The Association of State Wetland Managers Presents:

Improving Wetland Restoration Success
2014 — 2015 Webinar Series

Playa and Rainwater Basin Restoration

Presenters:
Richard Weber, NRCS Wetland Team, CNTSC and
Ted LaGrange, Nebraska Game & Parks Commission

Moderators: Jeanne Christie & Marla Stelk

Funded by EPA Wetland Program Development Grant 83541601

If you have any technical difficulties during the webinar you can send us a question in the webinar question box or call Laura at (207) 892-3399 during the webinar.

HAVING TROUBLE WITH THE SOFTWARE?

Don't Panic -
we've got it covered!

Check your email from this morning:

1. You were sent a link to instructions for how to use the Go To Webinar software.
2. You were also sent a PDF of today's presentation. This means you can watch the PDF on your own while you listen to the audio portion of the presentation by dialing in on the phone number provided to you in your email.

AGENDA

- **Welcome and Introductions** (5 minutes)
- **Restoration Webinar Schedule & Future Recordings** (5 minutes)
- **Playa & Rainwater Basin Restoration** (60 minutes)
- **Question & Answer** (15)
- **Wrap up** (5 minutes)

WEBINAR MODERATORS

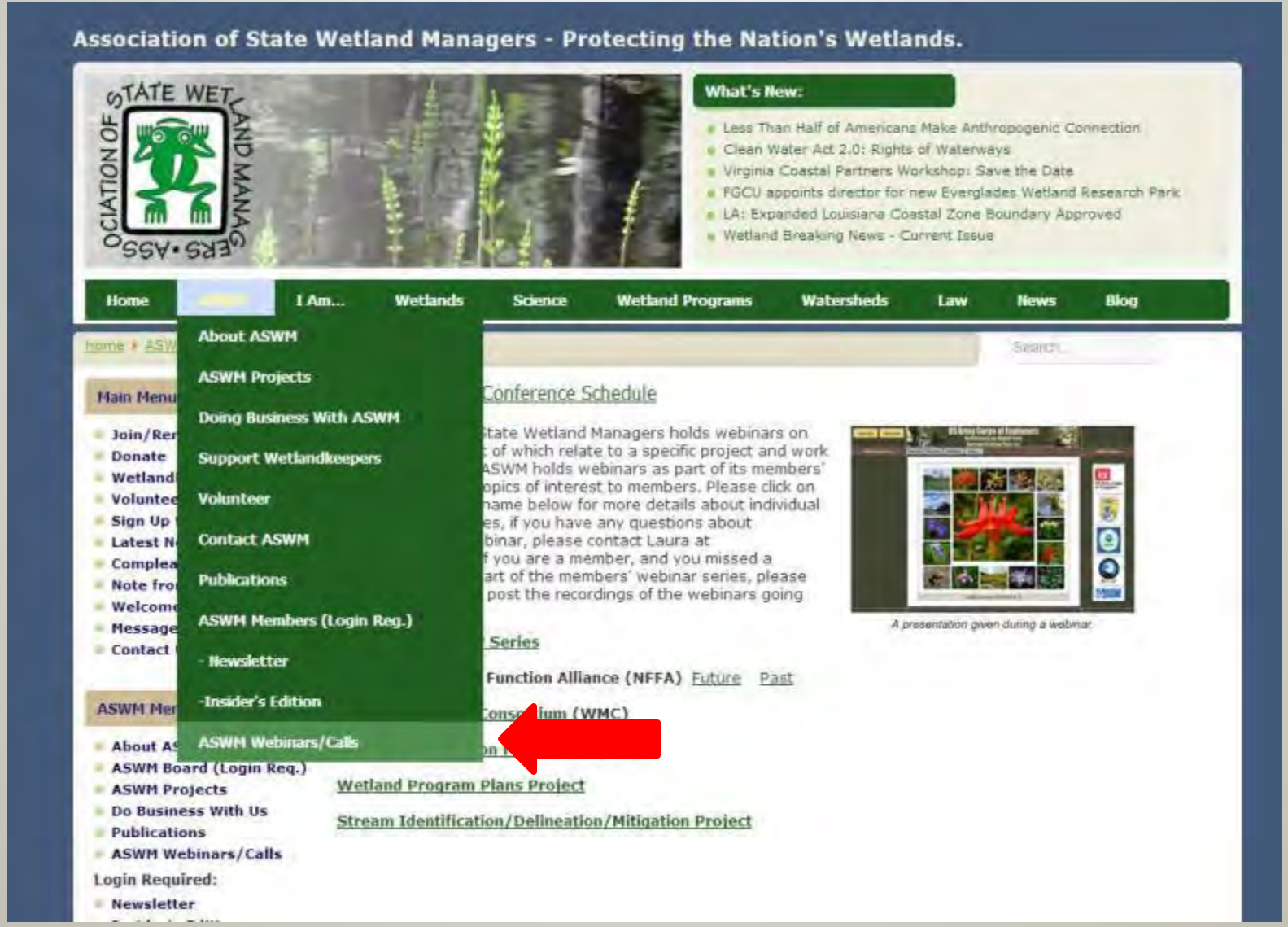
Jeanne Christie,
Executive Director

Marla Stelk,
Policy Analyst

WETLAND RESTORATION PROJECTS

- Convened interdisciplinary workgroup of 25 experts
- Developing monthly webinar series to run through September 2015
- Developing a white paper based on webinars and participant feedback
- To be continued through 2016 in an effort to pursue strategies that:
  - Maximize outcomes for watershed management
    - Ecosystem benefits
    - Climate change
  - Improve permit applications and review
  - Develop a national strategy for improving wetland restoration success

WEBINAR SCHEDULE & RECORDINGS



WEBINAR SCHEDULE & RECORDINGS

FUTURE SCHEDULE - 2015

- **Tuesday, March 17, 3:00pm eastern:**
  - **Pacific Coast Wetland Restoration**

    Presented by:

    Charles "Si" Simensted, University of Washington and,

    John Callaway, University of San Francisco
- **Tuesday, April 21, 3:00pm eastern:**
  - **Vernal Pool Restoration: How to Restore the Landscape**

    Presented by:

    Mick Micacchion, Midwest Biodiversity Institute

FOR FULL SCHEDULE, GO TO: http://aswm.org/aswm/6774-future-webinars-improving-wetland-restoration-success-project

PRESENTERS

Rich Weber
NRCS Wetland Team, CNTSC

Ted LaGrange
Nebraska Game &
Parks Commission

A “COOKBOOK” APPROACH TO WETLAND RESTORATION WON’T WORK

There are too many variables.

- *Ingredients are always different*
- *Reason for ‘cooking’ varies*
- *Recipe isn’t always correct*
- *Inexperienced cooks*
- *Cooking time varies*
- *Poor inspection when “cooking”*
- *Additional ingredients may be needed*
- *Is it really done?*

WE NEED TO UNDERSTAND THE PLANNING PROCESS AND VARIABLES FROM SITE TO SITE THAT MUST BE STUDIED, UNDERSTOOD AND ADDRESSED

EACH WETLAND RESTORATION PROJECT IS UNIQUE:

- *Consider both historic and current landscape setting*
- *Analyze how water moves into and out of the site*
- *Evaluate soils present and identify any onsite drainage*
- *Focus first on hydrology and soil first, last on plants*
- *Develop a plan that is achievable for the site*
- *Develop comprehensive cost estimates*
- *Ensure plan is followed*
- *Hire experienced and knowledgeable contractors*
- *Adapt plan as needed during construction*
- *Determine if monitoring criteria will measure progress*
- *Keep good records and share with others*

Playa and Rainwater Basin Restoration

IT WILL TAKE US A FEW MOMENTS TO MAKE THE SWITCH…

Playa and Rainwater Basin Restoration

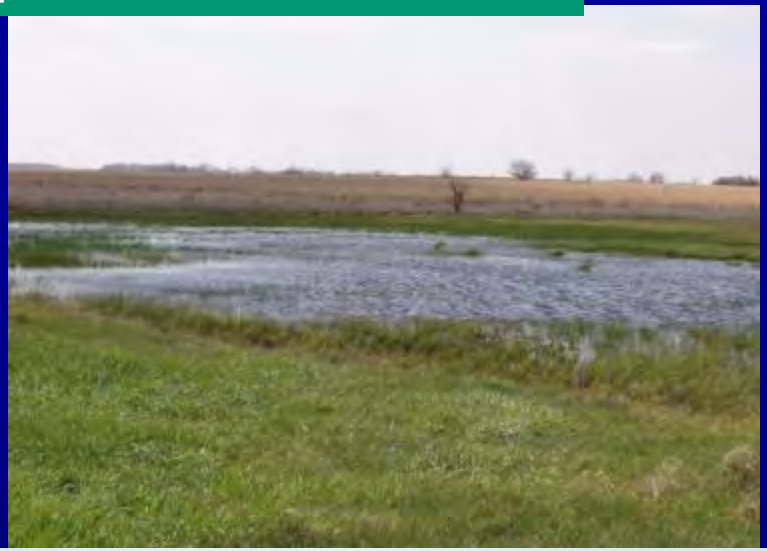
By Rich Weber (NRCS) and Ted LaGrange (Nebraska Game and Parks Commission)

- Classification
- How did the system function?
- What has been altered?
- Restoration Techniques

DEPRESSIONAL Wetlands

Wyoming – Recharge Depression, Gillette

Nebraska Rainwater Basin Depression



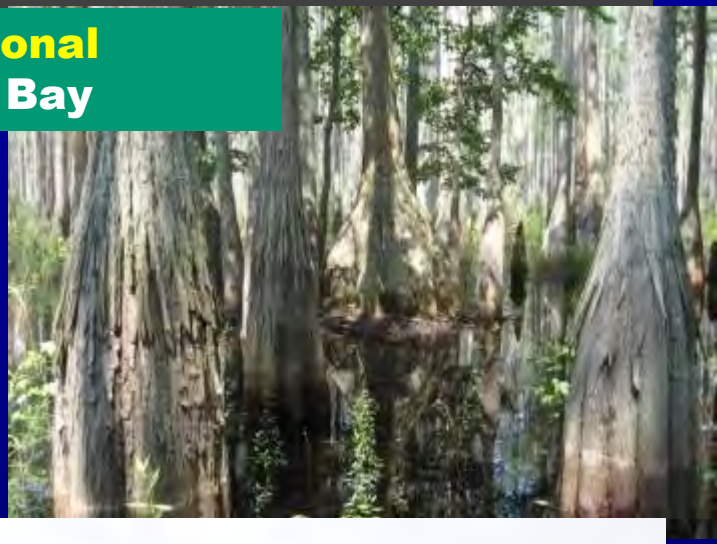
South Carolina – Carolina Bay

South Dakota Prairie Pothole

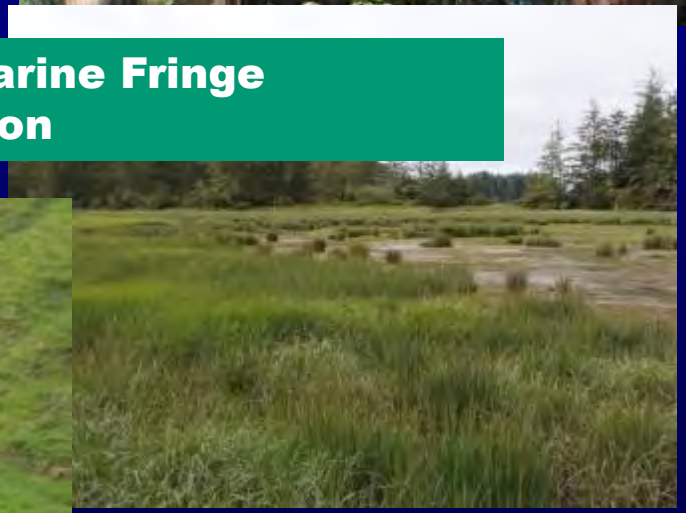
One of the Seven HGM Classes

- RIVERINE
- SLOPE
- MINERAL SOIL FLAT
- ORGANIC SOIL FLAT
- ESTUARINE FRINGE
- LACUSTRINE FRINGE
- DEPRESSION

Depressional
Carolina Bay



Estuarine Fringe
Oregon

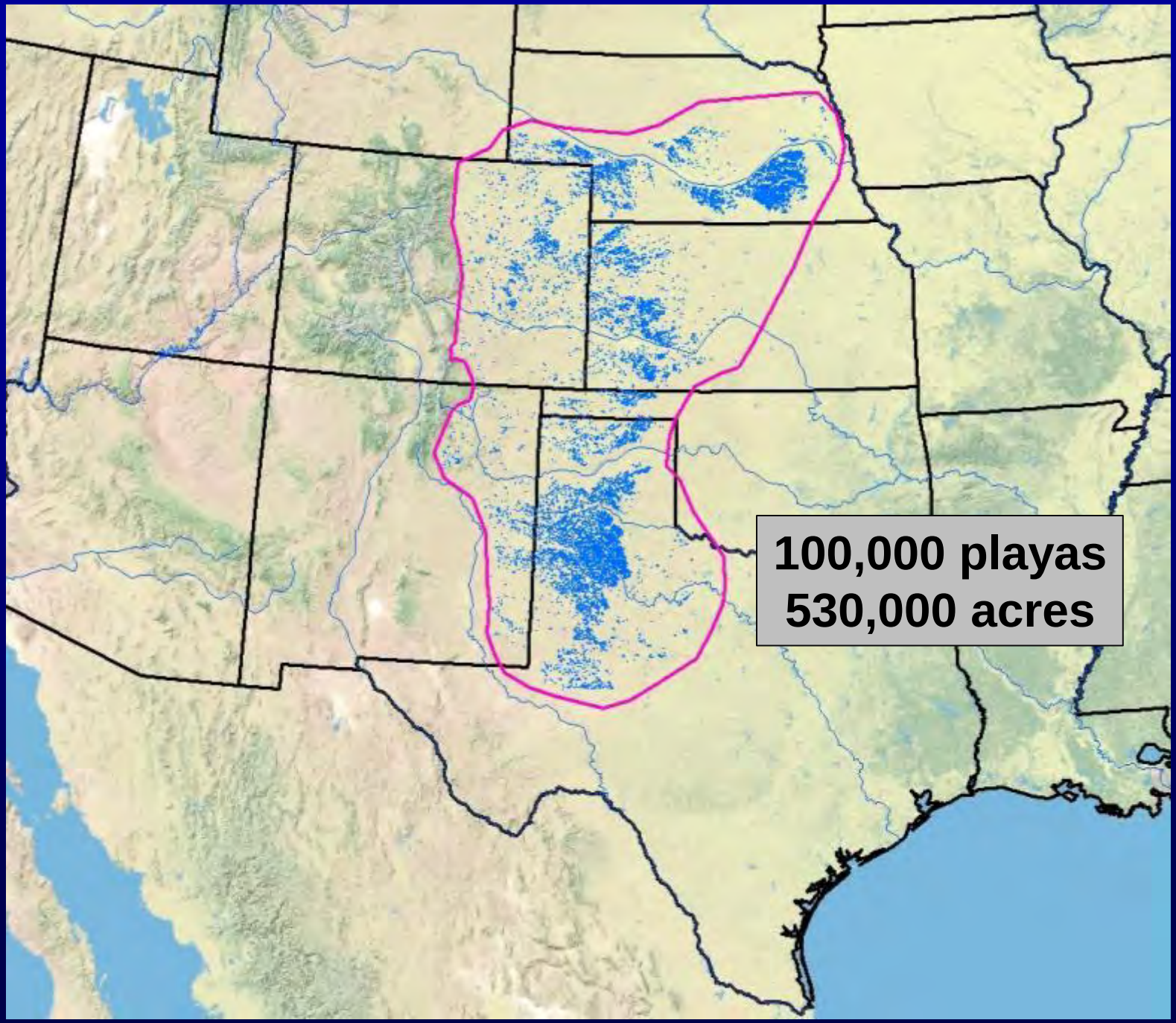


Mineral Flats
Indiana Flatwoods

Slope
Puerto Rico

DEPRESSIONAL

- Dominant Water Source – Surface Runoff and/or Groundwater
- Closed Topographic Depressions
- Found on Interfluves or as elements in headwater reaches
- Exist in Complexes


