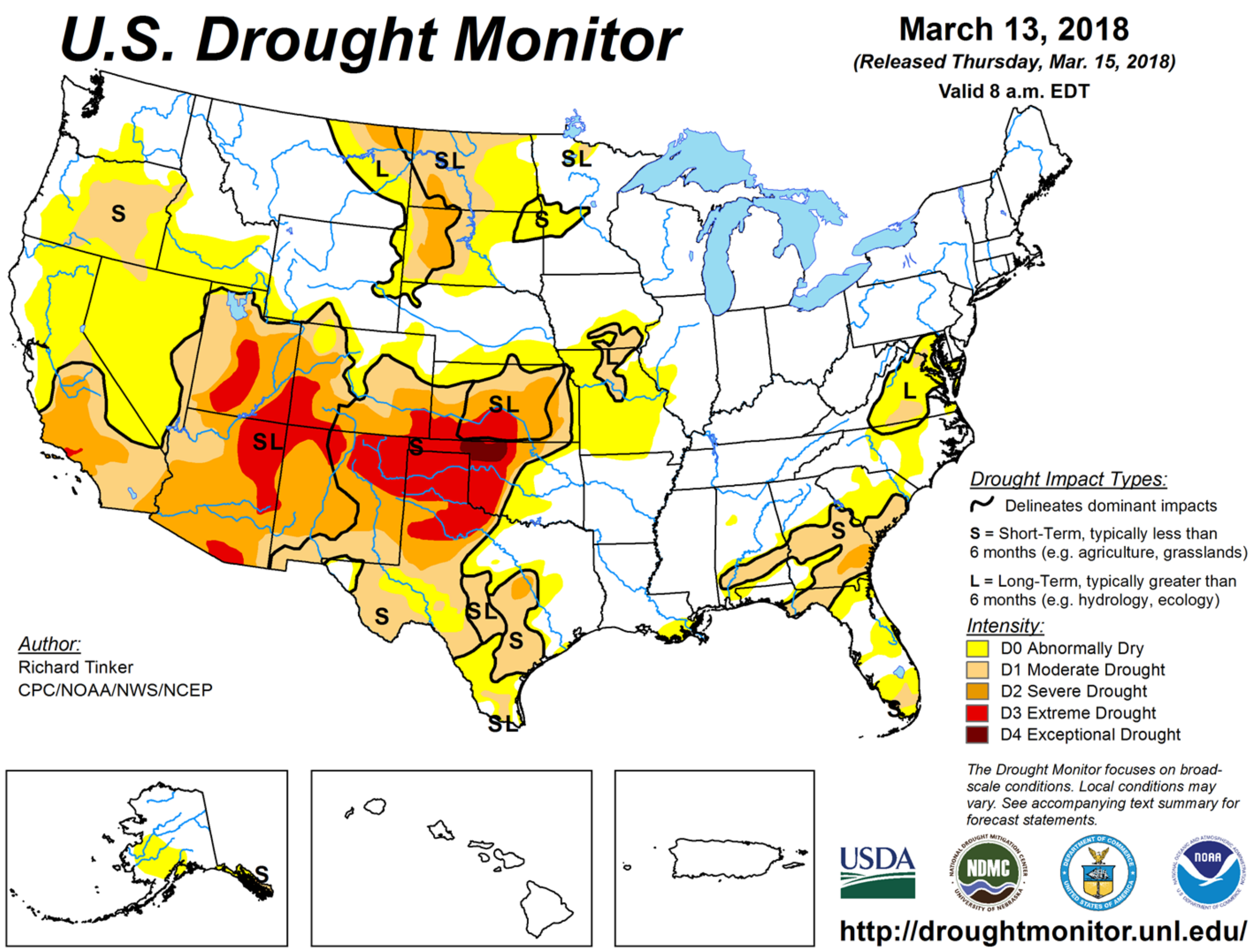
Thank You

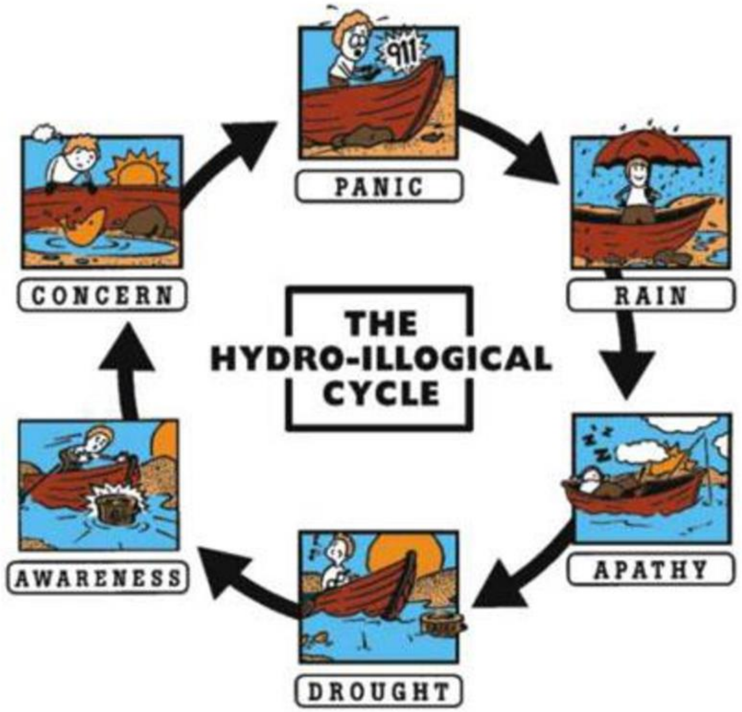
Drought Planning

KELLY HELM SMITH, NORTH PLATTE, MARCH 21, 2018

UPPER PLATTE RIVER BASIN WATER MANAGEMENT PLANNING

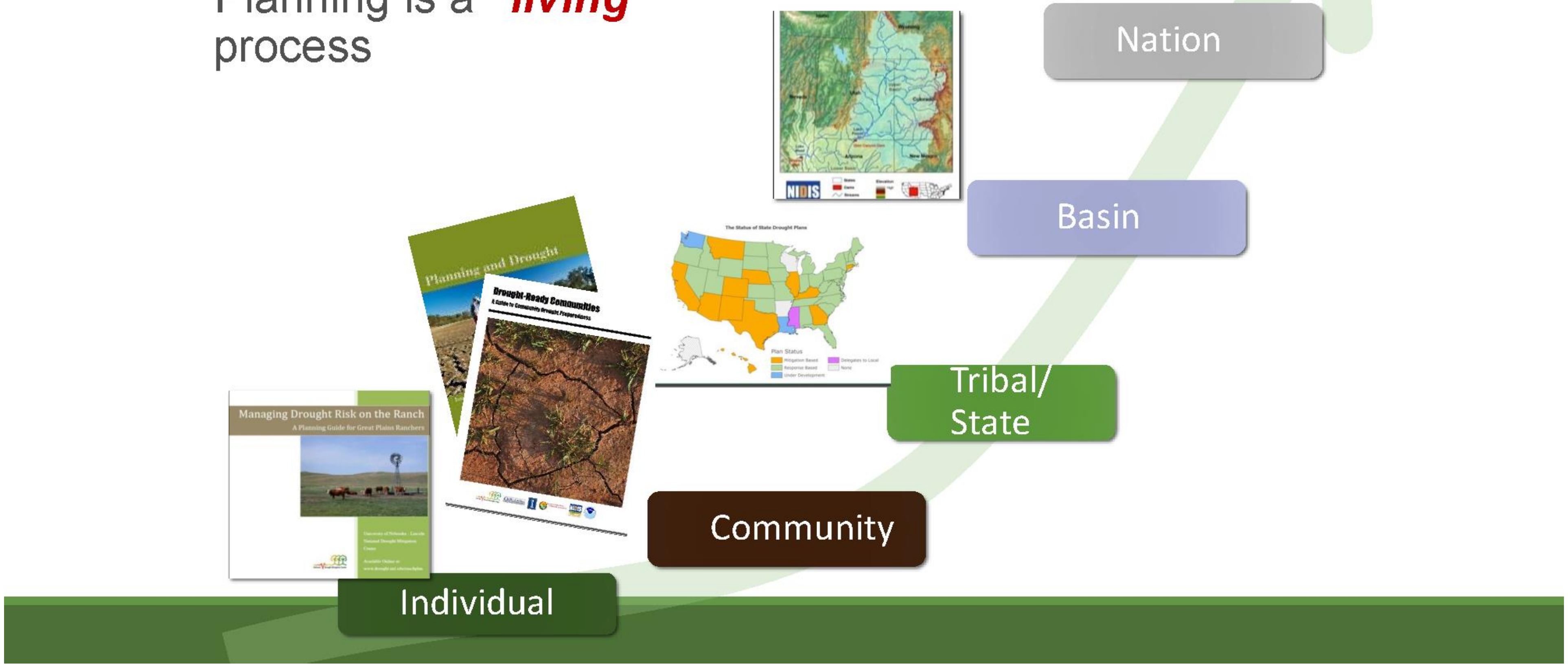
NATIONAL DROUGHT MITIGATION CENTER
UNIVERSITY OF NEBRASKA


U.S. Drought Monitor
March 13, 2018
(Released Thursday, Mar. 15, 2018)
Valid 8 a.m. EDT
Drought Impact Types:
Delineates dominant impacts
S = Short-Term, typically less than 6 months (e.g. agriculture, grasslands)
L = Long-Term, typically greater than 6 months (e.g. hydrology, ecology)
Intensity:
D0 Abnormally Dry
D1 Moderate Drought
D2 Severe Drought
D3 Extreme Drought
D4 Exceptional Drought
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
Author:
Richard Tinker
CPC/NOAA/NWS/NCEP
http://droughtmonitor.unl.edu/


THE HYDRO-ILLOGICAL CYCLE
PANIC
RAIN
APATHY
DROUGHT
AWARENESS
CONCERN
911

Drought Center supports planning at ***all scales***

Planning is a ***"living"*** process

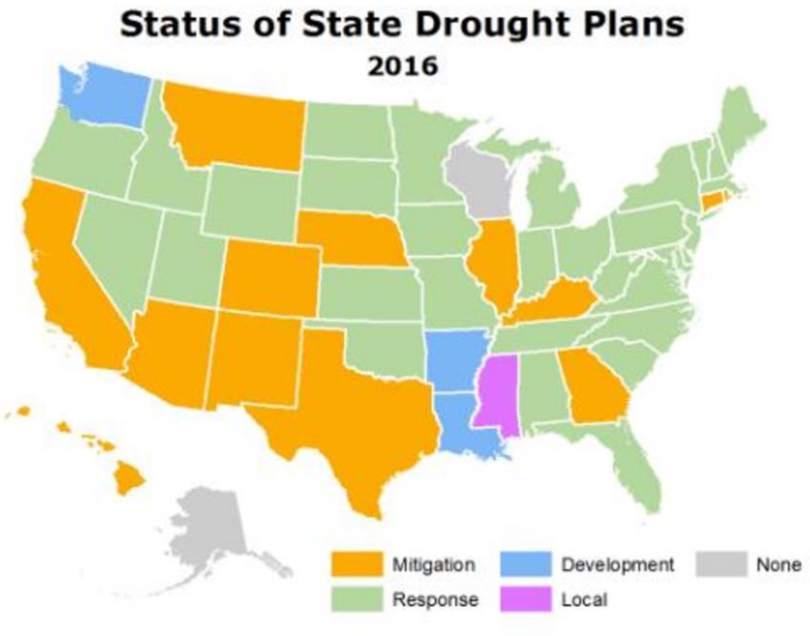


Scale matters

Photo: Compiled by Chuck Nelson. "A true-color cropped image of portion of the Sacramento-San Joaquin River Delta. This image was taken from a California Department of Fish and Game website available to the public as a GIS file and is part of a U.S. Department of Agriculture National Agricultural Imagery Program flight." http://www.csuchico.edu/inside/2012-05-10/bigpicture-2.shtml

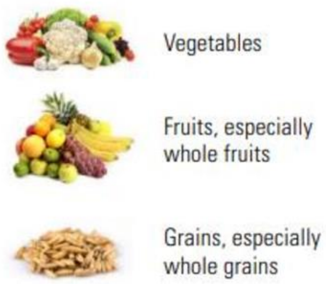
From Bandera: Cowboy Capital of the World, Palo Alto College, San Antonio, Texas http://pacweb.alamo.edu/InteractiveHistory/projects/rhines/StudentProjects/1999/bandera/BANDERA.htm