100,000 playas
530,000 acres

Joel Jorgensen, NGPC

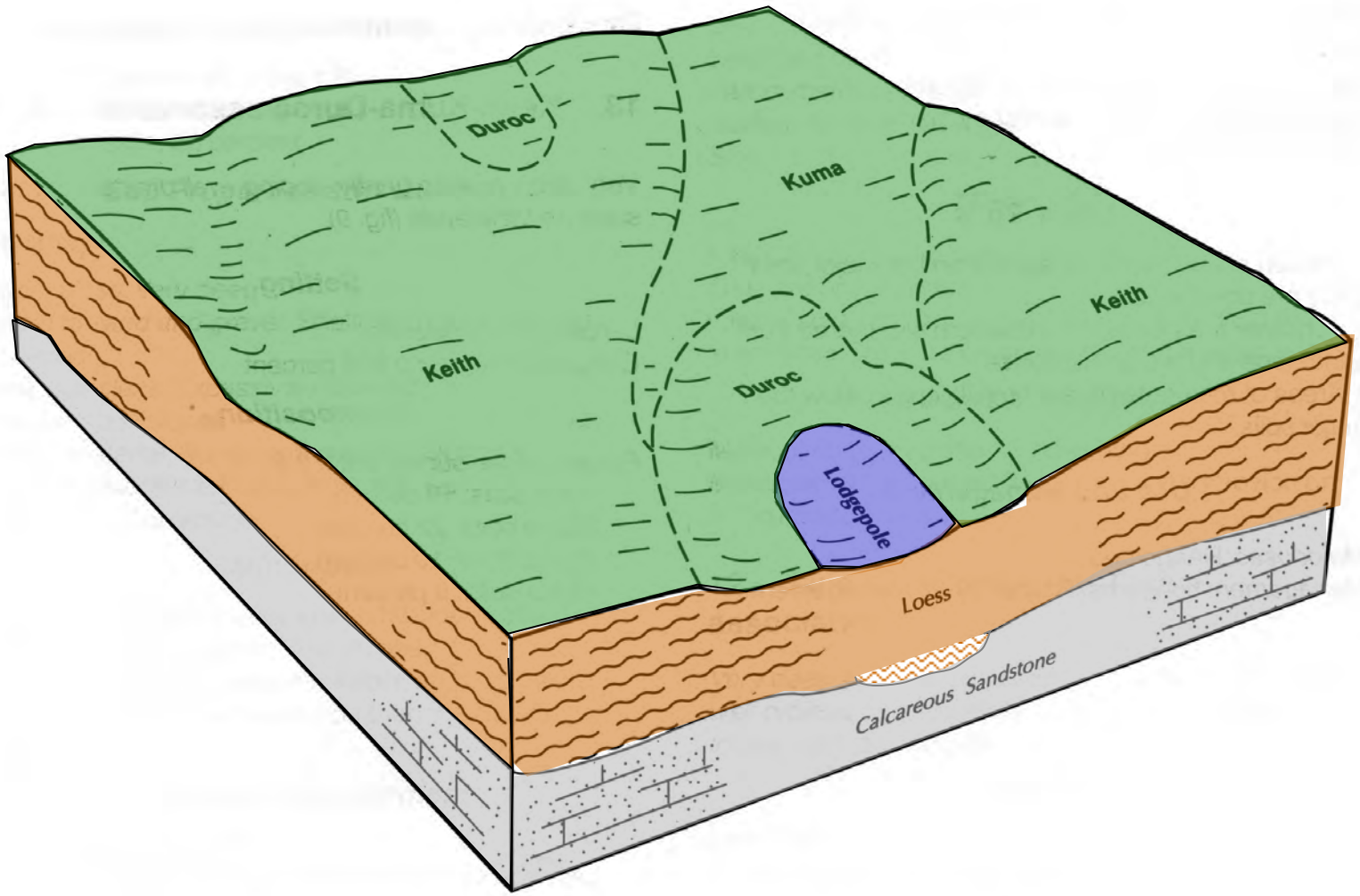
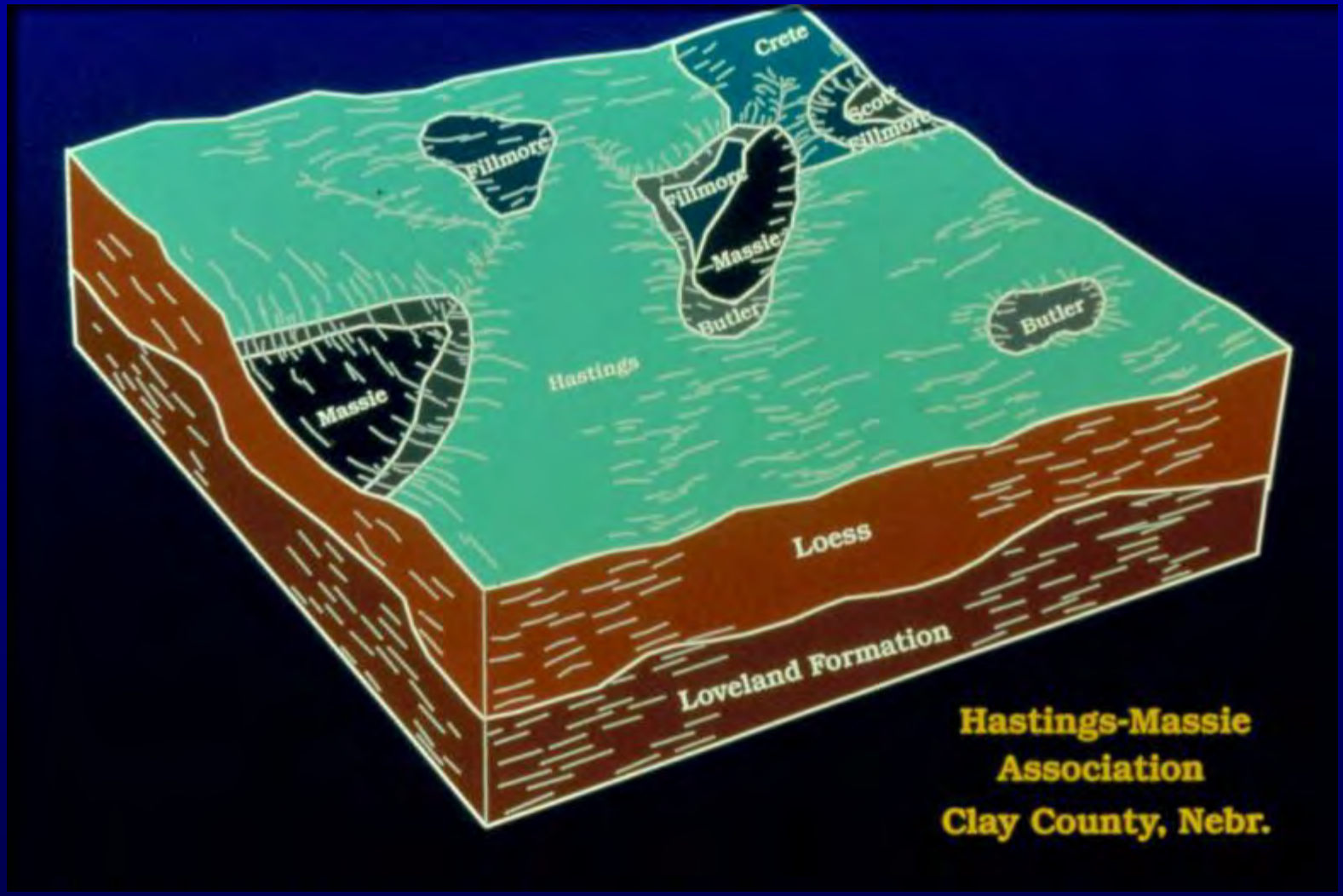
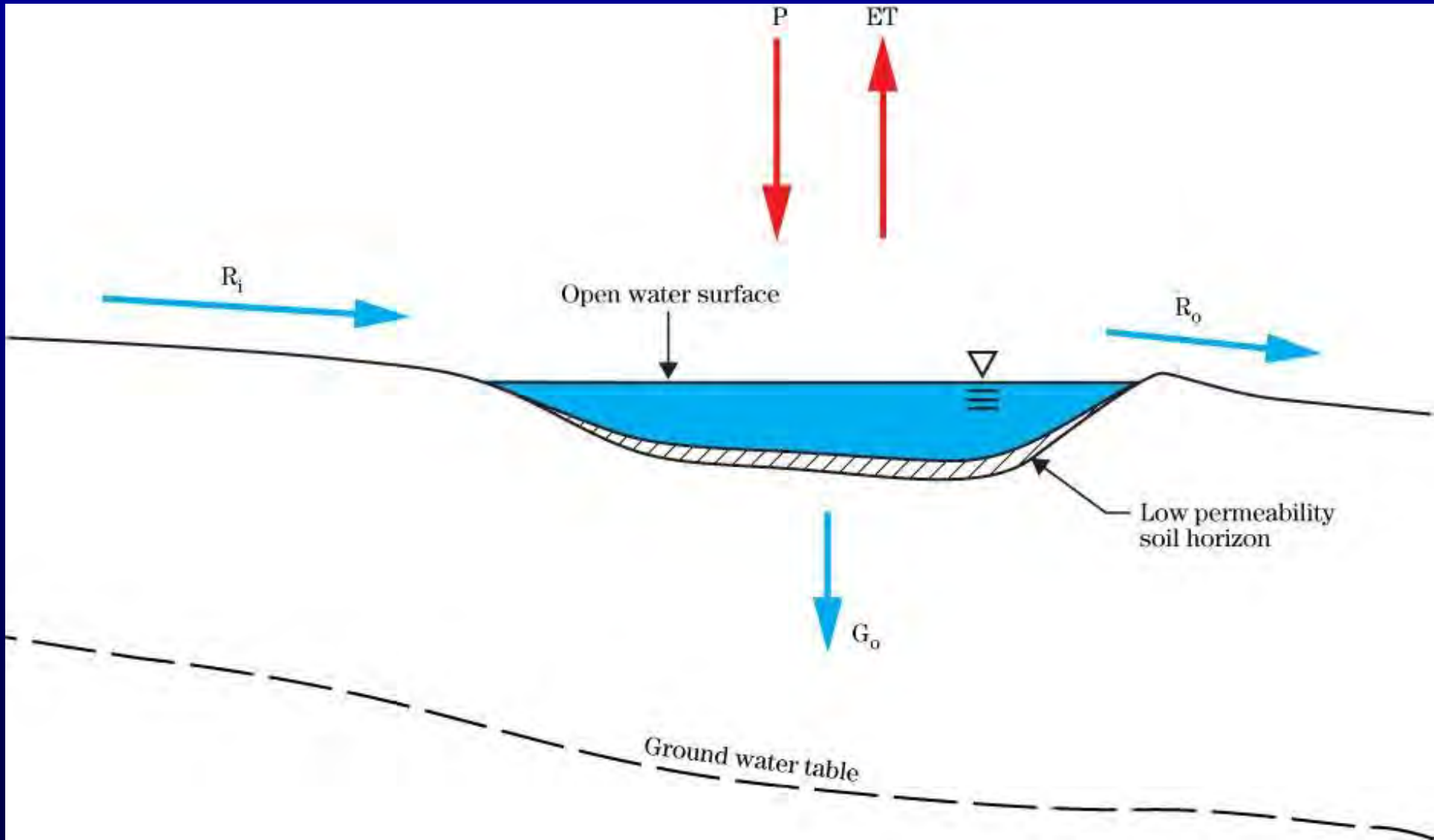