State drought planning "mitigation" vs. "response"



http://drought.unl.edu/Planning/DroughtPlans.aspx

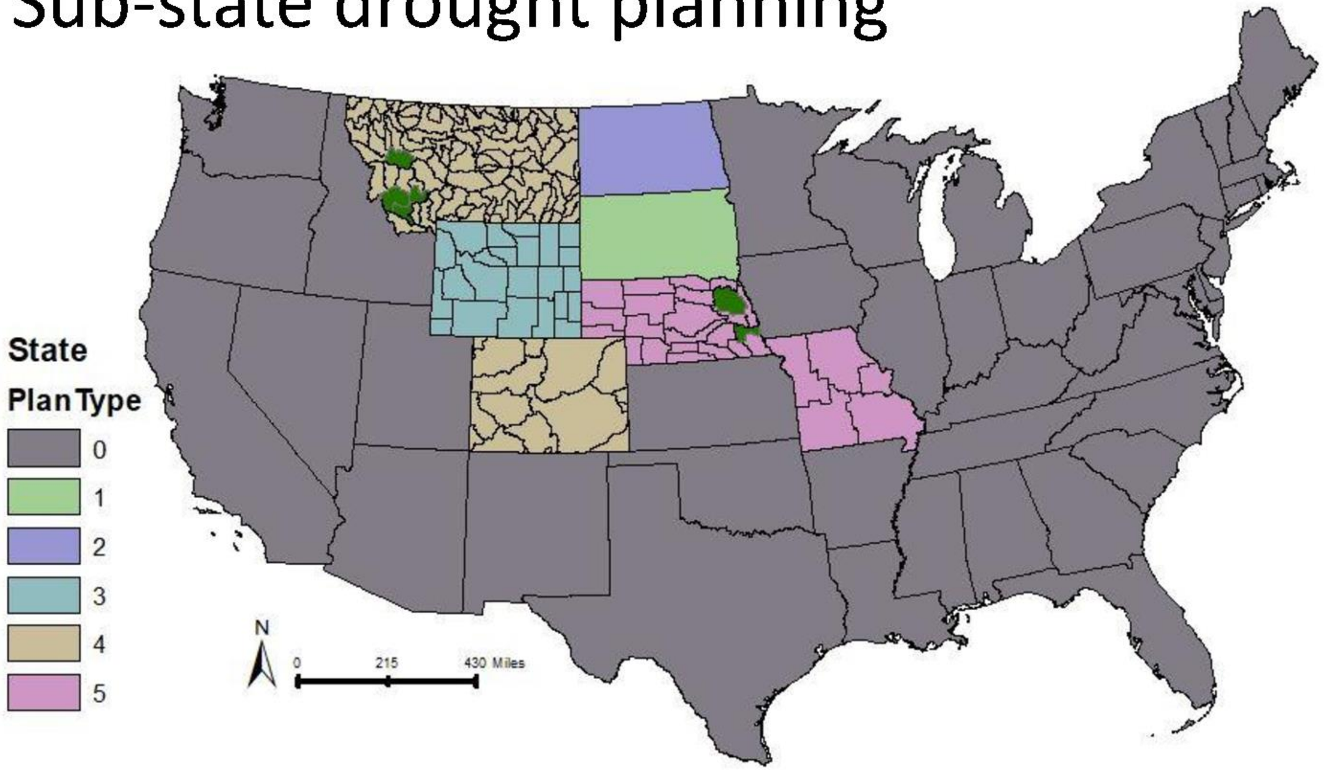
“mitigation” vs. “response”



Created by Luis_molinero
Freepik.com

Other images courtesy of Health.gov

Missouri River Basin
Sub-state drought planning



Missouri DEWS
Drought Plan Classification

1 – Has State Drought Plan and State Water Plan, but no current evidence of a sub-state, supra-municipal drought planning process

2- State Water Plan incorporates drought with possible sub-basins (though not delineated by HUC)

3 – State Drought Plan suggests sub units (counties)

4 –State Drought Plan/State Water Plan with distinct regional planning sub-units delineated by HUC

5 – State Drought Plan/State Water Plan with regional planning sub-units delineated by political Natural Resource Conservation Districts

*Sub-units in dark green are MT Watershed and NE NRDs with stand-alone drought plans.

Contexts & Opportunities for Drought Planning at Different Levels of Government

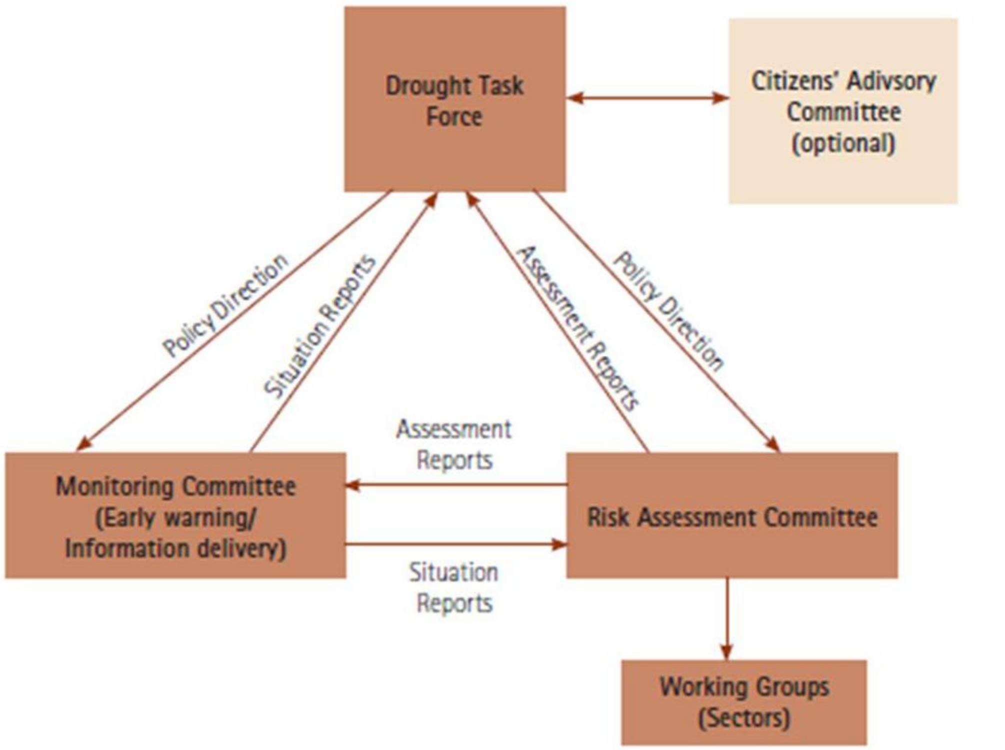
Federal	Monitoring NIDIS: NOAA, USDA, USGS, NASA & more	Policy & planning Agriculture policy, Clean Water Act	Land & Water Management Corps, Reclamation, Interior, Agriculture, Hazard Mitigation	Relief & Response NDRP: USDA, SBA, IRS, FEMA, etc.	Bureau of Indian Affairs
State	Monitoring Federal, state & local data	Water & resource management State water policies, plans	Drought plans Agriculture Drinking water Fire	Emergency Management Hazard plans	Tribal Indian tribes are sovereign nations, often with tribal agencies that manage water, land and other resources.
Sub-state	Monitoring Federal, state & local data, drought planning	District authorities & organizations vary by state: Irrigation, soil & water conservation, natural resources, groundwater management, watershed-based Also, hydropower		Emergency Management Hazard plans	
Local (county & municipal)	Monitoring Federal, state & local data specific to supply and demand	Municipal water supply plans, including drought contingency plans	Land use planning Xeriscaping, green infrastructure, zooming, comprehensive planning, etc.	Emergency Management Hazard plans	

Drought Planning: The Big Questions

10-Step Process

http://drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx

Figure 3. Drought preparedness and mitigation plan organizational structure
(Source: National Drought Mitigation Center, University of Nebraska-Lincoln)

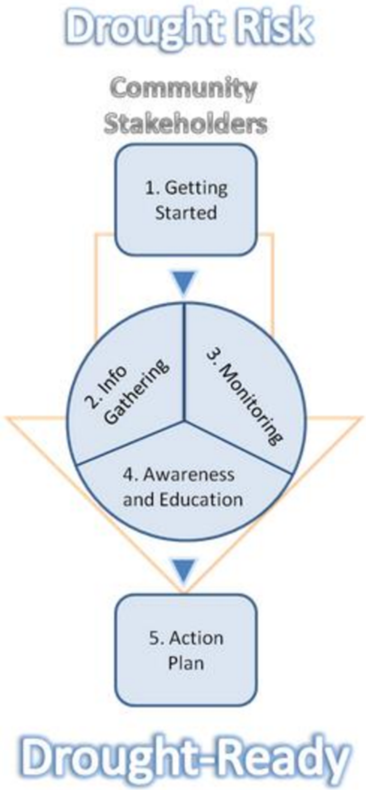


NATIONAL DROUGHT MITIGATION CENTER

Drought-Ready Communities

http://drought.unl.edu/Planning/PlanningProcesses/DroughtReadyCommunities.aspx

Impacts & Vulnerability:
- How have past droughts affected you?
- How would a future drought affect you?
- What do you need to protect?



Monitoring:
- How dry is it? What will you measure?
- Who is keeping watch?
- Who needs to know?

What do you want to protect?

Vulnerability x hazard = impact

- Subsistence agriculture
- Shallow wells
- Poor soil

X

Drought intensity, duration

=

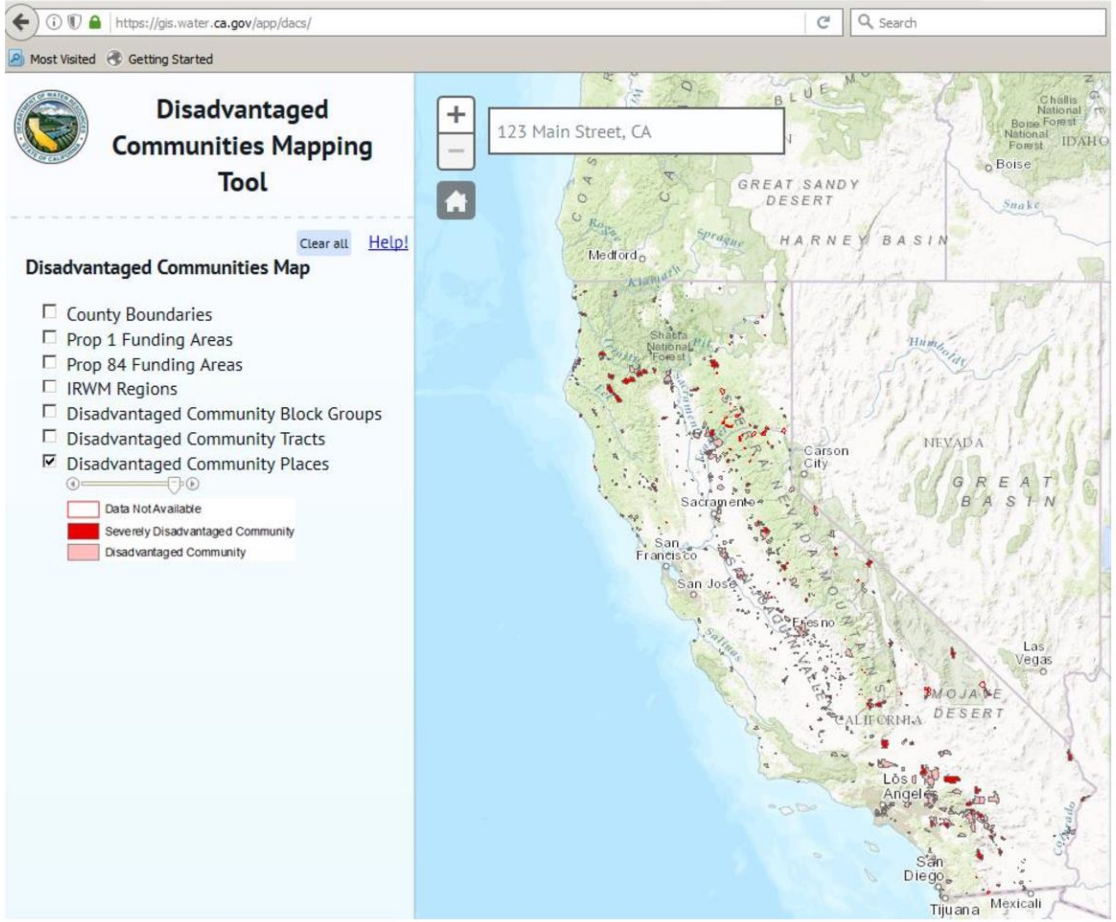
Impacts:

- How has drought affected you in the past?
- How is drought affecting you now?
- How would drought affect you in the future?

Impacts point to underlying vulnerability.
"Solve for" vulnerability.