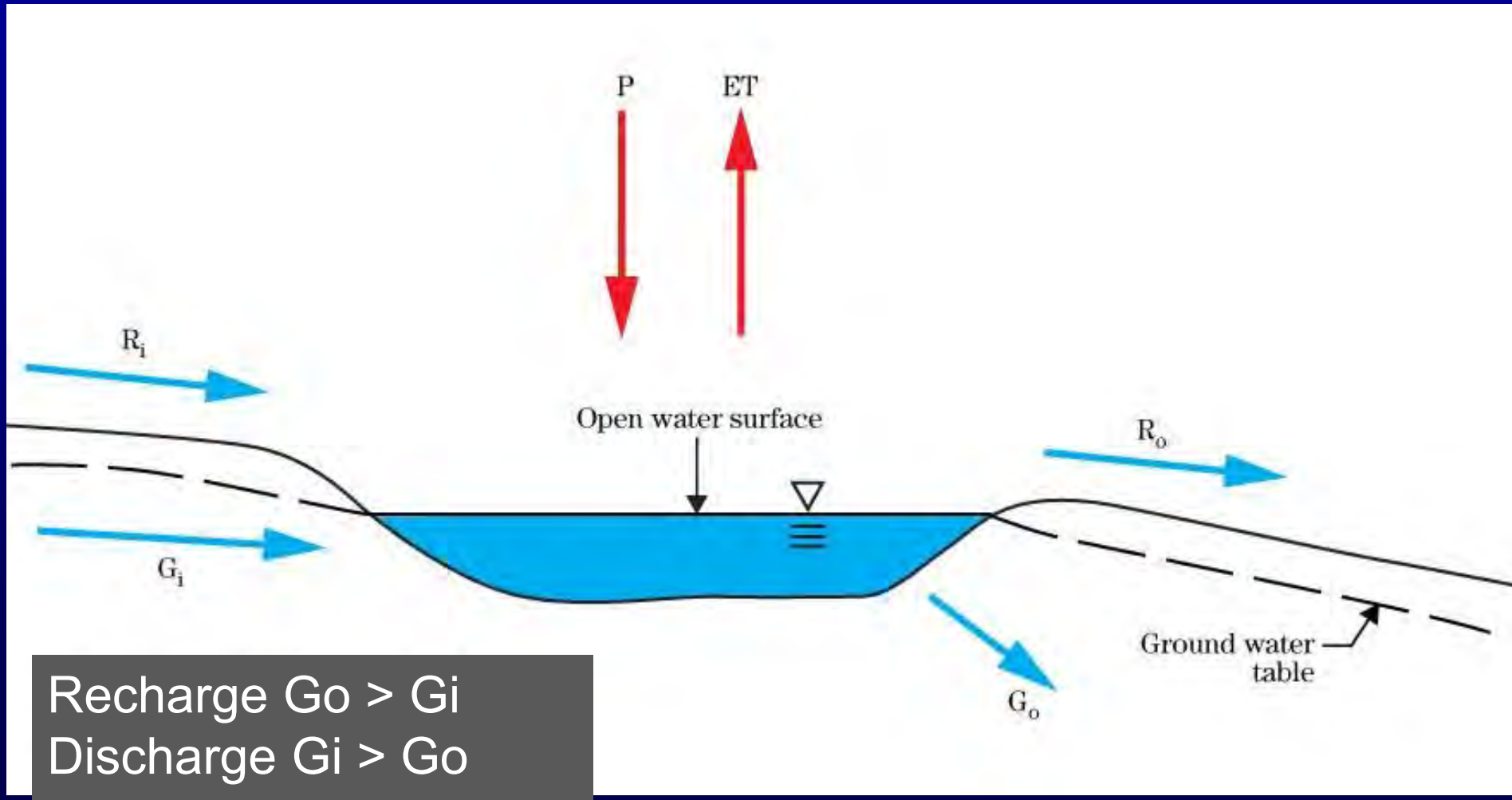
Figure 9.—Typical pattern of the soils and underlying material in the Keith-Kuma-Duroc association.


Crete
Fillmore
Fillmore
Massie
Butler
Butler
Hastings
Massie
Loess
Loveland Formation
Hastings-Massie
Association
Clay County, Nebr.

Depressional - Recharge



Depressional – Discharge or Flow Through

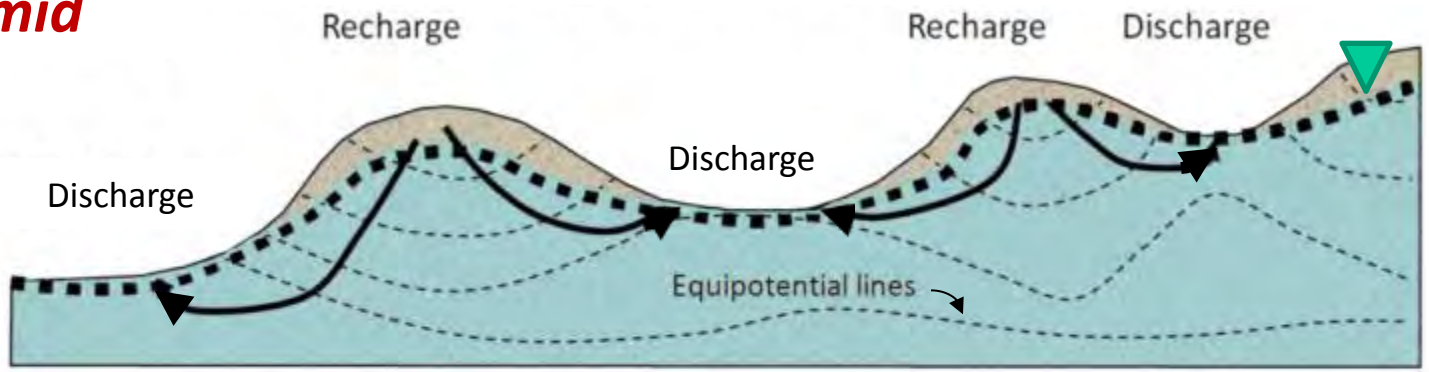


Recharge Go > Gi
Discharge Gi > Go

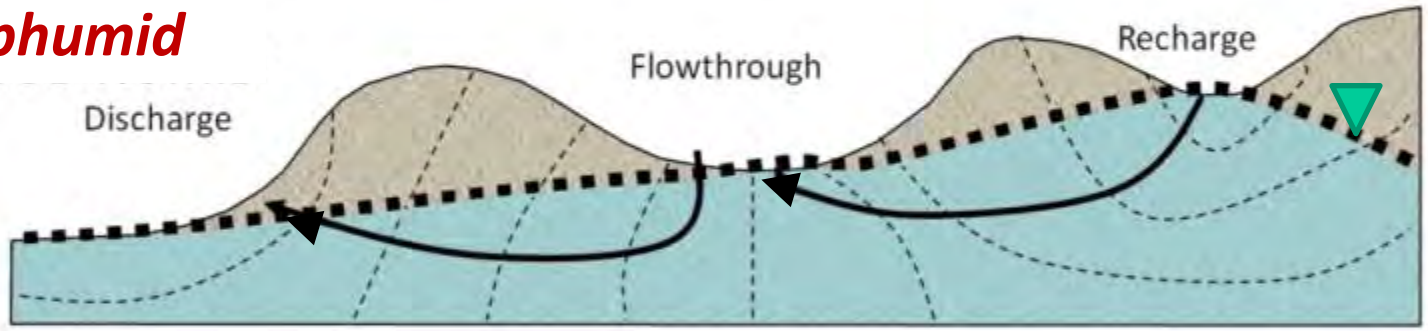
Soil Systems and Climate Uncertainty

(A way to bridge scales in climate prediction and response).

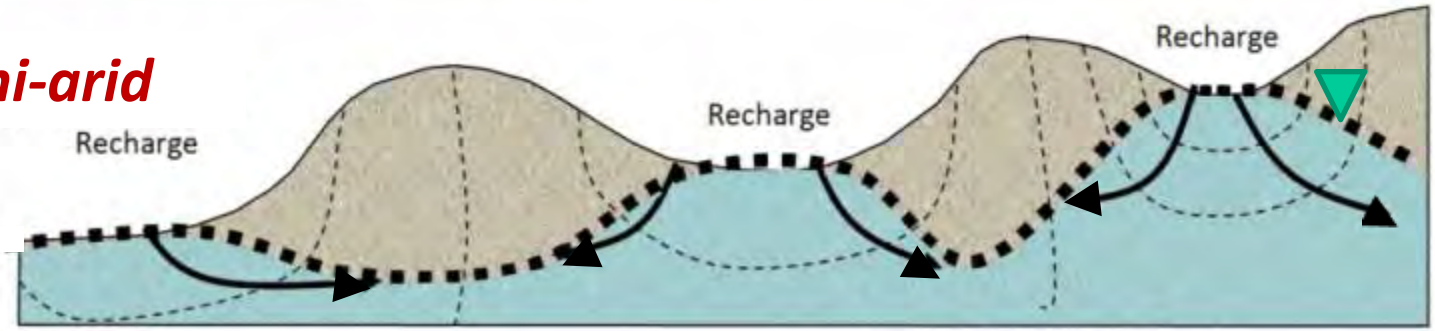
Humid



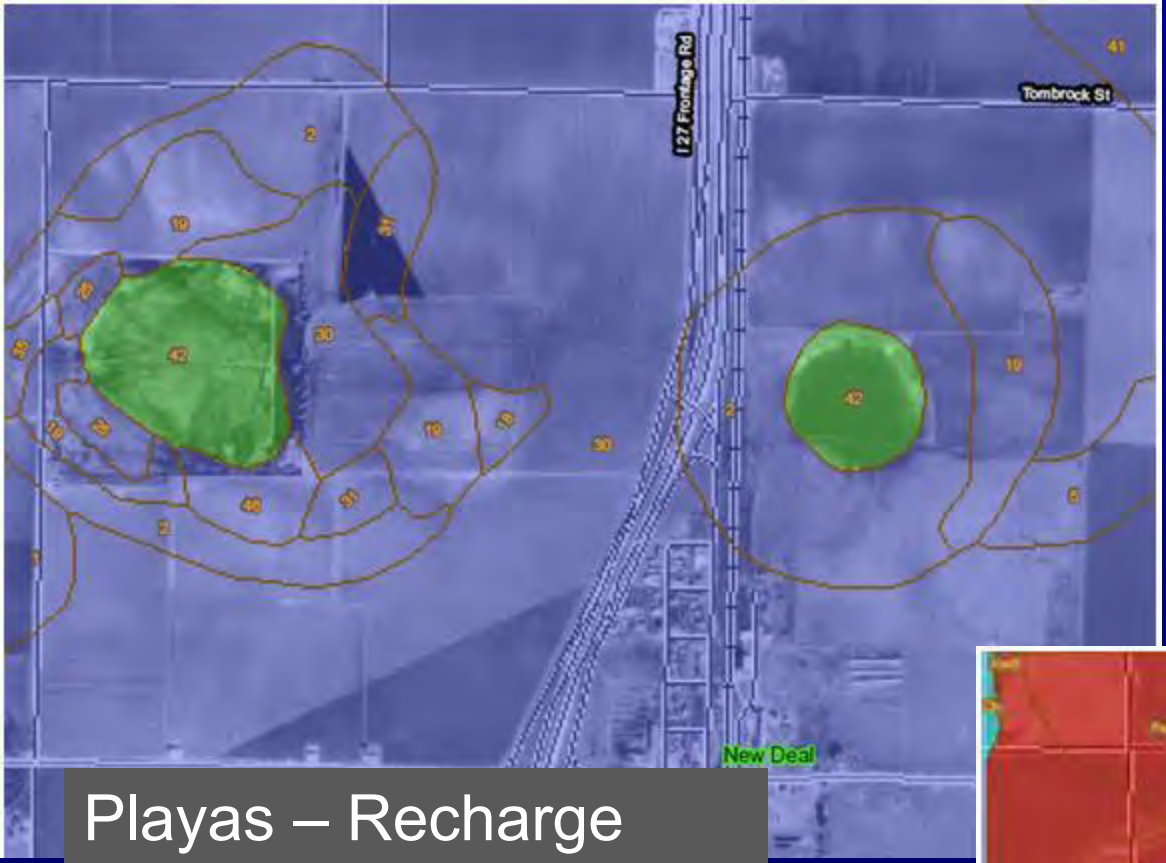
Subhumid



Semi-arid

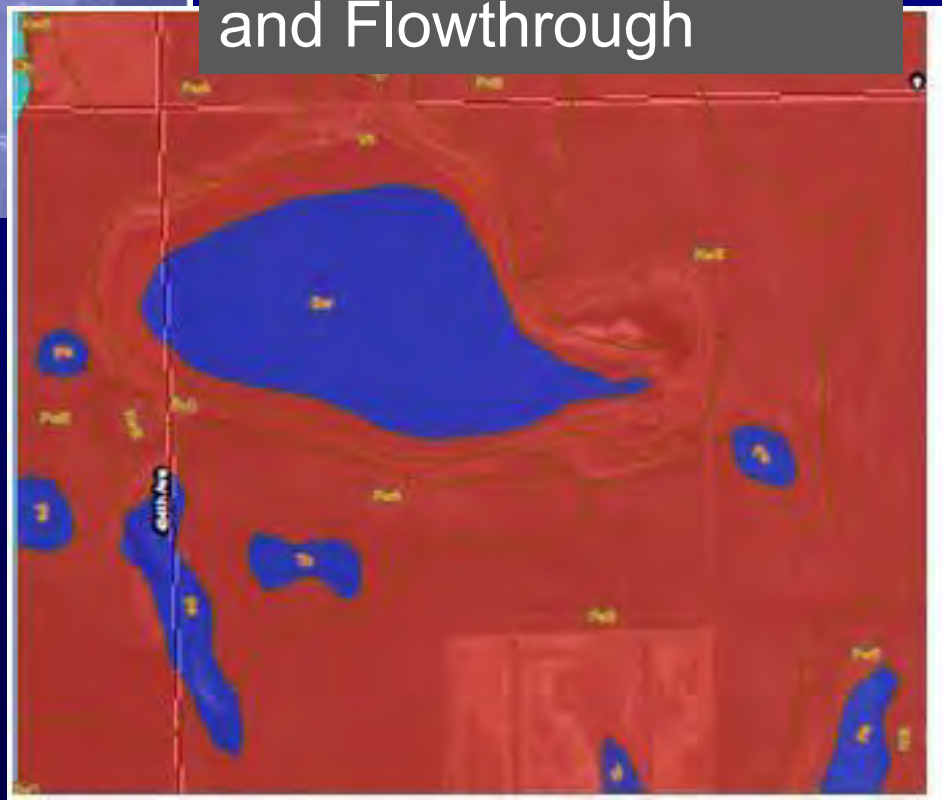


Richardson et al. 1991



Depressional- Default if not found on other HGM class

South Dakota Prairie Potholes – Recharge, Discharge, and Flowthrough

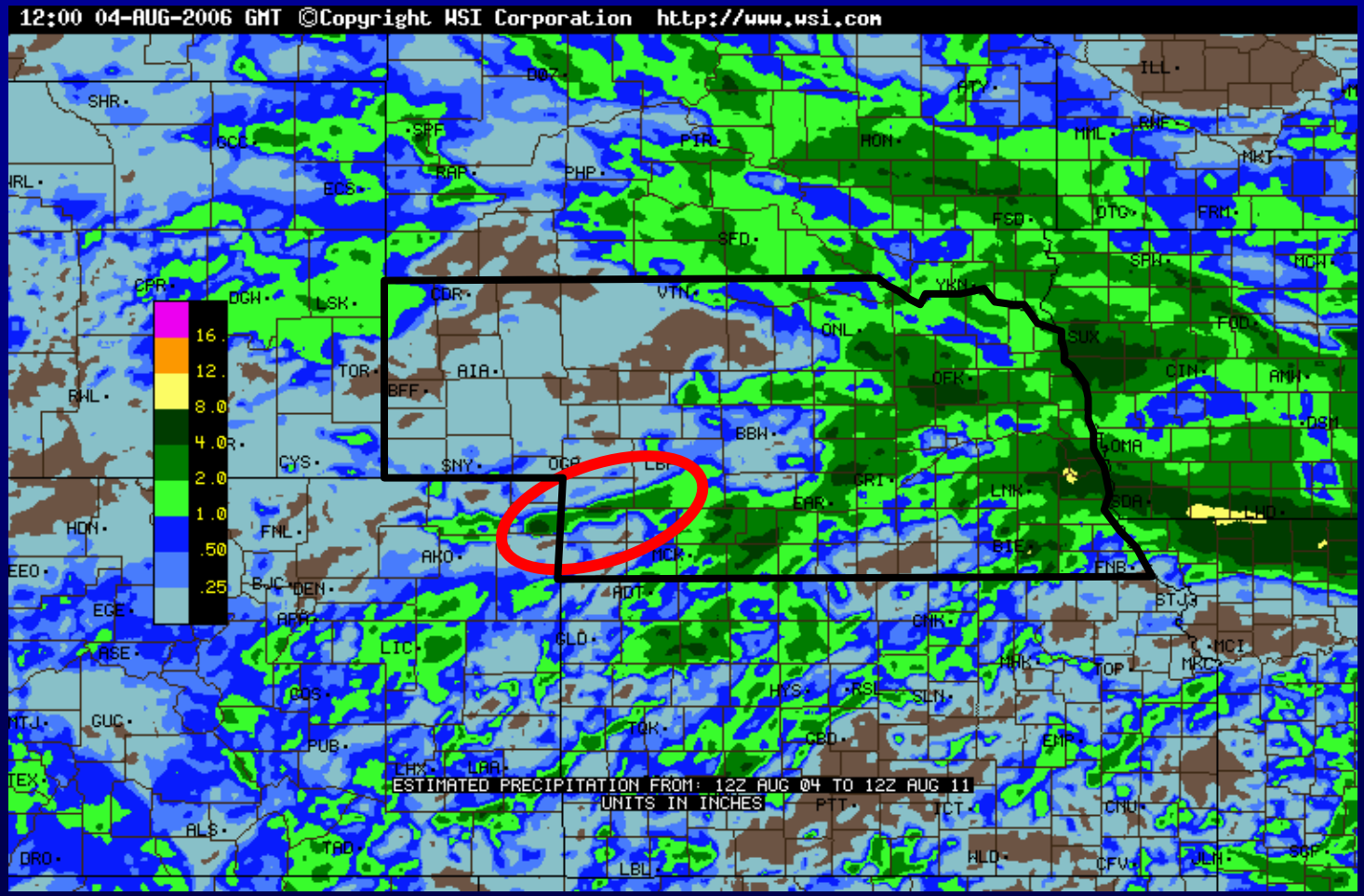


Playas – Recharge Texas and Nebraska studies

Recharge DEPRESSION Hydrology Considerations

- Dominant Water Source - Runoff
  - Watershed Runoff Volume
  - Runoff Water Quality
- Integrity of Soil for Ponding
  - Perching Layer
  - Soil Water Holding Capacity
  - Soil Organic Matter?
- Playa Geometry
  - Excess Sediment
  - Surface Drainage
  - Excavated Pits

Rainfall Event



Recharge DEPRESSION Water Budgeting

$(R_i + P) – (ET + G_o) = \triangle S$

R_i = Surface Runoff in
P = Precipitation on playa surface
ET = Evapotranspiration
G_o = Groundwater out through perching layer

$\triangle$ S = Surface and Soil Storage

Precipitation – WETS Tables

WETS Station : DUBOIS S IND FORAGE FRM, IN2309 Creation Date: 01/22/2003
Latitude: 3827 Longitude: 08642 Elevation: 00690
State FIPS/County(FIPS): 18037 County Name: Dubois
Start yr. - 1971 End yr. - 2000

Month	Temperature (Degrees F.) avg daily max	avg daily min	avg	Precipitation (Inches) avg	30% chance will have less than	more than	avg # of days w/.1 or more	avg total snow fall
January	37.9	20.3	29.1	3.10	1.90	3.79	5	2.3
February	43.4	23.4	33.4	2.81	1.76	3.44	5	2.5
March	53.8	32.9	43.3	4.08	2.91	4.74	7	1.3
April	64.5	43.0	53.8	4.65	3.07	5.45	8	0.0
May	73.9	52.4	63.2	5.29	3.41	6.09	8	0.0
June	82.2	61.4	71.8	4.68	3.19	5.95	7	0.0
July	86.0	65.5	75.8	4.38	3.02	5.09	6	0.0
August	85.0	63.5	74.2	4.04	2.78	4.94	5	0.0
September	78.5	56.2	67.3	3.55	2.10	4.05	5	0.0
October	67.4	44.1	55.7	3.15	2.15	4.02	5	0.2
November	54.5	35.2	44.8	4.27	2.87	5.18	7	0.0
December	42.7	25.0	33.9	3.45	2.54	4.44	6	1.2
Annual	-----	-----	-----	------	41.49	51.98	--	----
Average	64.1	43.6	53.9	------	------	------	--	----
Total	-----	-----	-----	47.45	------	------	74	7.6

GROWING SEASON DATES

Probability	Temperature: 24 F or higher	28 F or higher	32 F or higher
	Beginning and Ending Dates Growing Season Length		

Monthly – With 30th and 70th Percentiles

180033037.txt

IN3037-date	tmax	tmin	tavg	prcp	snwd	snow	wteq
100160	65.00	35.00	50.00	0.00	0.00	0.00	
100260	70.00	47.00	58.50	0.28	0.00	0.00	
100360	65.00	41.00	53.00	0.00	0.00	0.00	
100460	69.00	44.00	56.50	0.00	0.00	0.00	
100560	76.00	46.00	61.00	0.47	0.00	0.00	
100660	73.00	41.00	57.00	0.00	0.00	0.00	
100760	65.00	38.00	51.50	0.00	0.00	0.00	
100860	66.00	42.00	54.00	0.00	0.00	0.00	
100960	74.00	47.00	60.50	0.00	0.00	0.00	
101060	77.00	41.00	59.00	0.00	0.00	0.00	
101160	80.00	48.00	64.00	0.00	0.00	0.00	
101260	80.00	50.00	65.00	0.00	0.00	0.00	
101360	80.00	52.00	66.00	0.00	0.00	0.00	
101460	77.00	54.00	65.50	0.00	0.00	0.00	
101560	73.00	58.00	65.50	0.00	0.00	0.00	
101660	67.00	46.00	56.50	0.00	0.00	0.00	
101760	73.00	44.00	58.50	0.00	0.00	0.00	
101860	62.00	37.00	49.50	0.00	0.00	0.00	
101960	51.00	36.00	43.50	0.26	0.00	0.00	
102060	49.00	28.00	38.50	0.00	0.00	0.00	
102160	49.00	27.00	38.00	0.00	0.00	0.00	
102260	61.00	32.00	46.50	0.00	0.00	0.00	
102360	59.00	38.00	48.50	0.00	0.00	0.00	
102460	44.00	25.00	34.50	0.00	0.00	0.00	
102560	54.00	23.00	38.50	0.04	0.00	0.00	
102660	52.00	43.00	47.50	0.39	0.00	0.00	
102760	55.00	49.00	52.00	0.00	0.00	0.00	
102860	56.00	47.00	51.50	0.00	0.00	0.00	
102960	51.00	42.00	46.50	0.00	0.00	0.00	
103060	65.00	42.00	53.50	0.00	0.00	0.00	
103160	59.00	42.00	50.50	0.28	0.00	0.00	
110160	44.00	36.00	40.00	0.00	0.00	0.00	
110260	43.00	36.00	39.50	0.00	0.00	0.00	
110360	53.00	35.00	44.00	0.00	0.00	0.00	
110460	52.00	39.00	45.50	0.00	0.00	0.00	
110560	43.00	37.00	40.00	0.16	0.00	0.00	
110660	40.00	30.00	35.00	0.20	0.00	1.90	
110760	42.00	22.00	32.00	0.00	0.00	0.00	
110860	51.00	29.00	40.00	0.12	0.00	0.00	
110960	44.00	30.00	37.00	0.18	0.00	0.40	
111060	37.00	24.00	30.50	0.00	0.00	0.00	
111160	41.00	25.00	33.00	0.00	0.00	0.00	
111260	50.00	27.00	38.50	0.00	0.00	0.00	
111360	61.00	41.00	51.00	0.00	0.00	0.00	
111460	64.00	41.00	52.50	0.00	0.00	0.00	
111560	64.00	56.00	60.00	0.42	0.00	0.00	
111660	59.00	39.00	49.00	0.00	0.00	0.00	
111760	49.00	32.00	40.50	0.00	0.00	0.00	
111860	5[illegible]						
111960	4[illegible]						
112060	5[illegible]						
112160	4[illegible]						
112260	5[illegible]						
112360	5[illegible]						
112460	5[illegible]						
112560	5[illegible]						
112660	6[illegible]						
112760	6[illegible]						
112860	6[illegible]						
112960	3[illegible]						
113060	2[illegible]						
120160	3[illegible]						

Current Daily for Period of Record

Web Soil Survey – Soil Storage and Confining Layer Information

Map symbol and soil name	Depth	Sand	Silt	Clay	Moist bulk density	Saturated hydraulic conductivity	Available water capacity	Linear extensibility	Organic matter	Erosion factors		Wind erodibility	Wind erodibility
	In	*Pct*	*Pct*	*Pct*	*g/cc*	*micro m/sec*	*In/In*	*Pct*	*Pct*				
Bu:													
Butler	0-11	---	---	18-27	1.20-1.40	4.23-14.11	0.22-0.24	3.0-5.9	2.0-4.0	.37	.37	3	6	48
	11-31	---	---	45-55	1.10-1.20	0.07-0.42	0.11-0.13	6.0-8.9	1.0-2.0	.37	.37			
	31-38	---	---	32-40	1.10-1.30	0.42-1.41	0.14-0.20	6.0-8.9	0.5-1.0	.37	.37			
	38-60	---	---	20-35	1.20-1.40	4.23-14.11	0.18-0.22	3.0-5.9	0.0-0.5	.37	.37			
Ce:													
Crete	0-10	---	---	20-27	1.20-1.40	4.23-14.11	0.22-0.24	3.0-5.9	2.0-4.0	.37	.37	5	6	48
	10-13	---	---	27-40	1.25-1.45	1.41-4.23	0.18-0.20	6.0-8.9	1.0-3.0	.37	.37			
	13-28	---	---	42-55	1.20-1.30	0.07-0.42	0.11-0.16	6.0-8.9	0.5-2.0	.37	.37			
	28-32	---	---	27-40	1.25-1.45	0.42-1.41	0.18-0.20	6.0-8.9	0.5-2.0	.37	.37			
	32-80	---	---	20-27	1.30-1.45	4.23-14.11	0.18-0.22	6.0-8.9	0.5-1.0	.37	.37			
CeB:													
Crete	0-5	---	---	20-27	1.20-1.40	4.23-14.11	0.20-0.23	3.0-5.9	2.0-4.0	.37	.37	5	6	48
	5-8	---	---	27-40	1.25-1.45	0.42-1.41	0.16-0.18	6.0-8.9	1.0-3.0	.37	.37			
	8-32	---	---	42-55	1.20-1.30	0.07-0.42	0.11-0.16	6.0-8.9	0.5-2.0	.37	.37			
	32-80	---	---	25-40	1.30-1.45	4.23-14.11	0.18-0.20	3.0-5.9	0.5-1.0	.43	.43			
Fm:													
Fillmore	0-13	---	---	18-27	1.30-1.40	4.23-14.11	0.21-0.24	2.0-2.9	2.0-4.0	.37	.37	3	6	48
	13-32	---	---	45-55	1.10-1.30	0.07-0.42	0.11-0.18	6.0-8.9	1.0-2.0	.37	.37			
	32-44	---	---	27-40	1.20-1.40	0.42-1.41	0.18-0.20	6.0-8.9	0.5-1.0	.37	.37			
	44-80	---	---	18-45	1.30-1.50	0.42-14.11	0.10-0.20	3.0-5.9	0.0-0.5	.43	.43			

Confining Layer

Water Holding Capacity

0.22 x 13 = 2.86 in.

USDA Natural Resources Conservation Service

This report shows only the major soils in each map unit. Others may exist.

Tabular Data Version: 5
Tabular Data Version Date: 11/21/2006

Monthly Evaporation

- E is evaporation from bare soil, shallow or deep ponds
- T is transpiration from plant leaves and stems
- ET is a combination of both