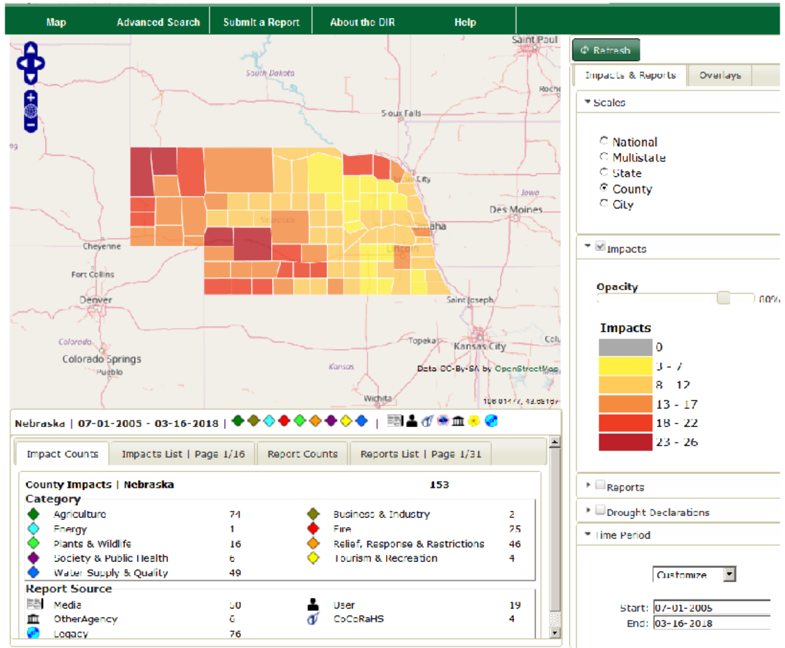
What you can control: Reduce vulnerability ahead of time

What do you want to protect?



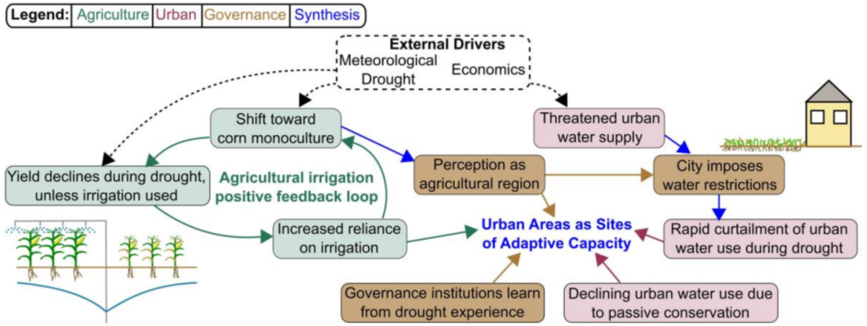
https://californiawaterblog.com/2017/08/06/small-self-sufficient-water-systems-continue-to-battle-a-hidden-drought/

Where (else) to find information on drought impacts



http://droughtreporter.unl.edu

Study on balancing agricultural and urban water use in the Platte River Basin includes detail on drought impacts & responses



Zipper, S. C., K. Helm Smith, B. Breyer, J. Qiu, A. Kung, and D. Herrmann. 2017. Socio-environmental drought response in a mixed urban-agricultural setting: synthesizing biophysical and governance responses in the Platte River Watershed, Nebraska, USA. Ecology and Society 22(4):39. https://doi.org/10.5751/ES-09549-220439

https://www.ecologyandsociety.org/vol22/iss4/art39/

How will you know you are in drought?

Drought Monitoring & Early Warning

Establish an operational definition or definitions of drought, based at least in part on the impacts that you want to prevent.

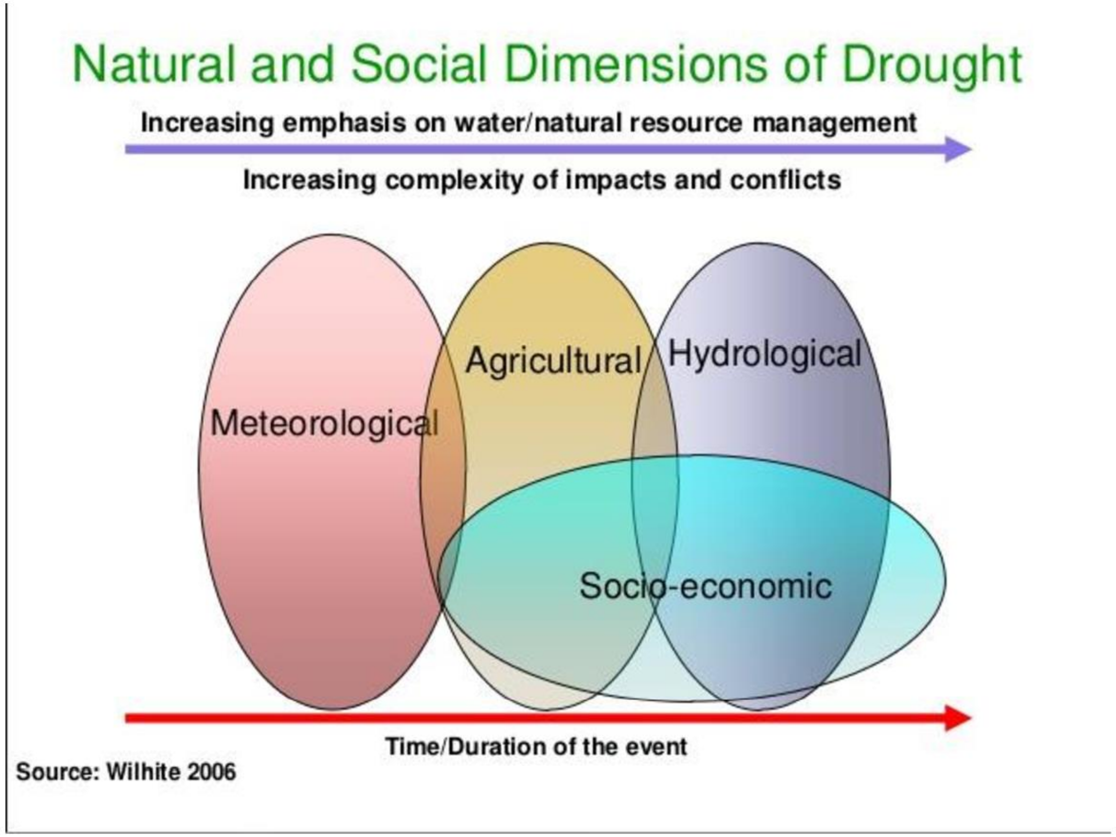
- large-scale climate indicator
- locally-relevant water supply indicator

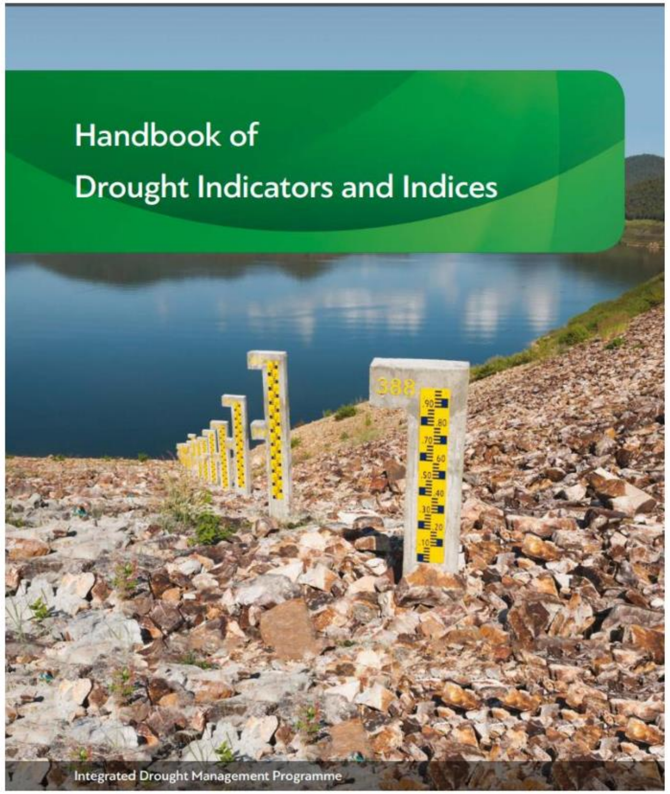
WHO is monitoring drought regularly?

WHO needs to know when it gets worse?

How can the general public tune in to drought monitoring?

How will you know you are in drought?

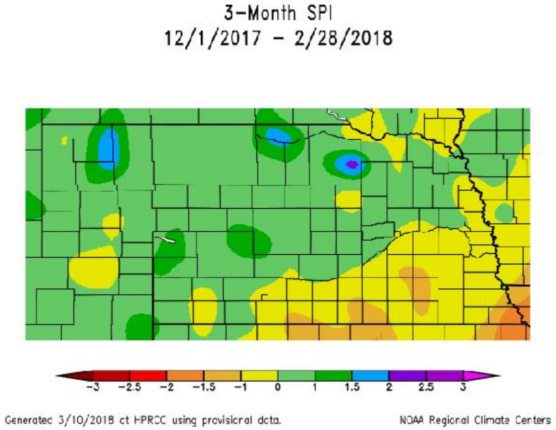




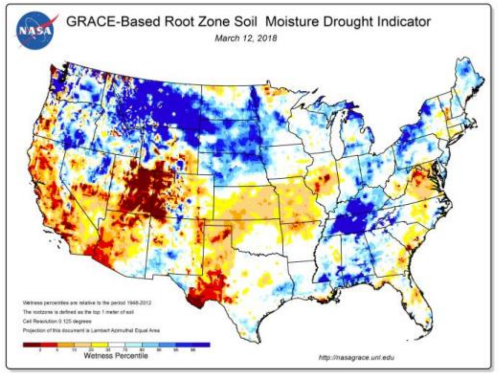
WORLD METEOROLOGICAL ORGANIZATION
WMO-No. 1173

Global Water Partnership
Towards a water secure world

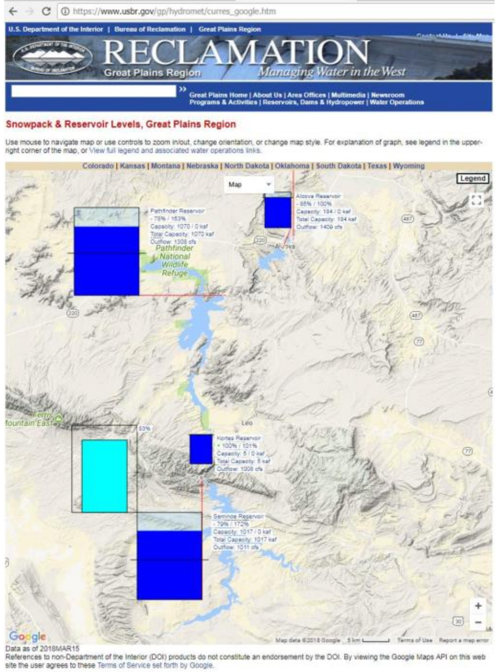
http://www.droughtmanagement.info/indices/



https://hprcc.unl.edu/maps.php?map=ACISClimateMaps



http://nasagrace.unl.edu/



For more:

- Drought.unl.edu
- Drought.gov

How will you know you are in drought?

Establish Triggers

Link stages of response to measurable indicators

Lincoln example

Phase 1: Moderate Shortage Voluntary Designated Day | Phase 2: Severe Shortage Mandatory Designated Day | Phase 3: Critical Shortage Limited Outdoor Water Use

PHASE 3: CRITICAL SHORTAGE: LIMITED OUTDOOR WATER USE

Signal: **Less than 200 cfs river flow; greater than 55 MGD usage**

Possible Action: **Limited outdoor water use; may result in either mandatory two (2) or one (1) designated day or no outside water use**

A. Signal(s) for Implementation

Phase 3 may be implemented when the river flow of the Platte River is less than 200 cfs and water usage exceeds 55 MGD or generally when system usage steadily exceeds the ability to supply as provided above. This phase shall be implemented in emergency situations to sustain life and maintain the health of the community. All actions will focus on preserving lifeline indoor water use and fire reserves in the reservoirs. Lifeline indoor water use shall be that use of water necessary for drinking, cooking, commercial, industrial, medical, and sanitary facilities and such other water use determined by the Lincoln-Lancaster County Health Department as necessary to maintain sanitary and health conditions. Other considerations such as remaining operational volume (ROV), well field modeling, time of year, number of days under or over the operative cfs or MGD signal, weather forecast, river flow forecast, previous rainfall, temperature, past experience, and agricultural and economic considerations may factor into implementation of this phase. The Director of Public Works and Utilities shall use his or her best professional judgment, considering weather conditions, weather forecasts, river flow conditions and water system operations, to make a recommendation to the Mayor for acceleration to this phase in the Plan.

What can you do ahead of time? During drought?

Identify response (during) and mitigation (ahead of time) actions

But remember …
The goal is not a written document. The goal is changes in physical, social and economic systems that will reduce impacts of the next drought on livelihoods, ecosystem services, etc. But a written plan can be extremely helpful in achieving that goal. Formal approval signifies official acceptance.