Evaporation Values for Nebraska Counties

	Monthly Evaporation (inches)												Total
	eb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec		
	.0	2.0	3.6	4.3	6.2	8.2	7.2	6.5	4.1	2.5	1.1		47.5
	.7	1.6	3.1	3.9	5.5	7.0	6.7	5.6	3.7	2.1	0.7		41.2
	.1	2.0	3.6	4.4	5.9	7.6	7.2	6.1	4.1	2.6	1.3		46.9
	.4	2.4	3.4	4.3	5.7	7.4	7.2	6.2	4.5	2.8	1.7		48.5
	.9	1.8	3.3	4.2	5.7	7.5	7.0	6.0	3.9	2.3	1.0		44.3
	.8	1.7	3.2	4.0	5.7	7.5	6.9	5.8	3.7	2.2	0.8		42.9
Box Butte	1.1	1.1	2.0	3.2	4.1	5.6	7.3	7.2	6.1	4.1	2.6	1.4	45.8
Boyd	0.5	0.6	1.5	3.0	3.8	5.3	6.8	6.7	5.6	3.5	2.0	0.6	39.9
Brown	0.6	0.8	1.8	3.2	4.0	5.5	7.1	6.9	5.8	3.8	2.3	0.9	42.7
Buffalo	0.8	1.0	2.0	3.6	4.3	6.2	8.0	7.3	6.4	4.1	2.0	1.1	46.8
Burt	0.6	0.7	1.6	3.0	3.6	5.4	6.7	6.5	5.4	3.5	2.0	0.7	39.7
Butler	0.7	0.9	1.8	3.3	4.0	5.3	7.5	6.9	5.7	3.7	2.2	0.8	42.8
Cass	0.8	0.9	1.8	3.2	3.9	5.7	7.6	6.9	5.5	3.8	2.2	0.8	43.1
Cedar	0.5	0.6	1.5	3.0	3.6	5.2	6.6	6.5	5.4	3.4	2.0	0.6	38.9
Chase	1.4	1.4	2.5	3.9	4.8	6.3	8.2	7.5	6.5	4.4	2.8	1.5	51.2
Cherry	0.7	0.8	1.8	3.2	4.0	5.6	7.1	7.0	5.9	3.8	2.3	1.0	43.2
Cheyenne	1.4	1.4	2.4	3.6	4.4	5.8	7.5	7.2	6.2	4.5	2.9	1.6	48.9
Clay	0.9	1.0	2.0	3.5	4.3	6.1	8.2	7.2	6.4	4.0	2.4	1.0	47.0
Colfax	0.6	0.8	1.7	3.2	3.9	5.6	7.2	6.8	5.5	3.7	2.1	0.7	41.8
Cuming	0.6	0.7	1.6	3.0	3.7	5.4	6.8	6.6	5.4	3.5	2.0	0.7	40.0
Custer	0.7	1.0	1.9	3.5	4.3	6.0	7.7	7.2	6.1	4.0	2.4	1.0	45.8
Dakota	0.5	0.6	1.5	3.0	3.6	5.2	6.5	6.5	5.4	3.4	2.0	0.6	38.8
Dawes	1.0	1.0	1.9	3.0	4.0	5.5	7.1	7.0	6.0	4.0	2.5	1.3	44.3
Dawson	0.9	1.1	2.0	3.7	4.4	6.2	8.0	7.3	6.4	4.2	2.5	1.2	47.9
Deuel	1.3	1.3	2.3	3.7	4.5	5.9	7.7	7.3	6.3	4.3	2.8	1.5	48.9
Dixon	0.5	0.6	1.5	3.0	3.6	5.2	6.5	6.5	5.4	3.4	2.0	0.6	38.8
Dodge	0.6	0.8	1.7	3.1	3.8	5.5	7.0	6.6	5.5	3.6	2.1	0.7	41.0
Douglas	0.7	0.8	1.7	3.2	3.8	5.6	7.1	6.6	5.5	3.7	2.1	0.7	41.5
Dundy	1.5	1.5	2.5	4.0	5.0	6.5	8.3	7.8	6.7	4.5	3.0	1.7	53.0
Fillmore	0.8	1.0	2.0	3.5	4.2	6.0	8.1	7.2	6.3	4.0	2.4	1.0	46.5
Franklin	1.0	1.2	2.2	3.7	4.5	6.4	8.4	7.5	6.8	4.2	2.6	1.3	49.8
Frontier	1.0	1.3	2.3	3.8	4.6	6.3	8.2	7.5	6.6	4.3	2.7	1.4	50.0
Furnas	1.0	1.3	2.3	3.8	4.6	6.5	8.5	7.6	6.9	4.3	2.7	1.4	50.9
Gage	0.8	1.0	2.0	3.5	4.2	5.9	8.1	7.2	6.2	4.0	2.4	1.0	46.3
Garden	1.1	1.2	2.1	3.5	4.3	5.8	7.5	7.2	6.2	4.2	2.7	1.4	47.2
Garfield	0.6	0.8	1.8	3.3	4.0	5.7	7.4	7.0	5.8	3.8	2.3	0.8	43.3
Gosper	1.0	1.2	2.2	3.7	4.5	6.3	8.3	7.5	6.6	4.2	2.6	1.3	49.4
Grant	1.0	1.0	2.0	3.5	4.2	5.7	7.4	7.1	6.0	4.0	2.5	1.2	45.6
Greeley	0.7	0.8	1.8	3.3	4.1	5.8	7.6	7.0	5.8	3.8	2.2	0.8	43.7
Hall	0.8	1.0	2.0	3.5	4.2	6.1	8.0	7.2	6.2	4.0	2.4	1.0	46.4
Hamilton	0.8	1.0	1.9	3.5	4.2	6.0	8.0	7.2	6.1	4.0	2.4	1.0	46.1
Harlan	1.0	1.3	2.3	3.8	4.5	6.5	8.5	7.5	6.9	4.3	2.7	1.3	50.6
Hayes	1.2	1.3	2.4	3.9	4.7	6.3	8.2	7.5	6.5	4.4	2.8	1.5	50.7
Hitchcock	1.3	1.4	2.5	4.0	4.8	6.5	8.4	7.8	6.8	4.5	2.8	1.5	52.3
Holt	0.6	0.7	1.6	3.1	3.9	5.5	7.0	6.8	5.8	3.7	2.2	0.7	41.6
Hooker	0.8	1.0	1.9	3.5	4.2	5.8	7.5	7.1	6.0	4.0	2.5	1.1	45.4
Howard	0.7	0.9	1.9	3.4	4.2	6.0	7.8	7.1	6.0	4.4	2.3	1.0	45.7
Jefferson	0.8	1.0	2.0	3.5	4.2	6.0	8.2	7.2	6.4	4.0	2.4	1.0	46.7
Johnson	0.8	1.0	1.9	3.4	4.0	5.8	7.9	7.0	6.0	3.9	2.3	0.9	44.9
Kearney	0.9	1.1	2.1	3.7	4.4	6.3	8.2	7.3	6.6	4.1	2.5	1.2	48.4
Keith	1.1	1.2	2.2	3.7	4.5	6.0	7.7	7.4	6.3	4.2	2.7	1.4	48.4
Keya Paha	0.6	0.7	1.6	3.0	3.8	5.4	6.8	6.8	5.8	3.7	2.2	0.7	41.1
Kimball	1.5	1.5	2.5	3.5	4.3	5.7	7.5	7.3	6.3	4.5	2.9	1.7	49.2
Knox	0.5	0.6	1.5	3.0	3.7	5.3	6.6	6.6	5.5	3.5	2.0	0.7	39.5
Lancaster	0.8	0.9	1.9	3.3	4.0	5.8	7.8	7.0	5.9	3.8	2.2	0.8	44.2
Lincoln	1.0	1.2	2.1	3.7	4.5	6.2	7.8	7.4	6.4	4.2	2.6	1.3	48.4
Logan	0.8	1.0	2.0	3.5	4.3	6.0	7.6	7.2	6.1	4.0	2.4	1.1	46.0
Loup	0.7	0.8	1.8	3.3	4.0	5.7	7.4	7.0	5.9	3.8	2.2	0.9	43.5

Water Budget Spreadsheet

Monthly Time Step

Wetland Water Budget Spreadsheet

County: Adams Cond. DA CN_1 = 85 CN_{III} = 67

Estimated Max. Deep Percolation= 0.5 inches/Month Overflow Height = 24 inches

Estimated Water Holding Capacity= 6.93 inches

Ratio of Drainage Area:Basin Area= 10 (runoff multiplied by this ratio to obtain runoff, surface inches)

Month	Precip (inches)	Runoff (inches)	Runoff (Sur. In.)	Other Inflow (Sur. In.)	ET Potential (inches)	Sum (inches)	Deep Perc (inches)	Sum (inches)	Outflow (inches)	Balance (inches)
									Starting= →	-6.93
September	3.02	0.60	5.99		5.17	-3.09	0.00	-3.09	0.00	-3.09
October	1.67	0.06	0.85		3.78	-4.33	0.00	-4.33	0.00	-4.33
November	0.98	0.00	0.00		1.58	-5.23	0.00	-5.23	0.00	-5.23
December	0.85	0.00	0.00		0.94	-5.32	0.00	-5.32	0.00	-5.32
January	0.51	0.00	0.00		0.94	-5.75	0.00	-5.75	0.00	-5.75
February	0.70	0.00	0.00		1.41	-6.46	0.00	-6.46	0.00	-6.46
March	2.06	0.20	2.01		2.35	-4.72	0.00	-4.72	0.00	-4.72
April	2.54	0.38	3.78		4.70	-3.12	0.00	-3.12	0.00	-3.12
May	4.77	1.65	16.51		5.64	12.52	0.50	12.02	0.00	12.02
June	3.94	1.11	11.13		6.56	20.52	0.50	20.02	0.00	20.02
July	3.43	0.82	8.18		7.05	24.55	0.50	24.05	0.05	24.00
August	3.32	0.76	7.55		6.58	28.29	0.50	27.79	3.79	24.00
Total	27.8	5.6	55.96	0.00	47.00	47.8	2.00	45.8	3.84	

Soils Info:	Depth	AWC	Description
Fillmore, Clay County NE	0 - 19 in	3.99	hydric
	19 - 33 in	2.94	hydric
	33 - 45 in	1.8	hydric

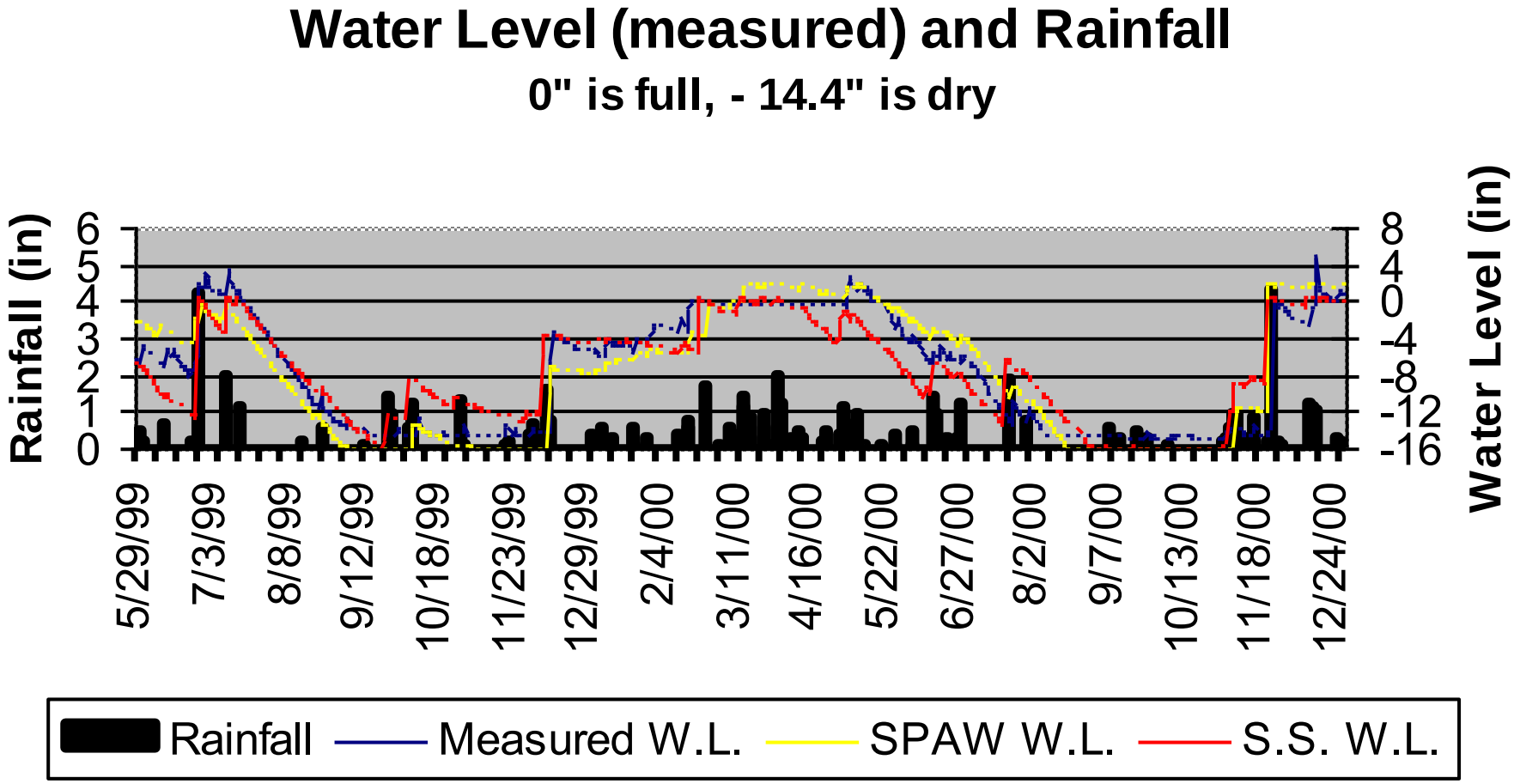
Design Info:
Precipitation and Runoff are monthly 50 percent chance events.
Et – 1.0 pan evaporation initial conditions, may be modified depending on location

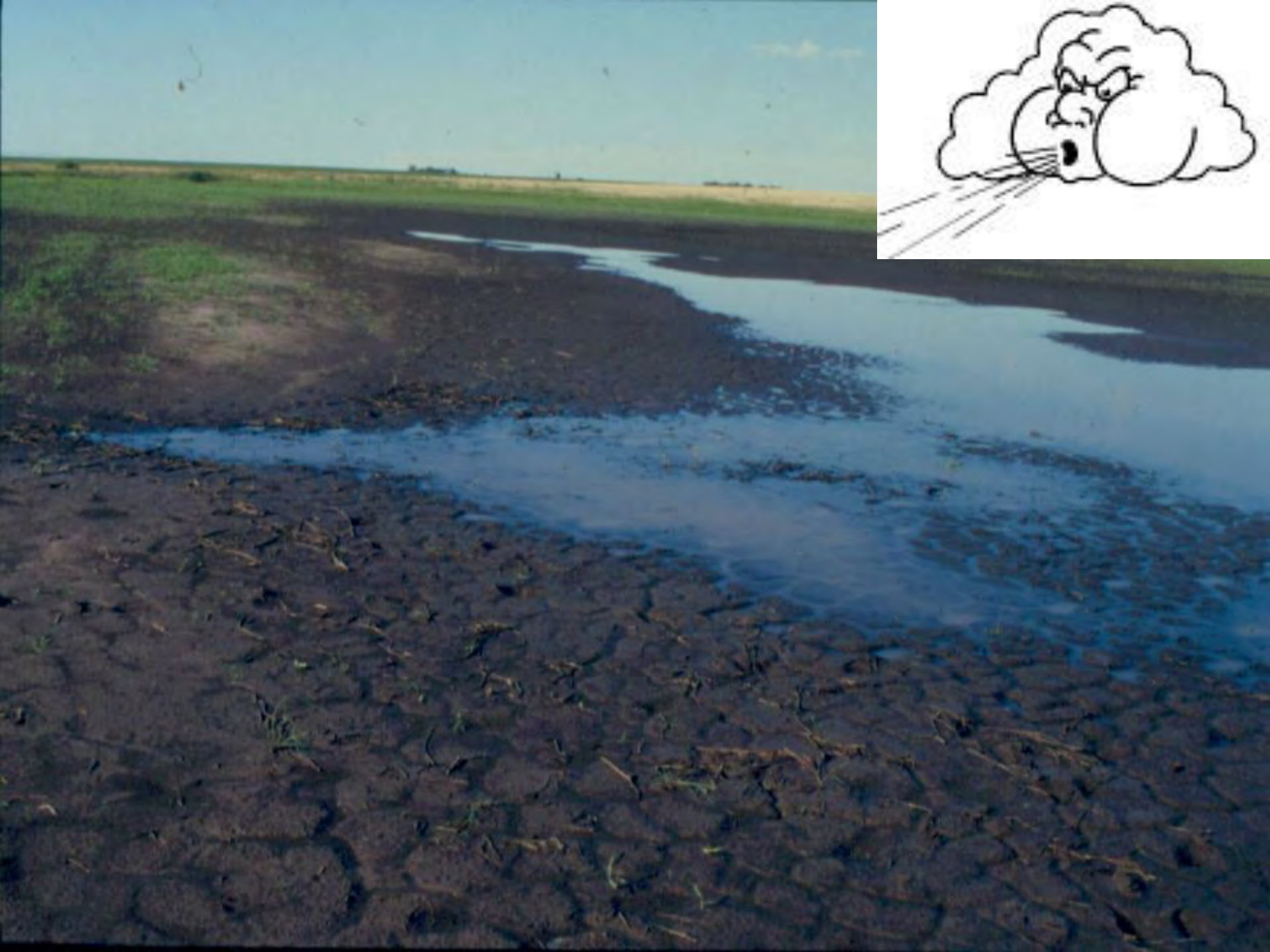
Created by Geoff Cetrelli, Civil Engineer USDA/NRCS Harrisburg, PA (717) 237-2215
Modified by Jacob Robison, Civil Engineer USDA/NRCS Grand Island, NE