And …
Response to one drought might be mitigation for the next drought, i.e., building infrastructure.

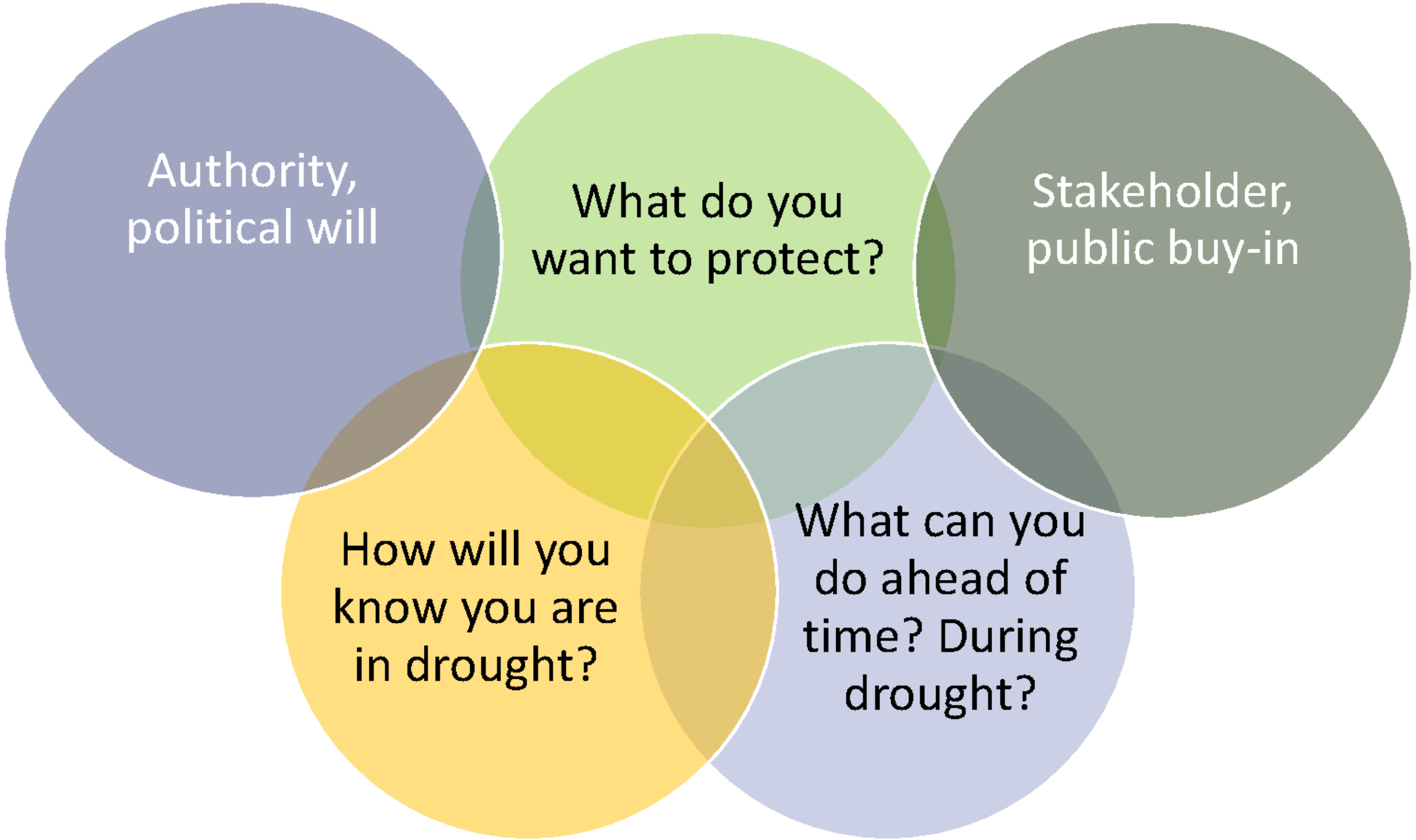
What can you do ahead of time? During drought?

Mitigation Actions

- Adopt agricultural practices that enhance soil health
- Manage for multiple priorities, not just one (i.e., don’t prioritize agriculture and deprecate ecosystem services)
- Purchase, position firefighting equipment
- Enhance water supply and storage infrastructure
- Revise laws/policies to align incentives with increased drought resilience

Response Actions

- Hay hotline
- Haul water
- Food distribution
- Mental health hotlines


Authority, political will
What do you want to protect?
Stakeholder, public buy-in
How will you know you are in drought?
What can you do ahead of time? During drought?

Authority, political will

Who leads drought planning?

What authority do they have?

What is the scope or jurisdiction of the plan?

What is the overarching purpose or motivator of the plan?

Stakeholder, public buy-in

Involve key stakeholder groups in impact assessment subcommittees

Keep the general public informed

Monitor drought at regular intervals, even when there is none

Develop messaging ahead of time to request behavioral changes

Recent NRD drought plans

LOWER ELKHORN NRD

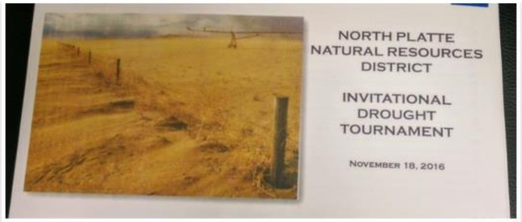
JANUARY 2017

Lower Elkhorn Natural Resources District

North Platte
NATURAL RESOURCES DISTRICT

Drought Tournament

> Programs > Drought > Drought Tournament

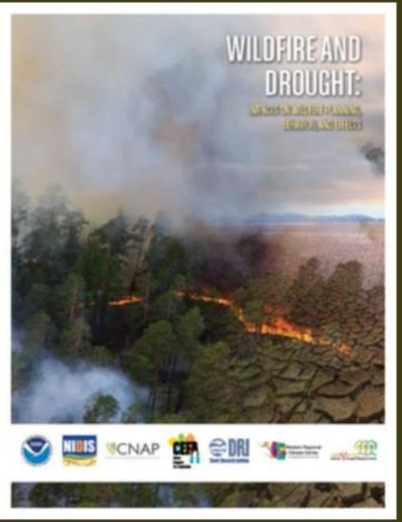


The North Platte NRD's first drought tournament was a sucess! The planning options will be used by the NRD Board of Directors to help formulate the District's drought policy.

Check out a short video about the drought tournament!

DryHORIZONS

A NEWSLETTER FROM THE DROUGHT RISK MANAGEMENT RESEARCH CENTER



Questions, comments?

Please contact

Kelly Helm Smith

ksmith2@unl.edu

402-472-3373

drought.unl.edu

Photo: Compiled by Chuck Nelson. "A true-color cropped image of portion of the Sacramento-San Joaquin River Delta. This image was taken from a California Department of Fish and Game website available to the public as a GIS file and is part of a U.S. Department of Agriculture National Agricultural Imagery Program flight." http://www.csuchico.edu/inside/2012-05-10/bigpicture-2.shtml

From Bandera: Cowboy Capital of the World, Palo Alto College, San Antonio, Texas http://pacweb.alamo.edu/InteractiveHistory/projects/rhines/StudentProjects/1999/bandera/BANDERA.htm

The Three "C"s of Drought Planning in the North Platte NRD:

Competition, Collaboration, and Community

Upper Platte Basinwide Planning Group

North Platte, NE

March 21, 2018

Tracy Zayac, Policy Advisor

North Platte Natural Resources District

Scottsbluff, NE

Presentation Summary

- Overview of planning process
  - NRD goals
  - Stakeholder perspectives
  - Planning strategy
- Highlights of draft plan
  - Major building blocks
- Critical components and lessons learned
  - Elements of success
  - Room for improvement

Drought Planning Goals

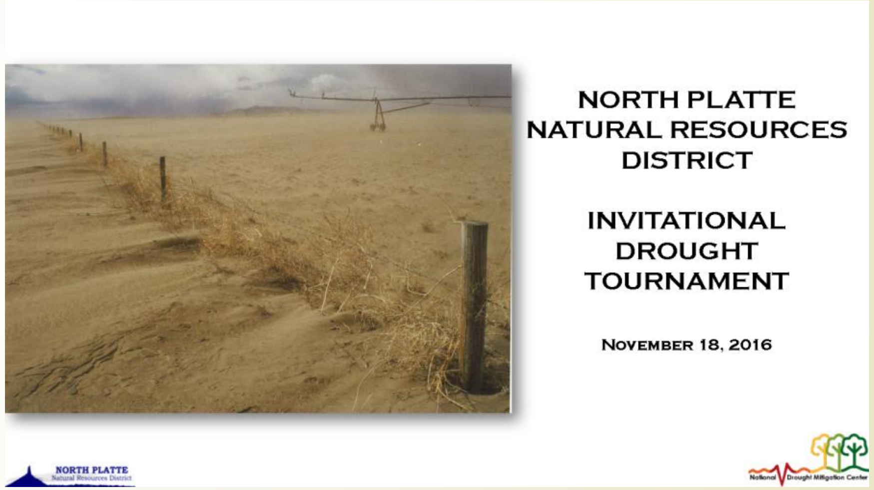
- Develop framework for managing resources during drought
- Understand sector-based drought impacts and vulnerabilities
- Analyze cost-benefit of mitigation and response strategies
- Build capacity for implementation

Stakeholder perspectives

- Broad-based sector representation
  - Ag and industry
  - Environment and recreation
  - Non-ag business, tourism
  - Social services, faith-based groups, education
  - Media and local government
  - Public health, behavioral health, emergency management
- Cross-sector learning and creating solutions
  - Sectors describe drought vulnerabilities and impacts to each other
  - Consider differences and commonalities
  - Integrate understanding of problems
  - Collectively develop and implement solutions

Drought Planning Process Overview

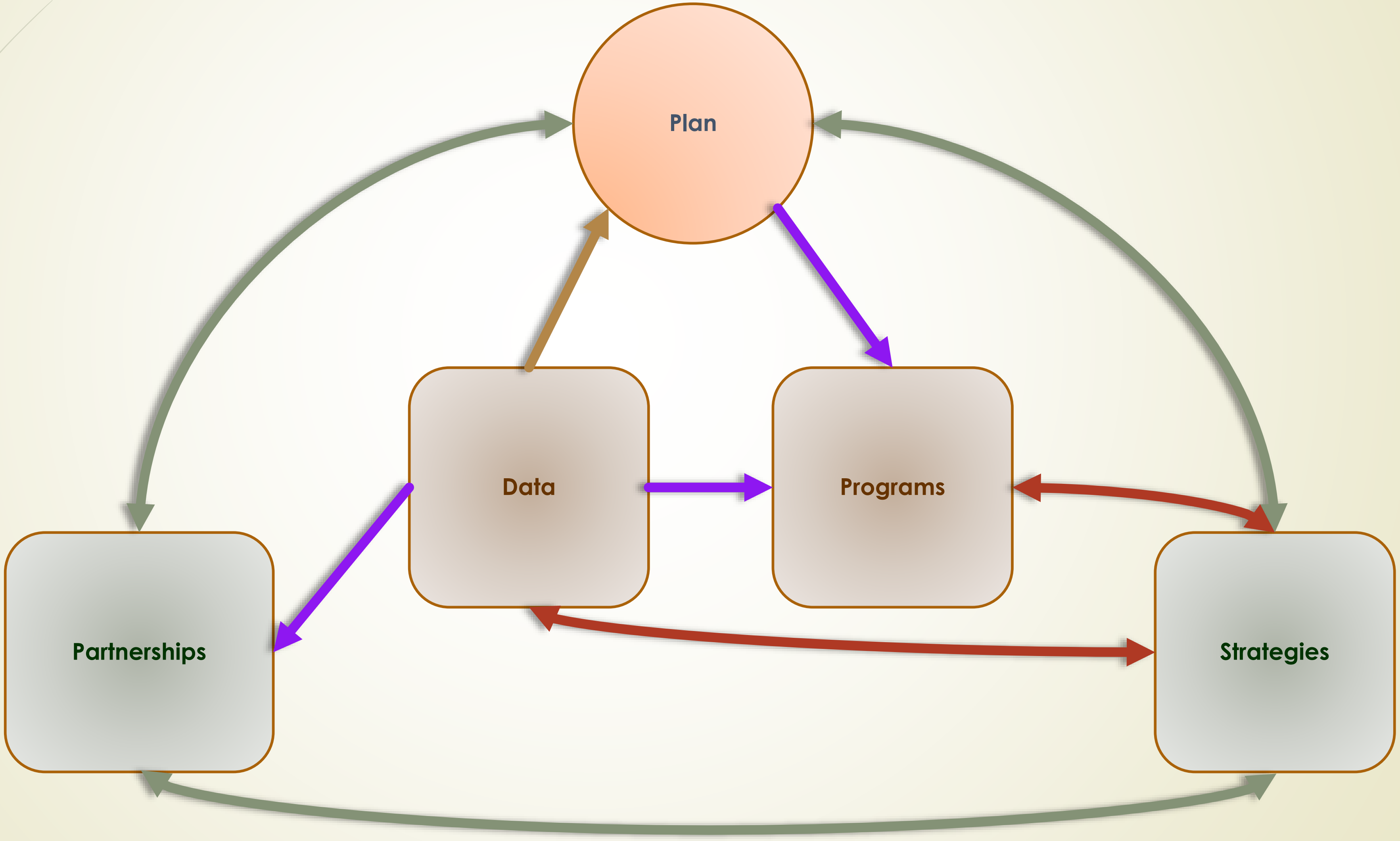
- Drought Tournament – November 2016
  - Competitive strategy development for simulated drought scenario
    - What?
    - How?
  - Begin inter-sector conversations
- Stakeholder meetings
  - Large group: all stakeholders
  - Small group: intra- and inter-sector
- Plan Committee
  - Sector representatives selected by all stakeholders



Plan Highlights

- Education!
  - Largest component of Plan
  - Includes collaboration with other organizations
- Monitoring
  - Regularly gather data on conditions for forecasting and assessment
  - Communicate to decision-makers
- Vulnerabilities and Impacts
  - Key topical areas across spectrum of sectors
  - Mitigation and response strategies
- Updates
  - Evaluation and metrics
  - Plan for revision

Critical Components



Lessons Learned

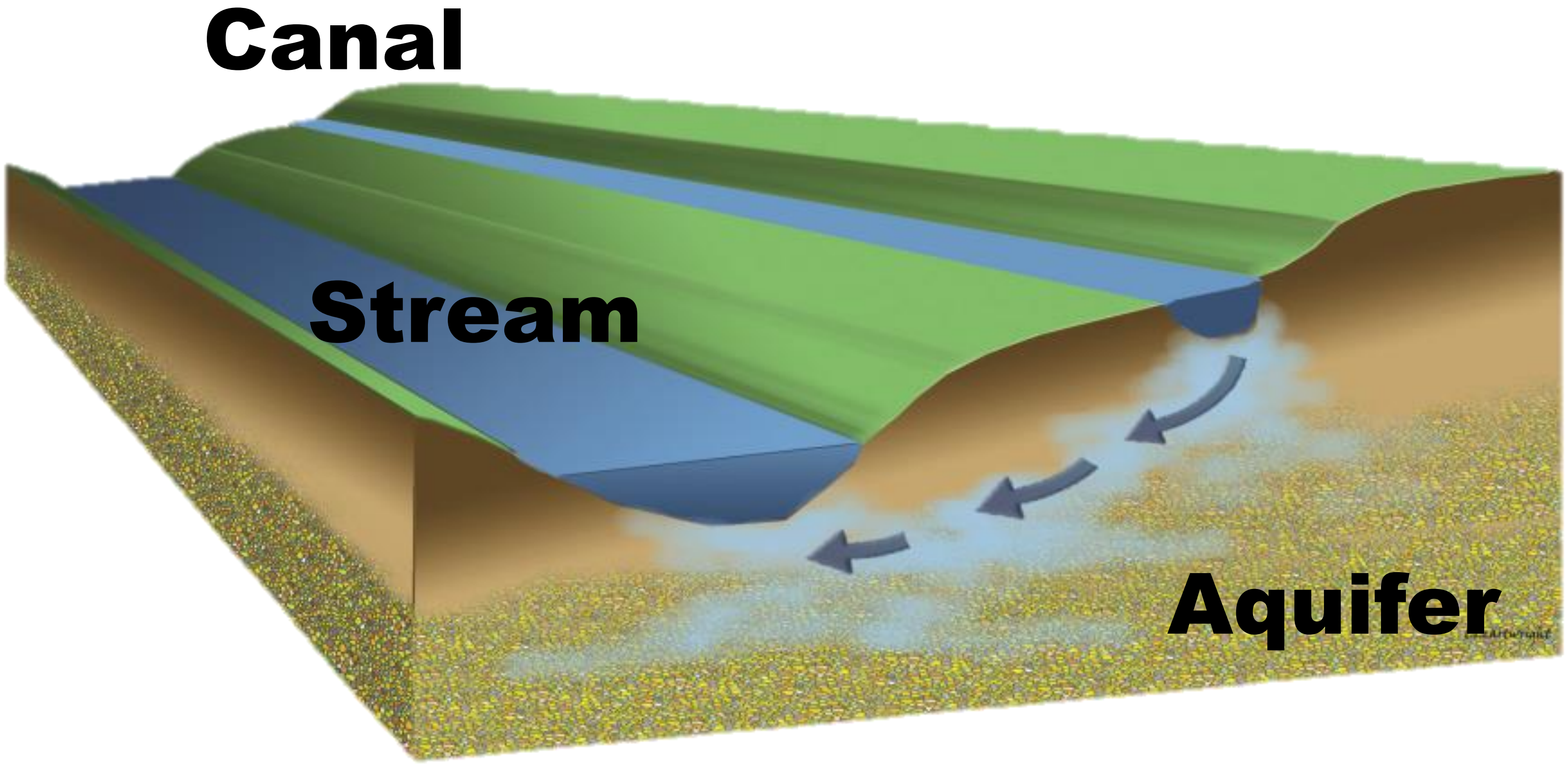
- Educate decision-makers and the public early and often
- Clearly define roles and responsibilities
- Get buy-in from decision-makers and the public

CONJUNCTIVE WATER MANAGEMENT IN THE UPPER PLATTE RIVER BASIN

Jesse Bradley, NeDNR
March 21, 2018
Upper Platte Basin-Wide Plan SPG

UNDERLYING CONCEPTS OF CONJUNCTIVE WATER MANAGEMENT (CWM)

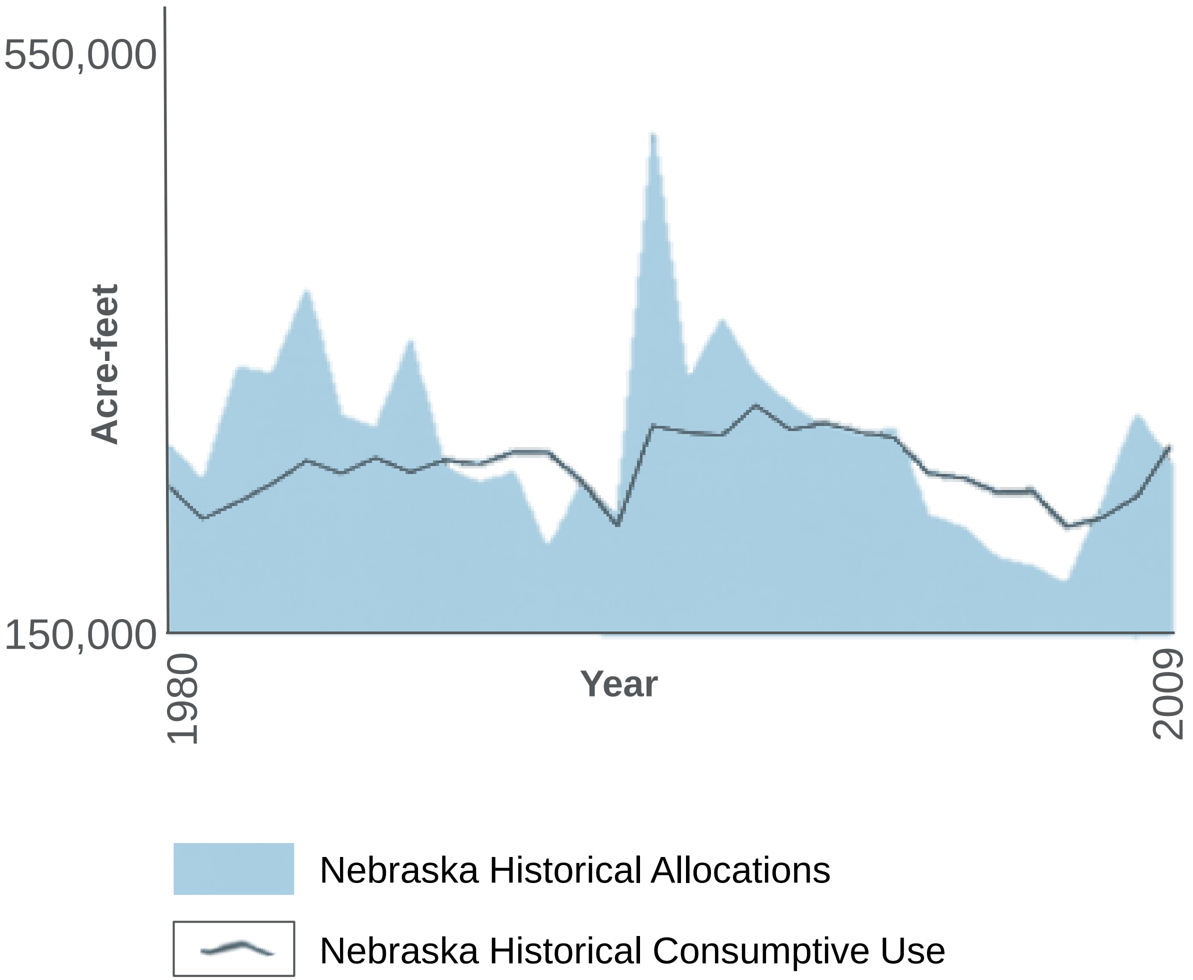
- Surface and groundwater resources are interconnected
- Decisions to improve the management of one cannot be made properly without considering the other



Conjunctive Water Management is an *adaptive process* that utilizes the *connection* between surface water and groundwater to *maximize water use*, while *minimizing impacts* to streamflow and groundwater levels in an effort to increase the overall water supply of a region and improve the reliability of that supply.

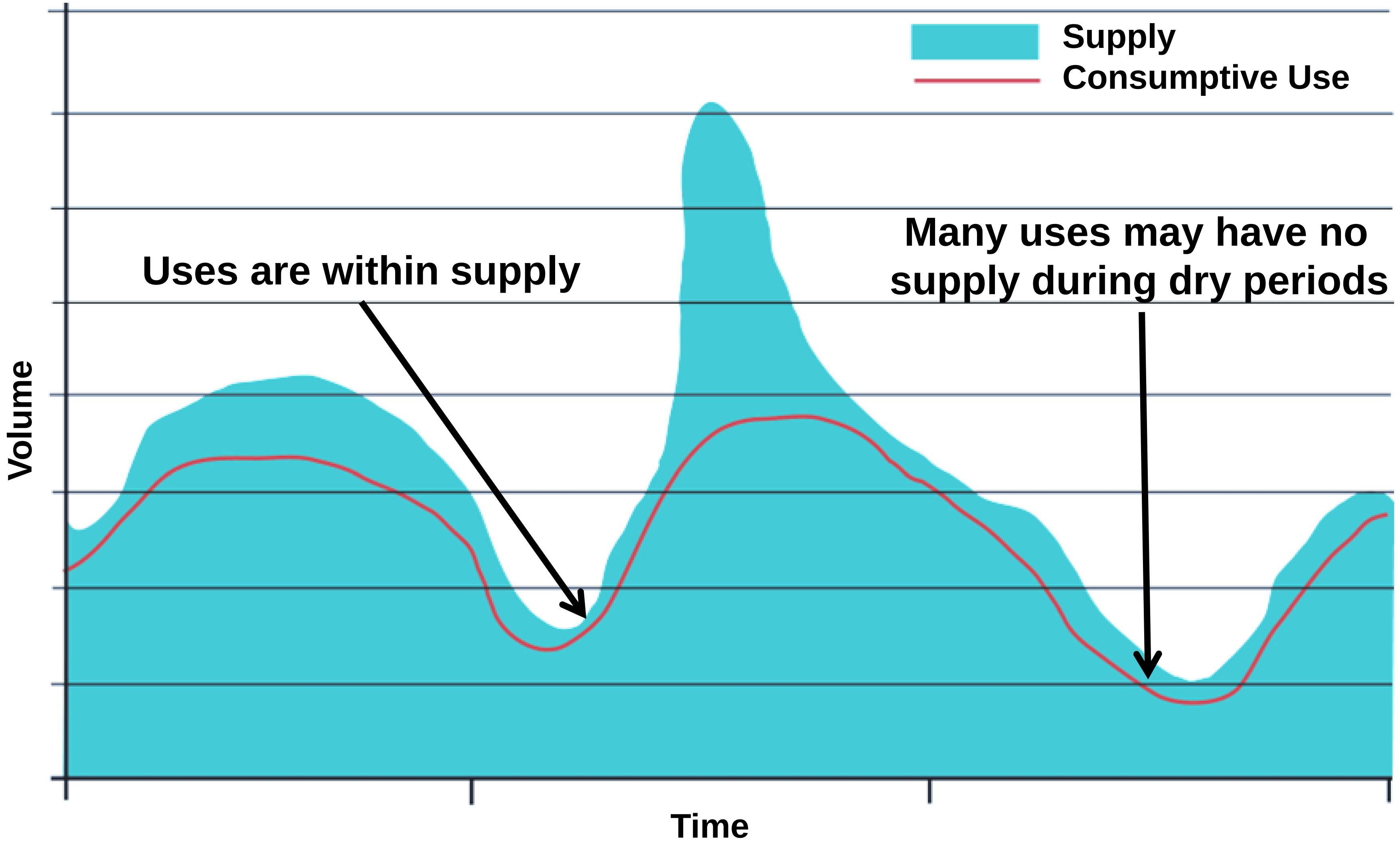
HOW IS CWM ACCOMPLISHED?