Additional weather data at www.wcc.nrcs.usda.gov/cgibin/getwetco.pl?state=ne

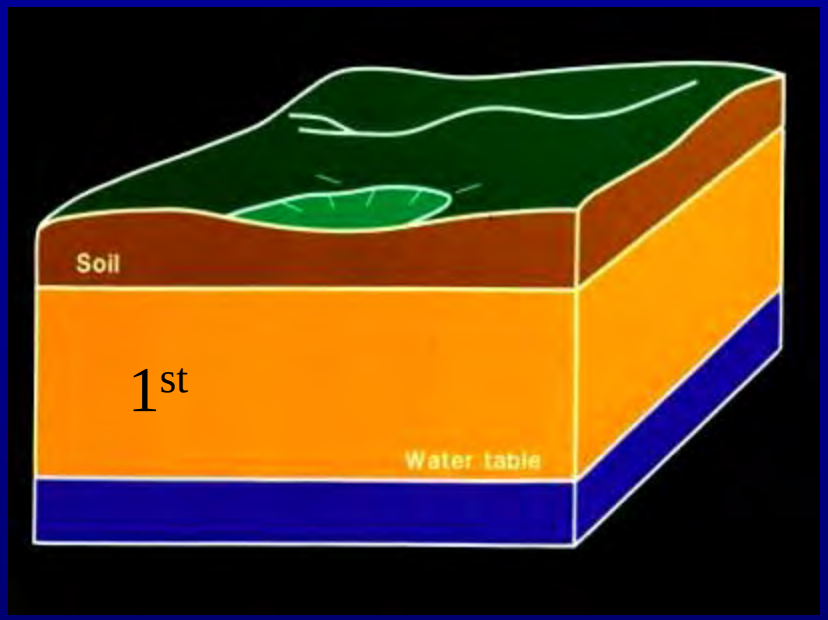
Soil-Plant-Air-Water (SPAW) Model

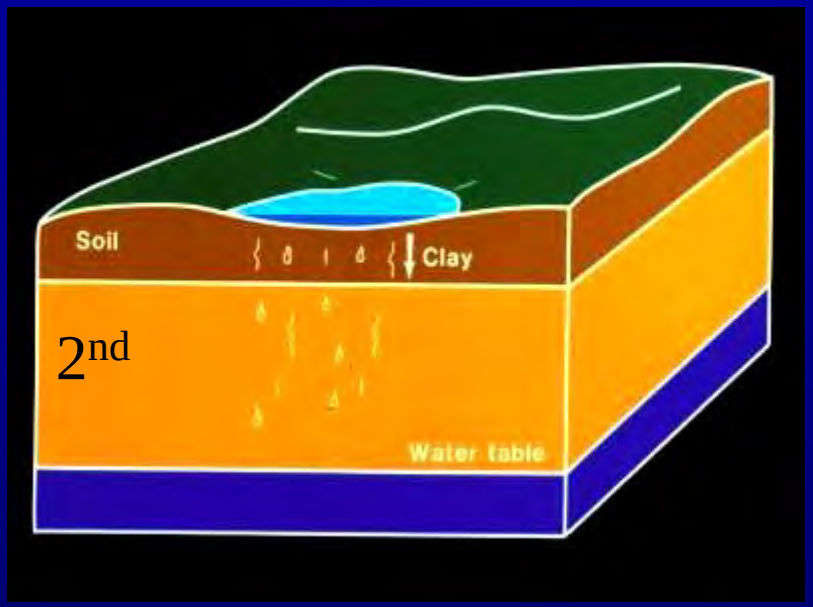
- Daily Time Step
- Adjusts for Watershed Runoff by Soil Moisture

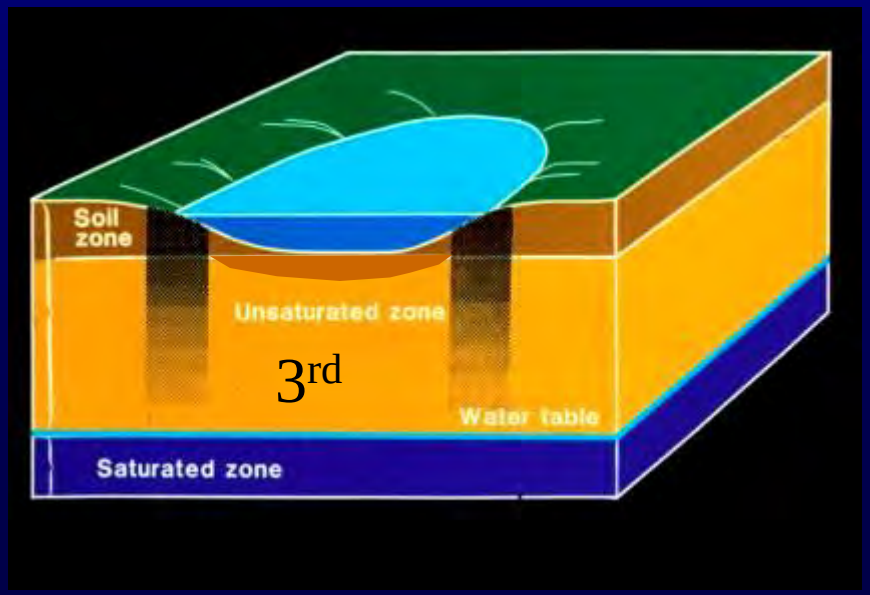




Carbonate solution hypothesis

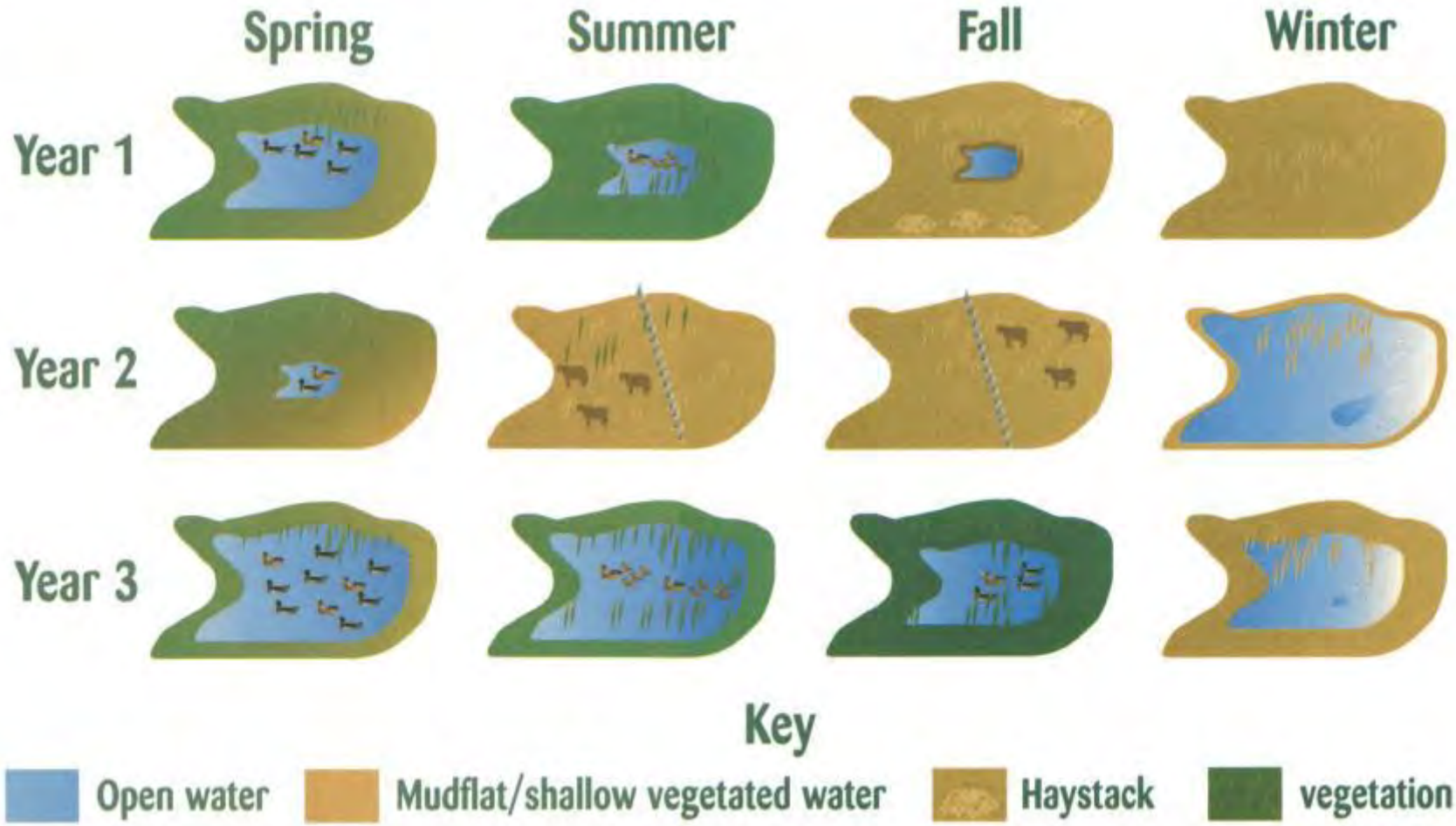


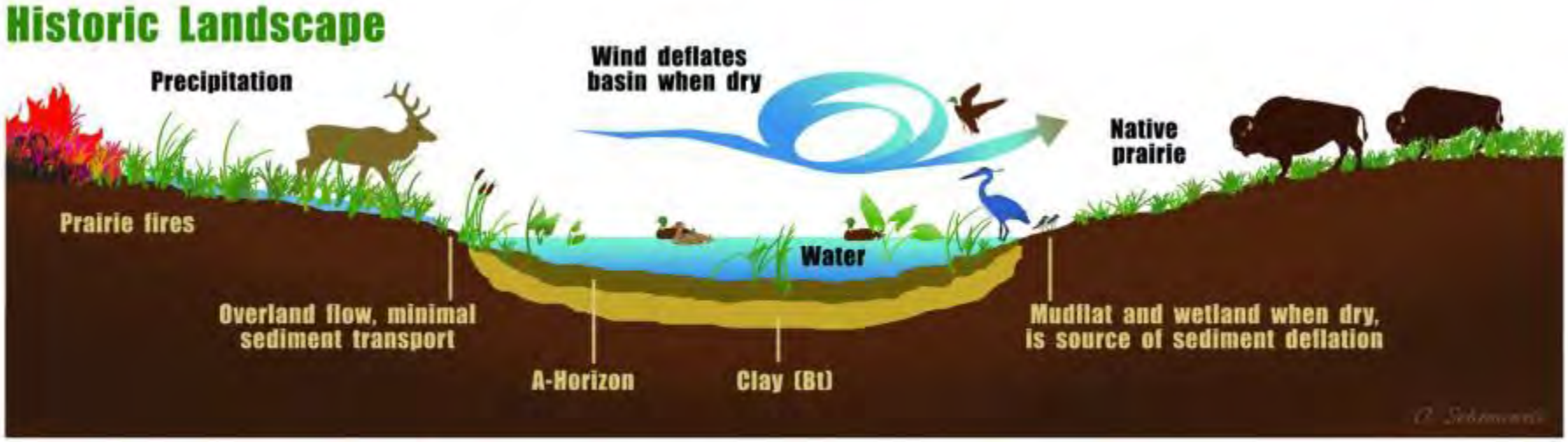




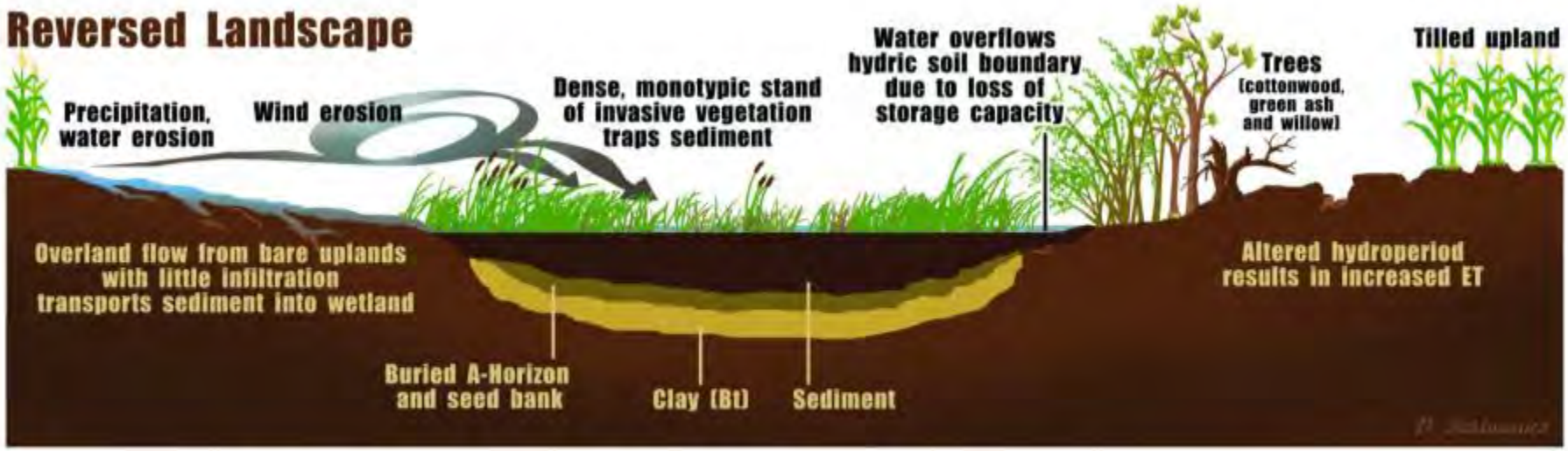
Courtesy Dr. Warren Wood
Michigan State Univ.

Wetlands
Aren't Always Wet

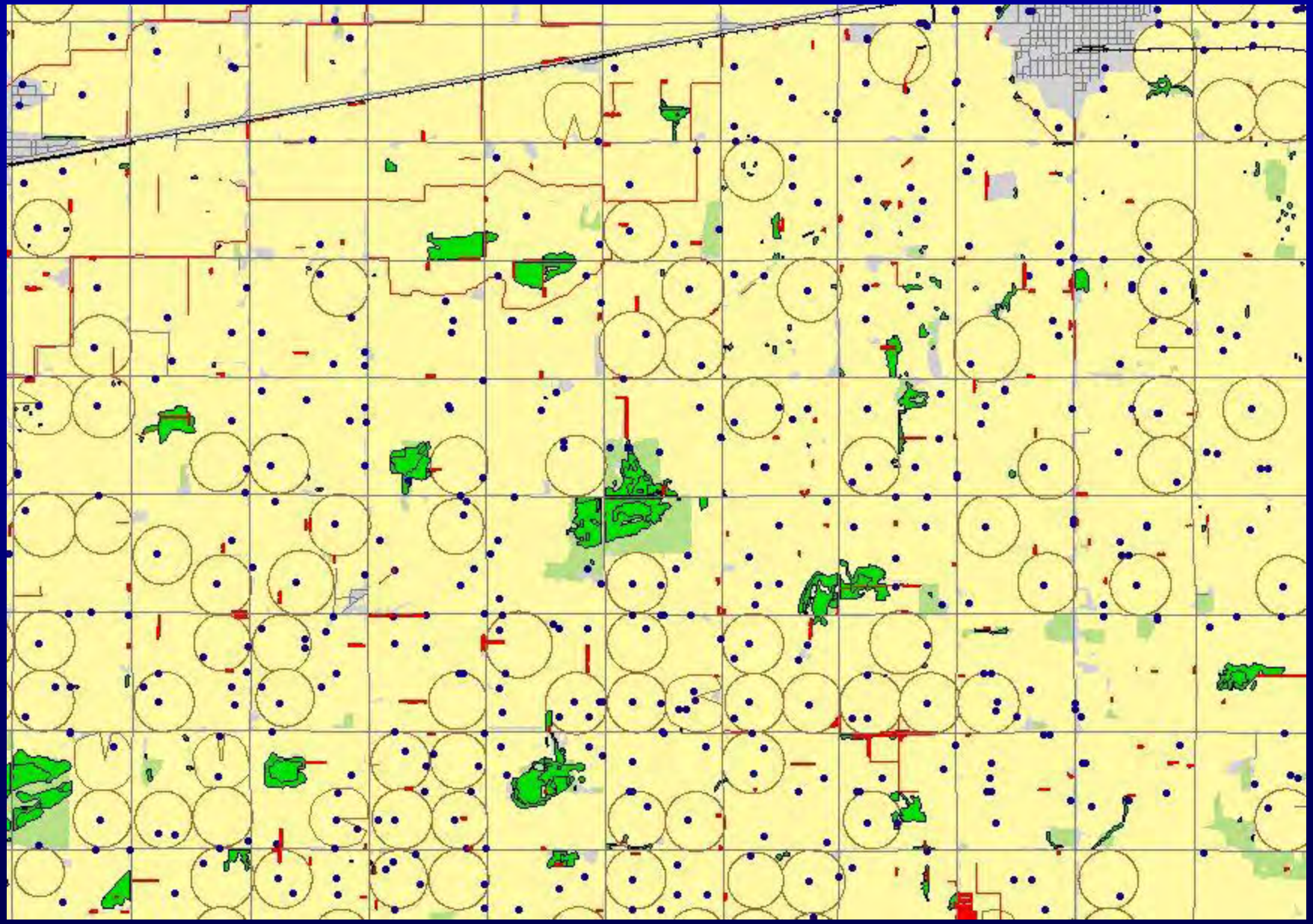




Generalized Cross-Section of Pre-Settlement Playa Wetland and Watershed



Generalized Cross-Section of Post-Settlement Altered Wetland and Watershed


Row Crops
Excavated Pits and Ditches
Center Pivots
Well
Palustrine Wetland
Grassland

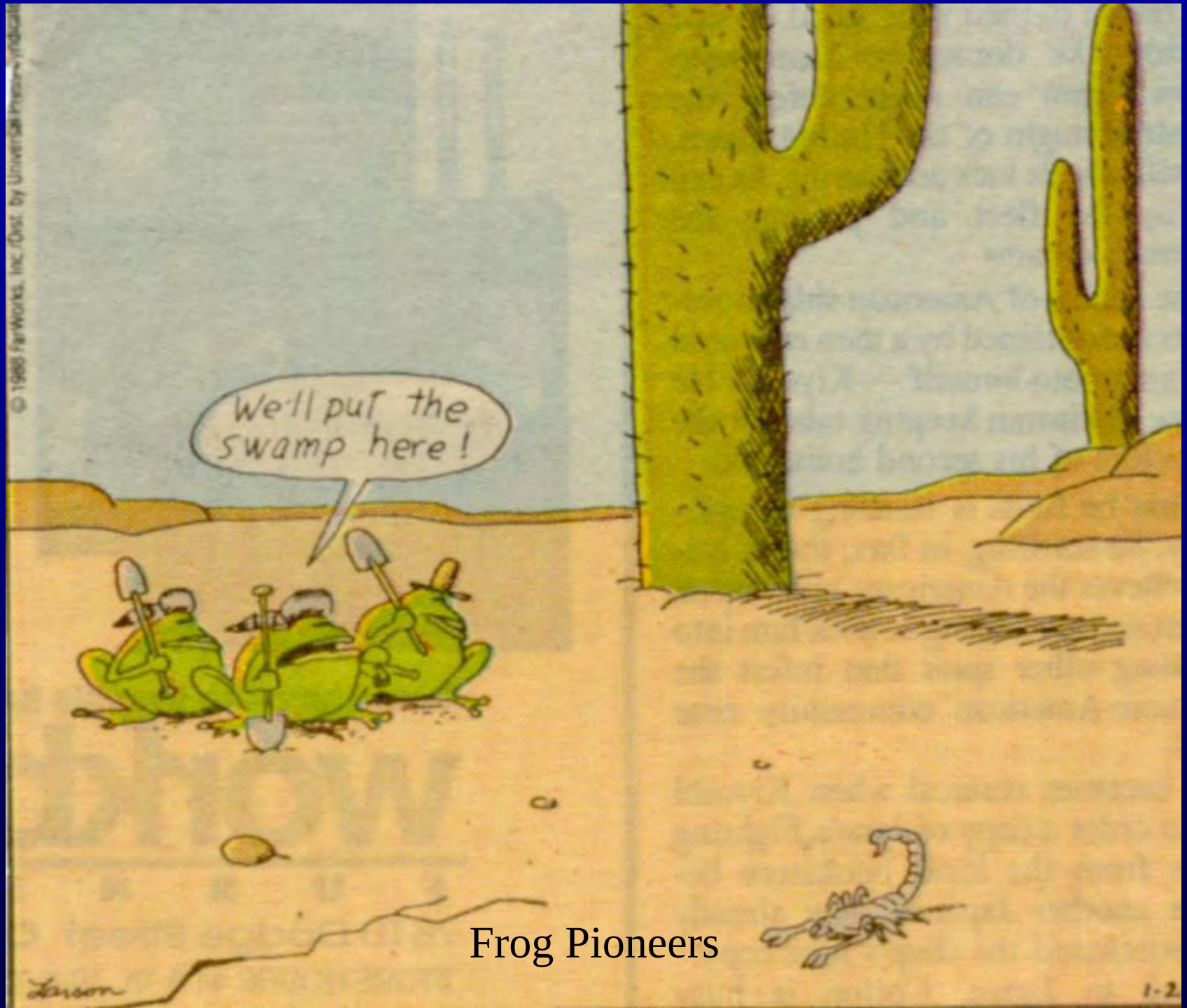
How playas have been altered

Within the wetland

- Drainage ditches
- Irrigation concentration pits, drainage pits, and livestock watering pits
- Land leveling
- Fill: berms, roads, ring dikes, etc.
- Culturally-accelerated sediment
- Invasive plants (trees, reed canary grass, others?)
- Altered disturbance dynamics (lack of fire, grazing, and water fluctuations)

Watershed impacts

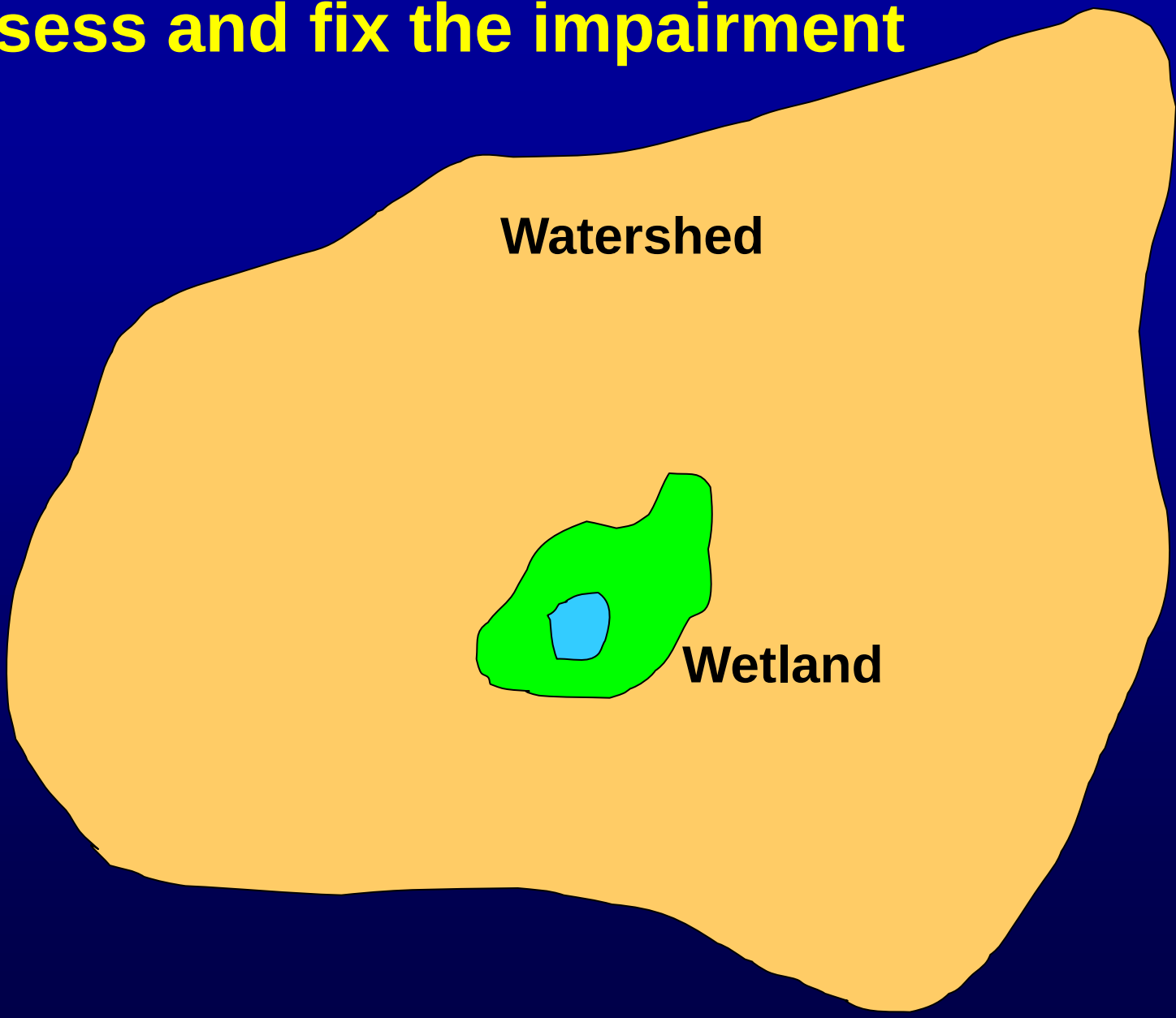
- Water diversions (roads, terraces, ponds etc.)
- Upland pits
- Irrigation additions
- Conversion of native prairie to other cover types.