- Typically, by:
  - Using or storing additional surface water when it is plentiful
  - Relying more heavily on groundwater during dry periods
- Can change the timing and location of water for more efficient use



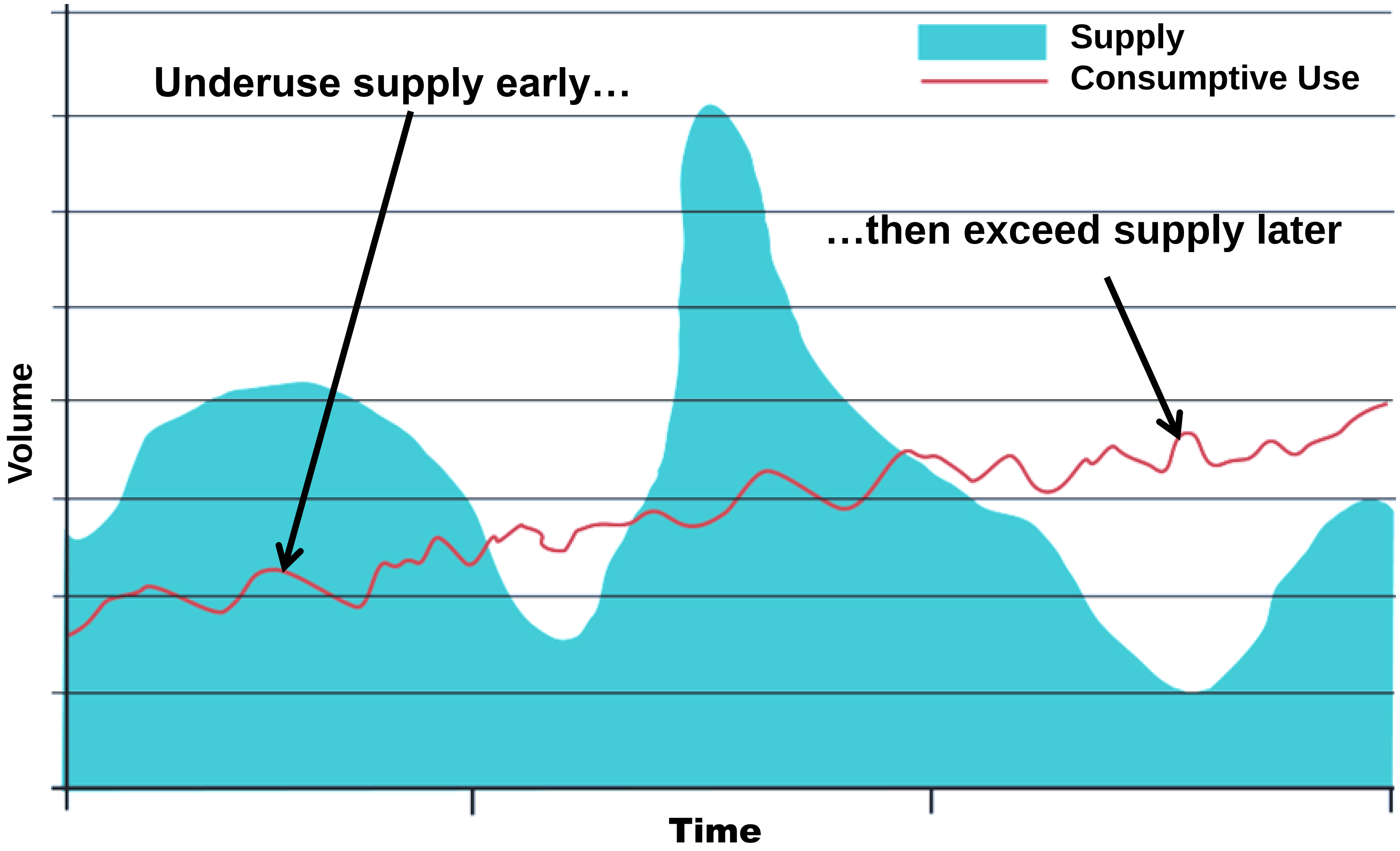
Scenario 1:

USING SURFACE WATER ONLY



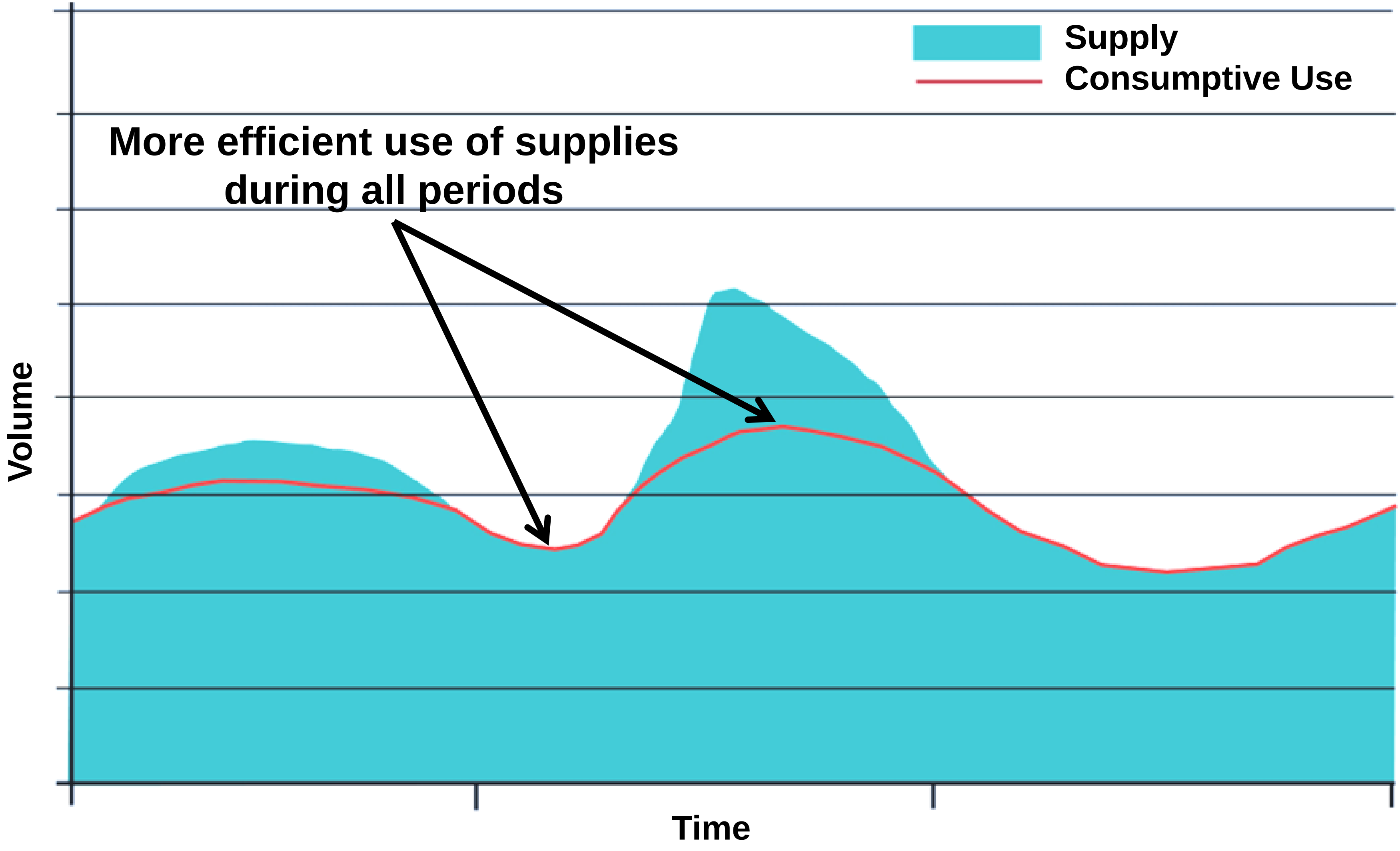
Scenario 2:

USING GROUNDWATER ONLY



Scenario 3:

MANAGING SUPPLIES THROUGH CWM

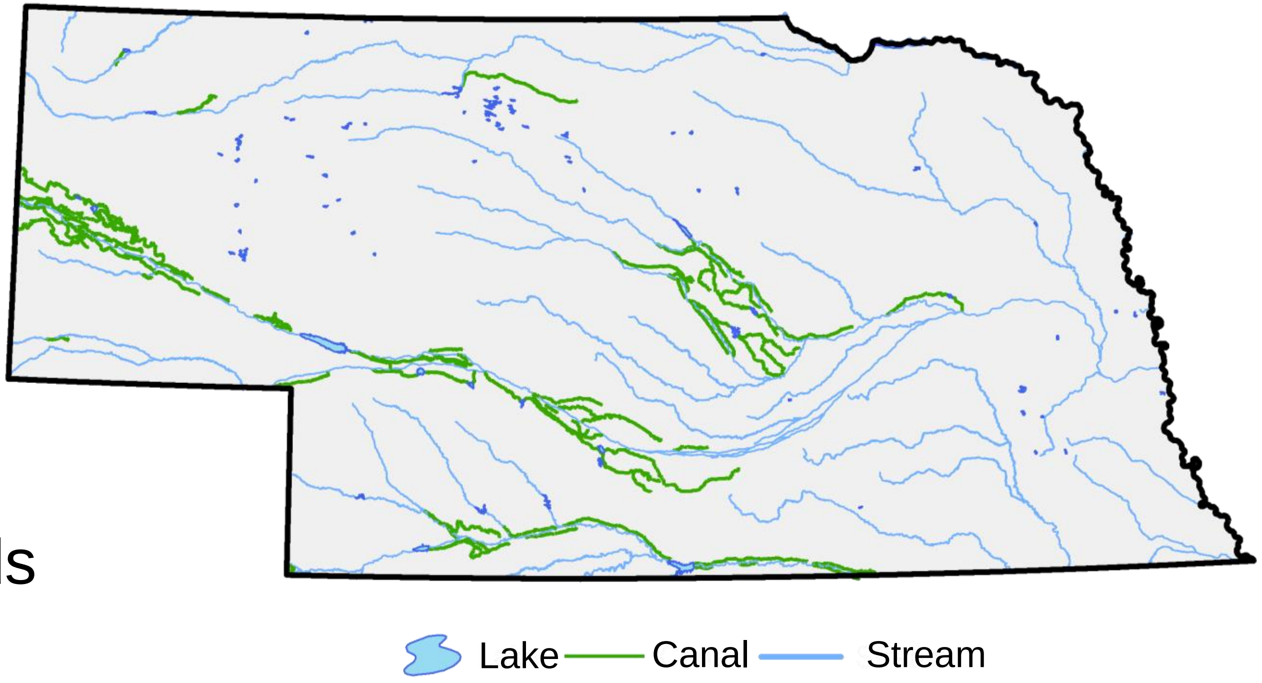


COMPONENTS OF CWM

- Surface water diversion and groundwater pumping
- Aquifer recharge
- Management of the timing of return flows
- Program for monitoring and evaluation

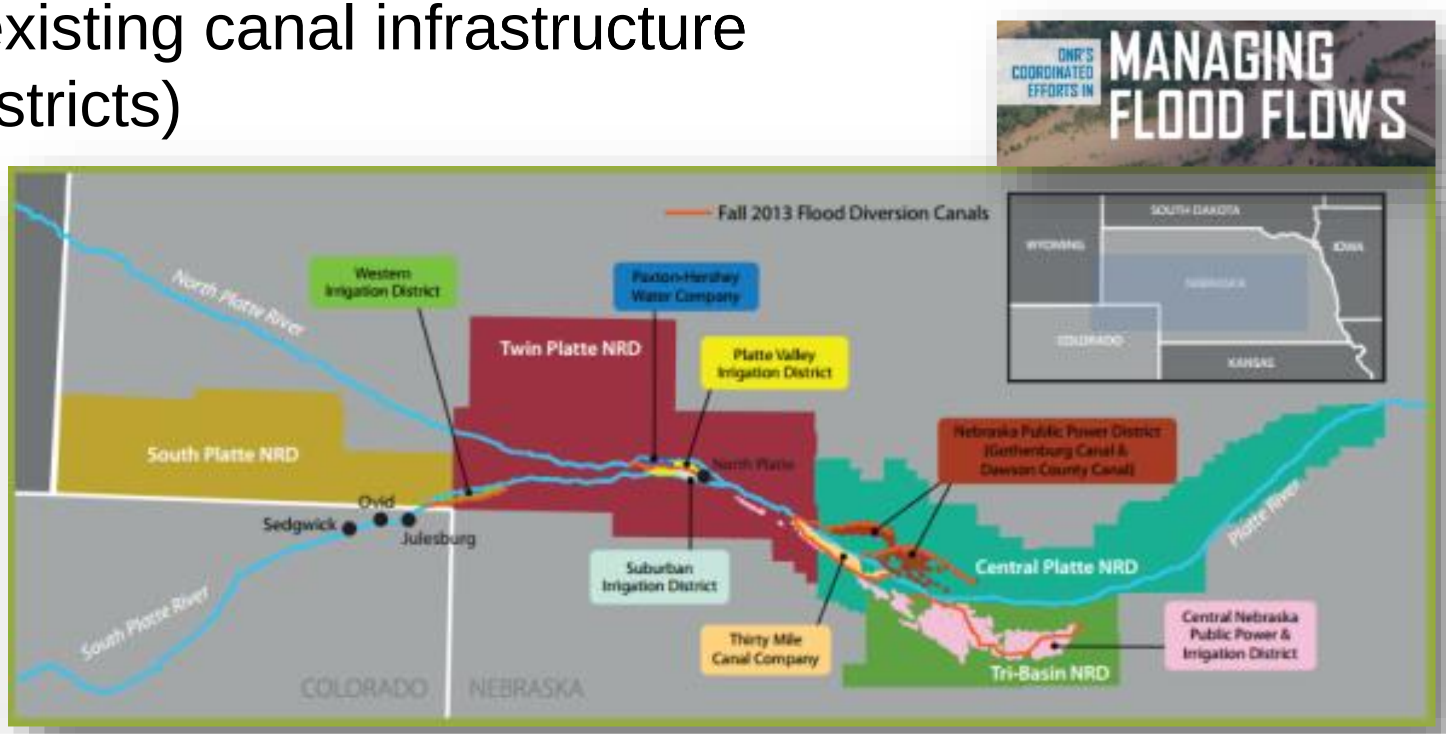
BENEFITS OF CWM

- Maximize available water supplies
- Leverage existing infrastructure
- Use existing planning framework
- Minimize the need for regulatory actions
- Customize to local opportunities or needs
- Maintain viability of existing uses



EXAMPLES OF CWM PROJECTS

- Augmentation projects such as N-CORPE
- Western canal conjunctive management study
- Water leasing arrangements
- CPNRD transfers and canal refurbishment
- Capturing excess flows using existing canal infrastructure (in partnership with irrigation districts)

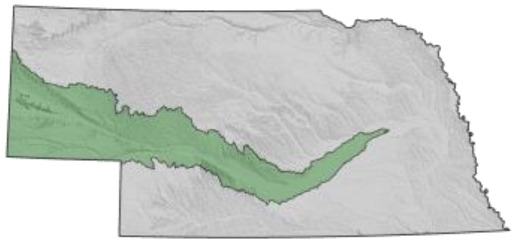


APPLYING CONJUNCTIVE MANAGEMENT

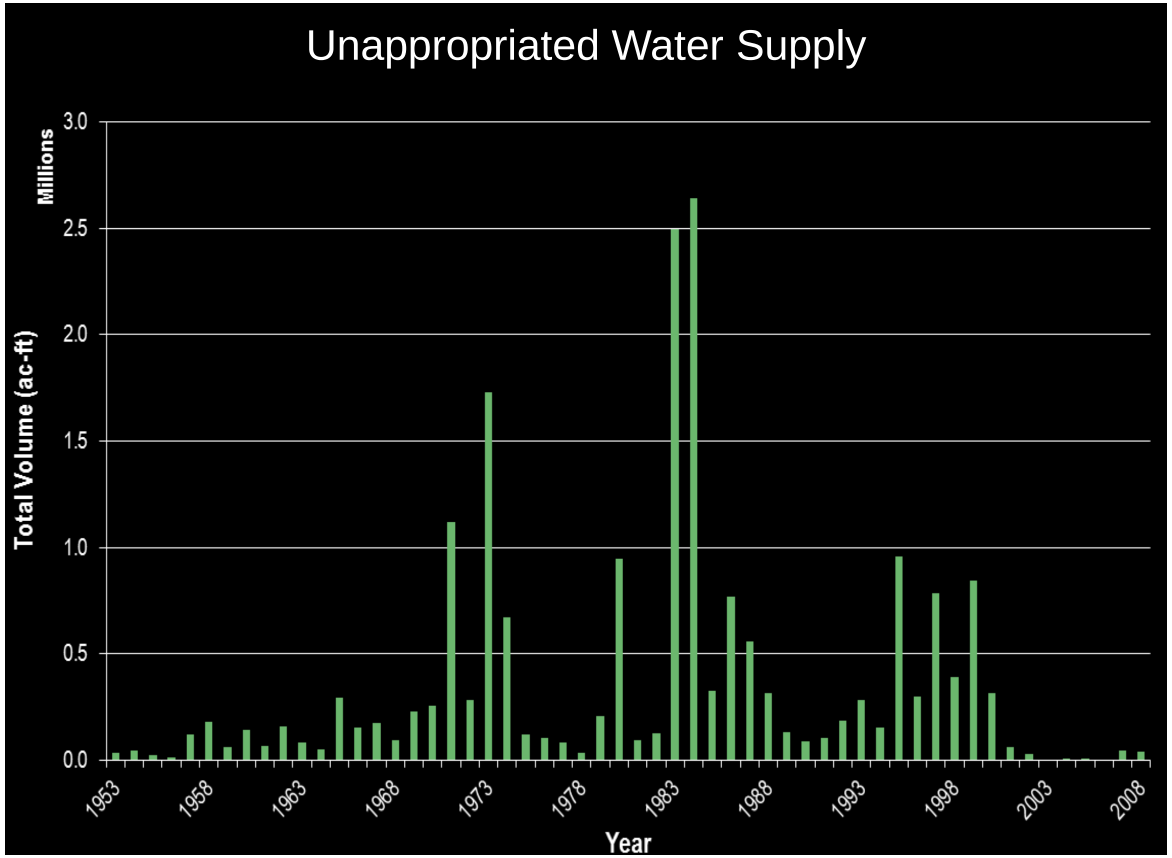
IN THE UPPER PLATTE RIVER BASIN

First Increment CWM Activities

UPPER PLATTE RIVER WATER SUPPLIES



- Receives average of 1 million ac-ft from snowmelt in Wyoming each year (North Platte Decree)
- More variable inflows in South Platte from Colorado
- Water is generally fully allocated, particularly above Elm Creek (overappropriated)
- Streamflows required to be shared under Endangered Species Act (Federal)
- Unappropriated water does occur during some very wet years, during shorter intervals, and outside of the irrigation season



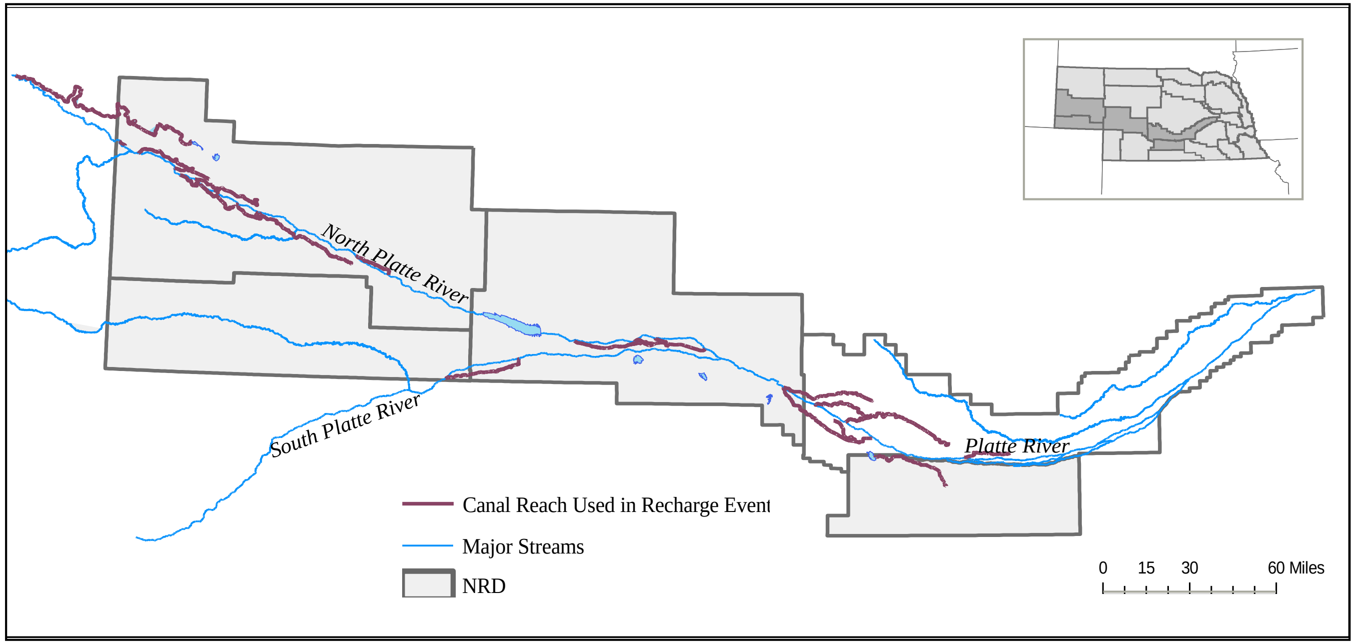
2011 PILOT PROJECT

- High flows in spring prior to irrigation season
- NeDNR coordinated with NRDs, Irrigation Districts/Canal Companies to divert excesses
- Acquisition of permits
- Contracts
- Monitor

2011 PILOT PROJECT

23 Canals and 5 NRDs

Diversion Total	**142,000 acre-ft**
Recharge Total	**64,000 acre-ft**
2011-2019 Returns	**15,000 acre-ft**



2013 FLOOD FLOWS

Friday, September 20, 2013 | **Saturday, September 21, 2013**

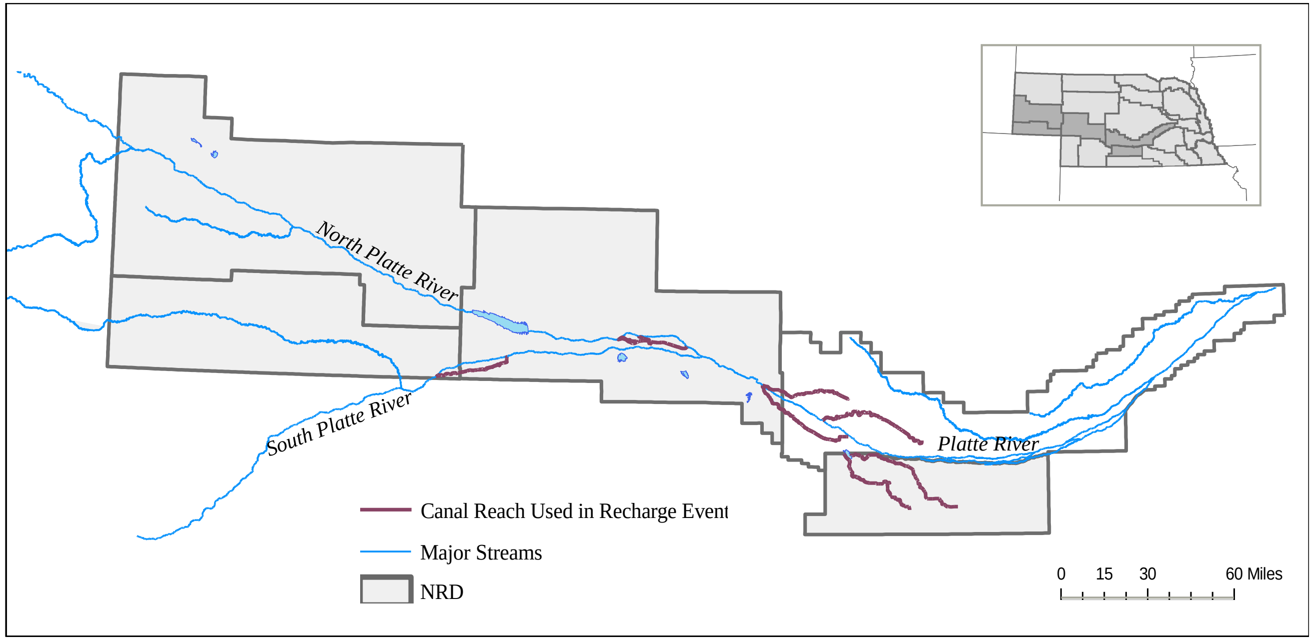
South Platte River Highway 83 Bridge, North Platte, NE

South Platte River Buffalo Bill Road Bridge, North Platte, NE

2013 FLOOD FLOWS

9 Canals and 4 NRDs

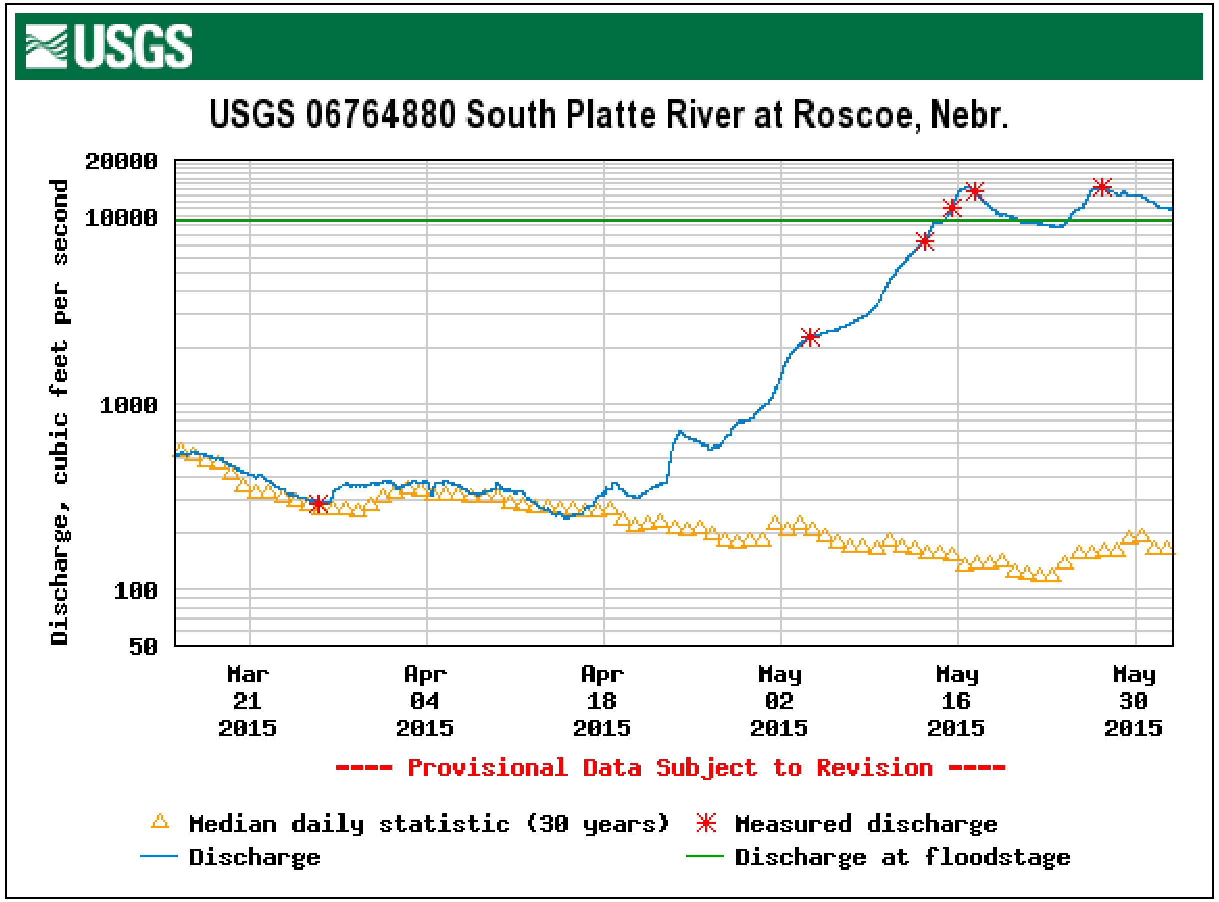
Diversion Total	**44,000 ac-ft**
Recharge Total	**27,000 ac-ft**
2011-2019 Returns	**5,600 ac-ft**



2015 FLOOD FLOWS

- Wet conditions during above average spring snowmelt
- Canals filled early
- Stored excess in lakes, reservoirs

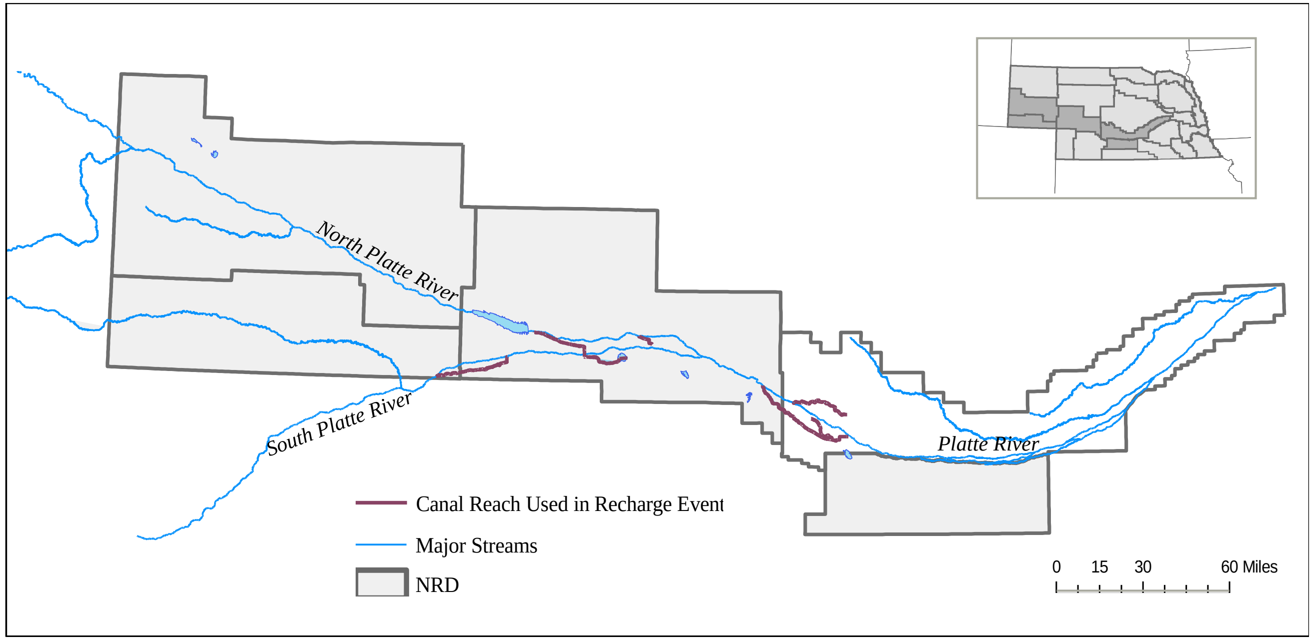
30-Mile Canal Headworks, June 2015



2015 FLOOD FLOWS

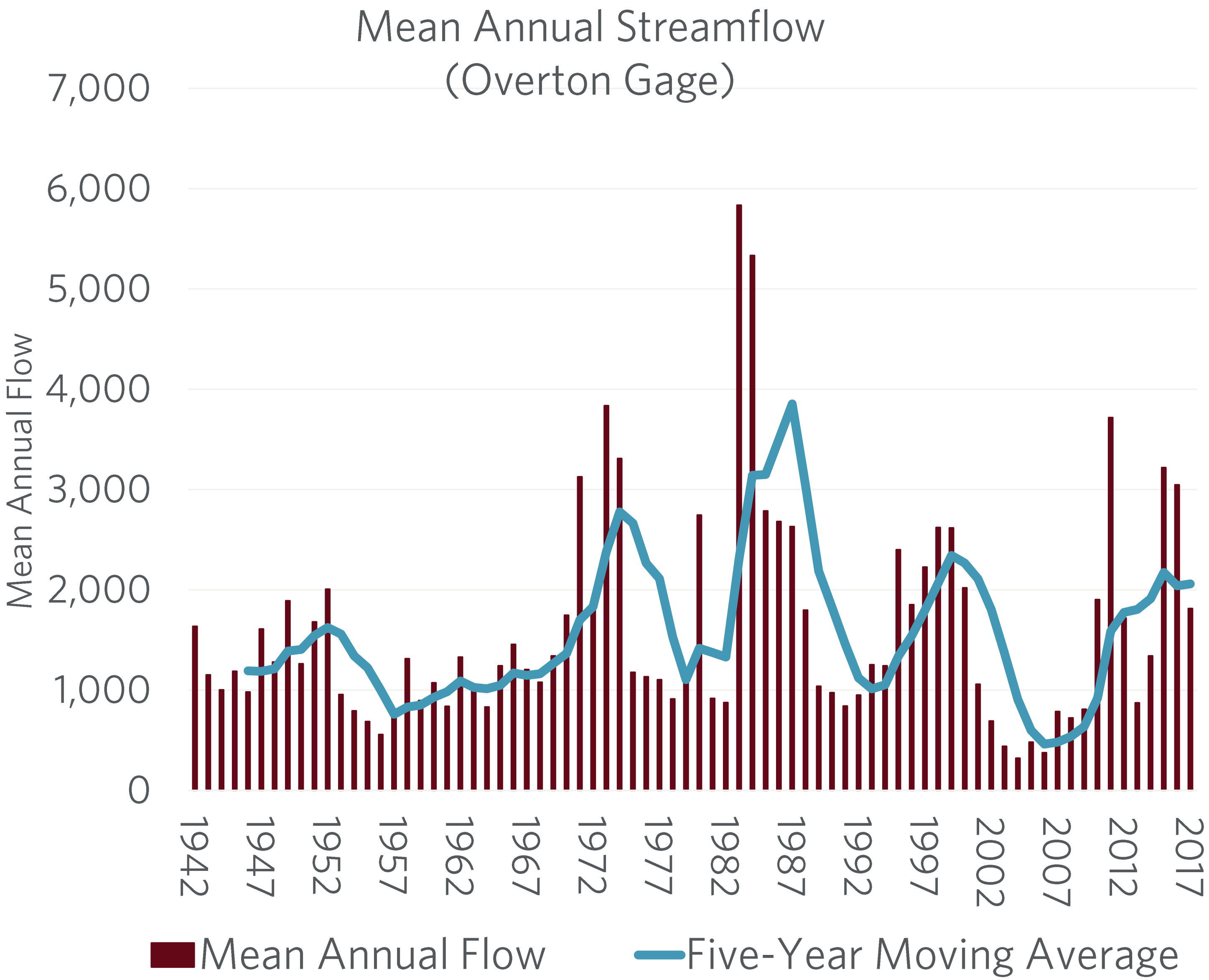
7 Canals and 4 NRDs

Diversion Total	**17,700 ac-ft**
Recharge Estimate	**7,600 ac-ft**



SUMMARY OF FLOOD FLOW DIVERSIONS (First Increment)

- Over 200 Kaf of flood flows diverted since 2011
- Resulting recharge in excess of 100 Kaf
- Accretions will benefit Platte River flows for many years into the future
- Process in place for future successes
- Reduces the need for additional regulations
- Creates greater resiliency in future periods



CWM FUTURE ACTIVITIES

- Expand implementation of CWM projects
- Enhance adaptation strategies based on management goals
- Support continued investment in maintaining and enhancing infrastructure
- Ensure that sound science and monitoring are available to support management decisions

Cozad Canal, Gothenberg, NE

NEBRASKA

Good Life. Great Water.

DEPT. OF NATURAL RESOURCES

Jesse.Bradley@nebraska.gov

2nd Increment Target Goals

- Post-1997 use depletions (33,800 AF at end of second increment) – Statutory Requirement
- Potential supplemental goals to #1 above that have been mentioned/discussed:
  - Maintain first increment mitigation efforts (estimated depletion offset of 43,600 – 126,200AF)
  - Offset growth in depletions from all uses during the next increment (approximately 44,600 AF – 3,500 AF in post-1997 use depletions already included in #1 above = 41,100 AF).
  - Offset post-1997 use depletions plus 5,000AF? 10,000 AF? % of total depletion growth in the second increment?
  - Offset growth in depletions since 1997 of all uses (105,200 AF – 33,800 included in #1 above = 71,400AF)
  - Compensation for lost hydropower generation due to depletions of surface flows
  - Offset lost hydropower with alternative energy source (wind, etc.)
  - Compensate surface water uses to improve reliability of water (canal improvements, diversion improvements, conjunctive management, etc.)
  - Drought plan – targeted actions (such as conjunctive management, regulation, etc.) to improve reliability of water during drought periods

UPPER PLATTE RIVER BASIN-WIDE PLAN DEVELOPMENT

Public Comment

Next Meeting – May 16, 2018

Holiday Inn Express | North Platte, NE