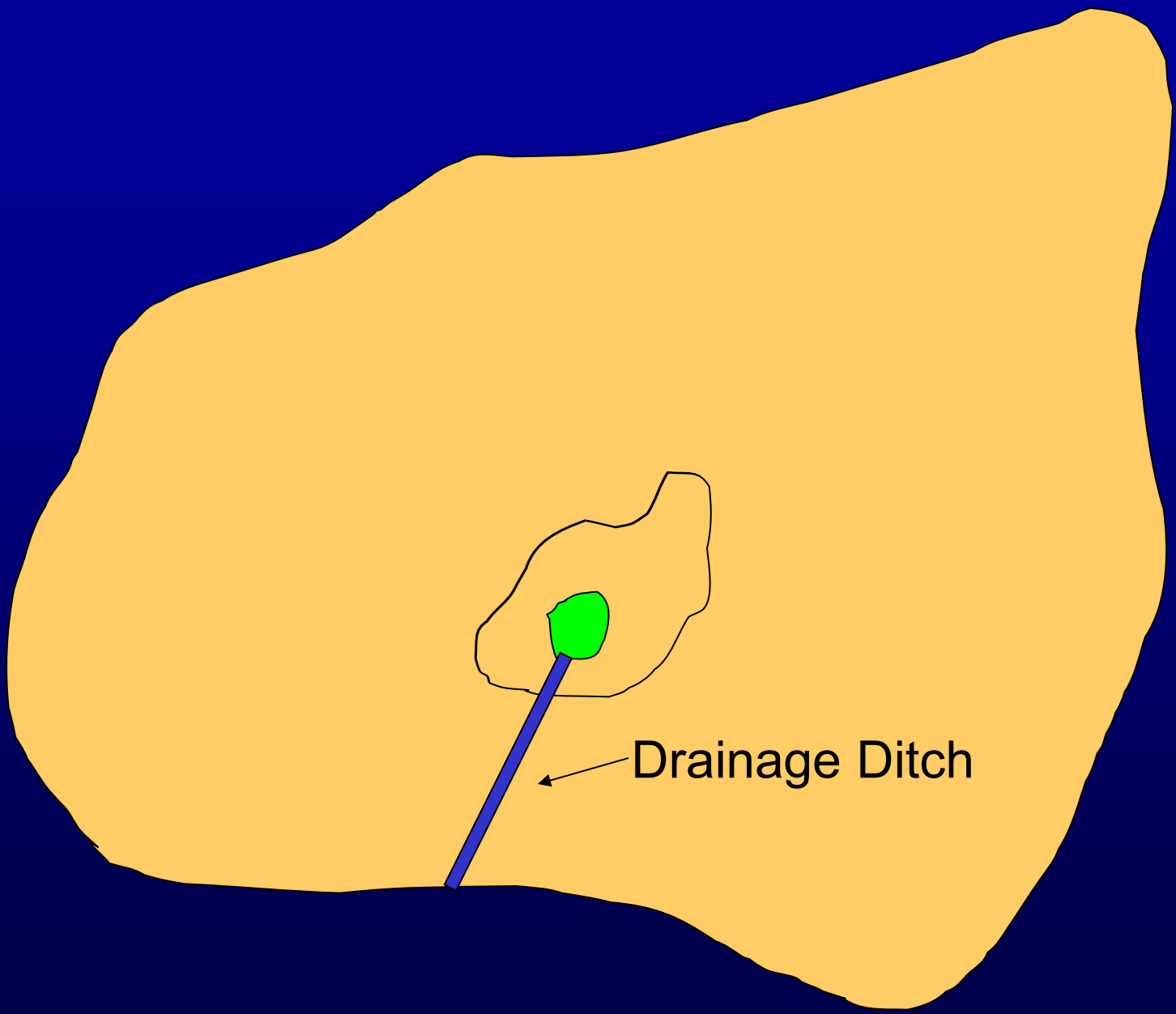


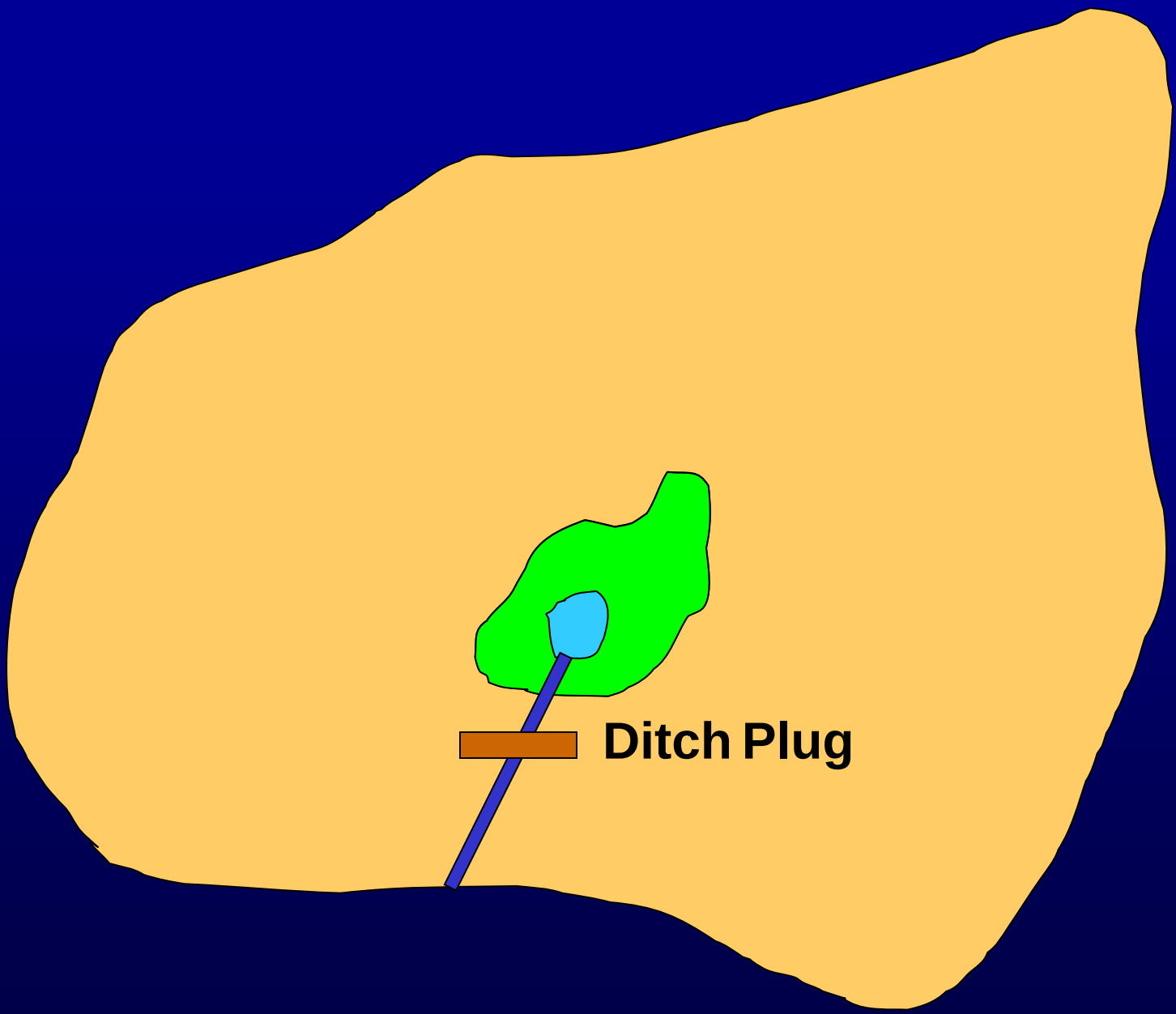
Frog Pioneers

What is the Goal?

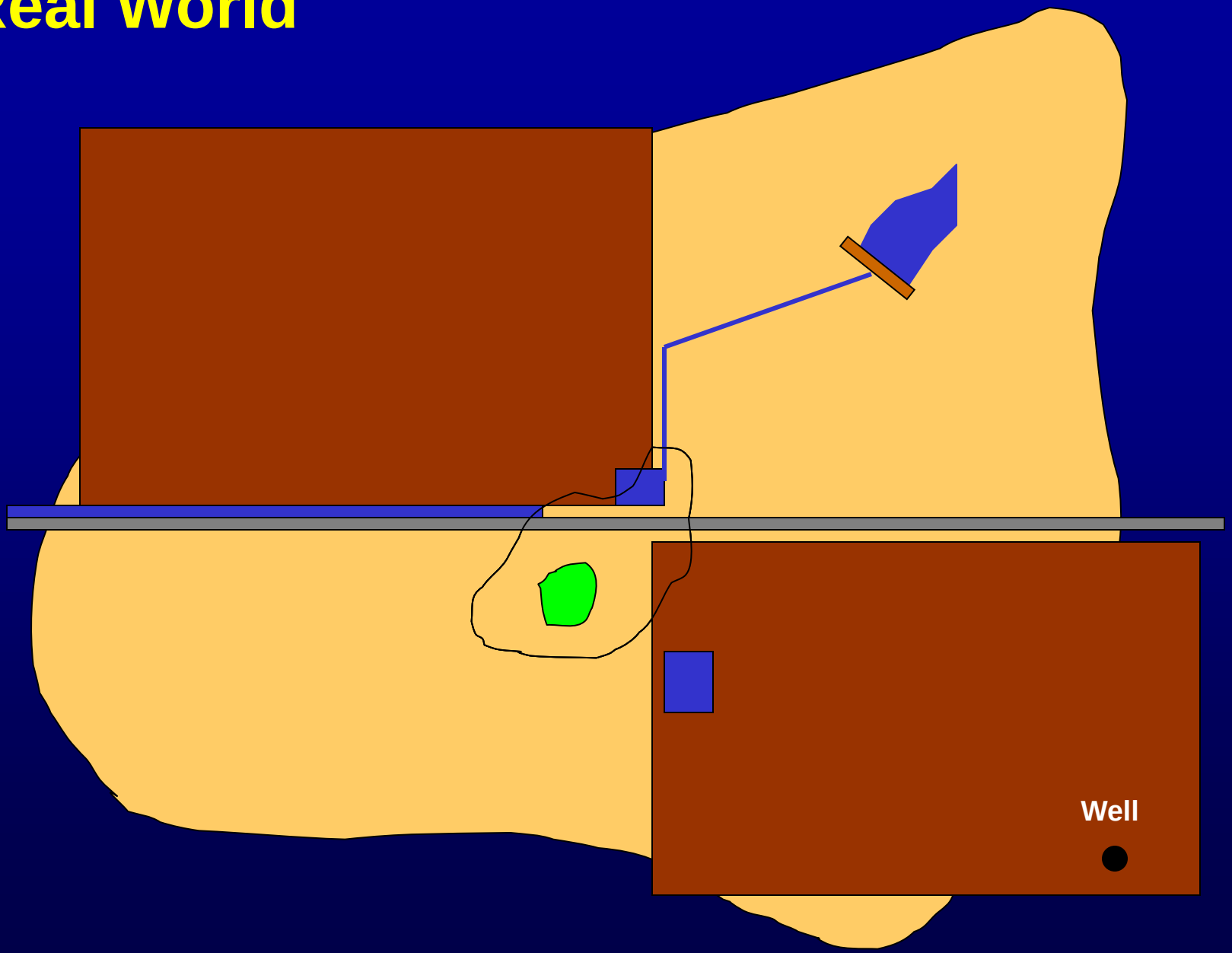
Assess and fix the impairment




Drainage Ditch


Ditch Plug

Real World

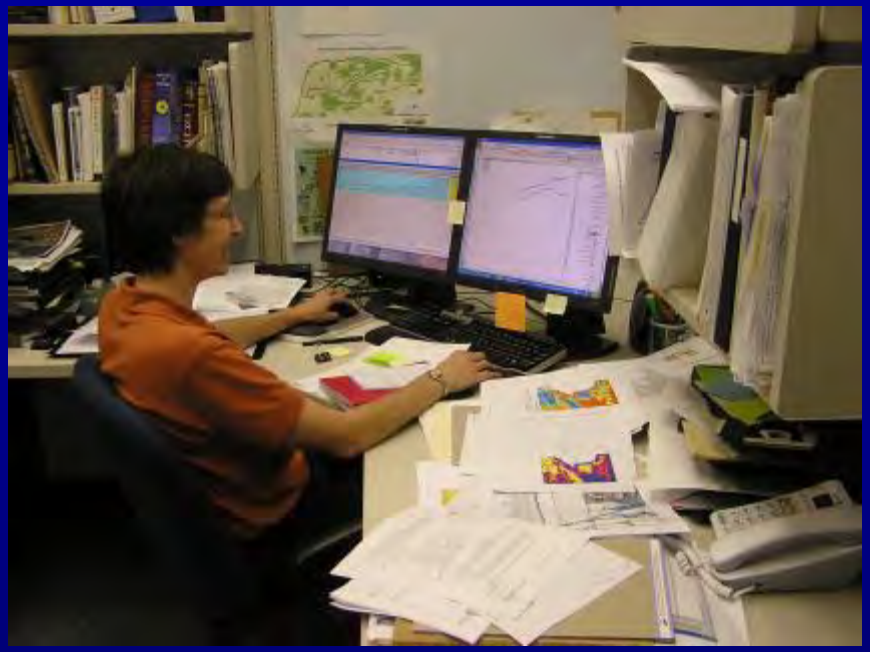


When you reach the edge of your Knowledge

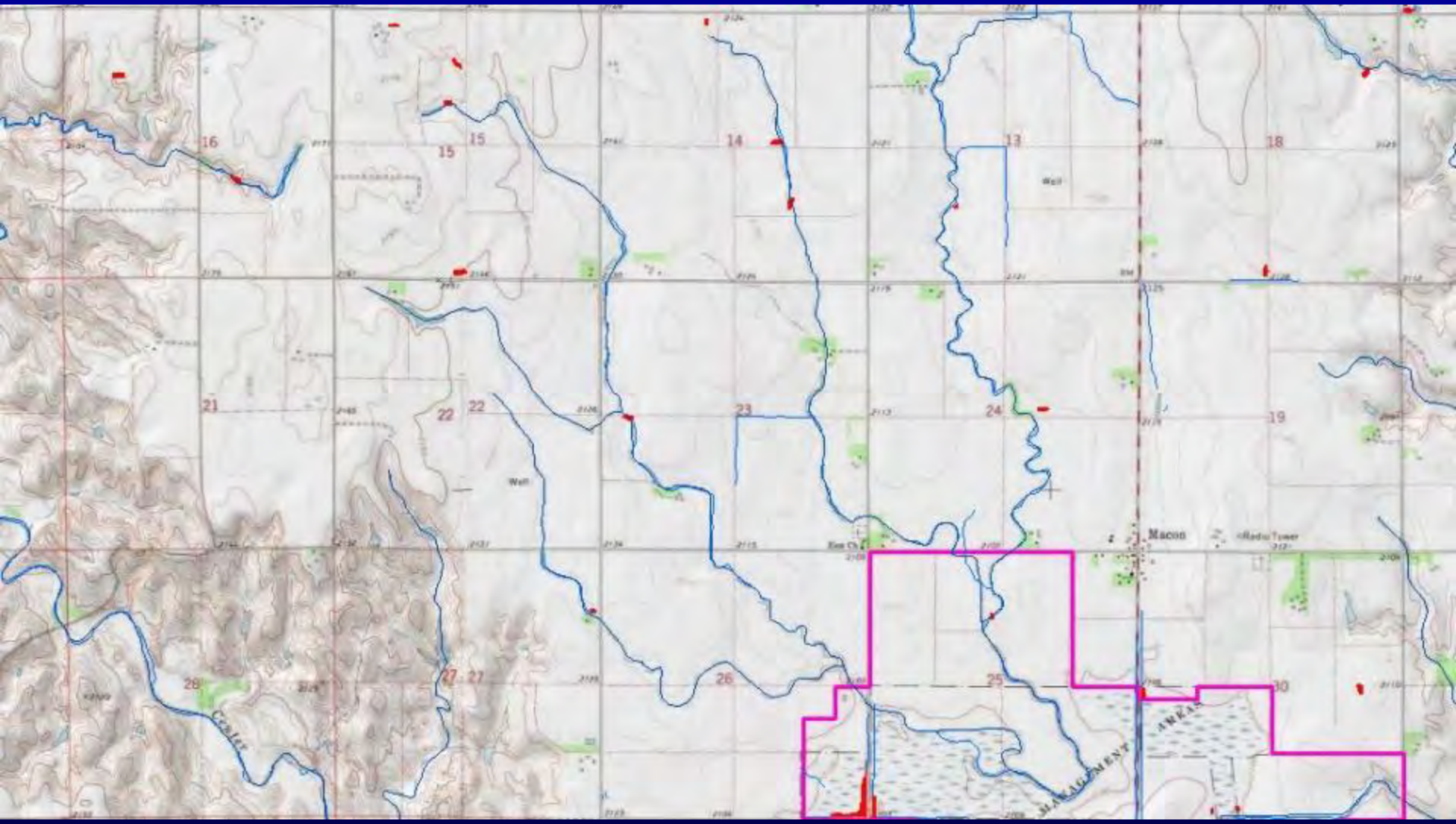
Get Help!

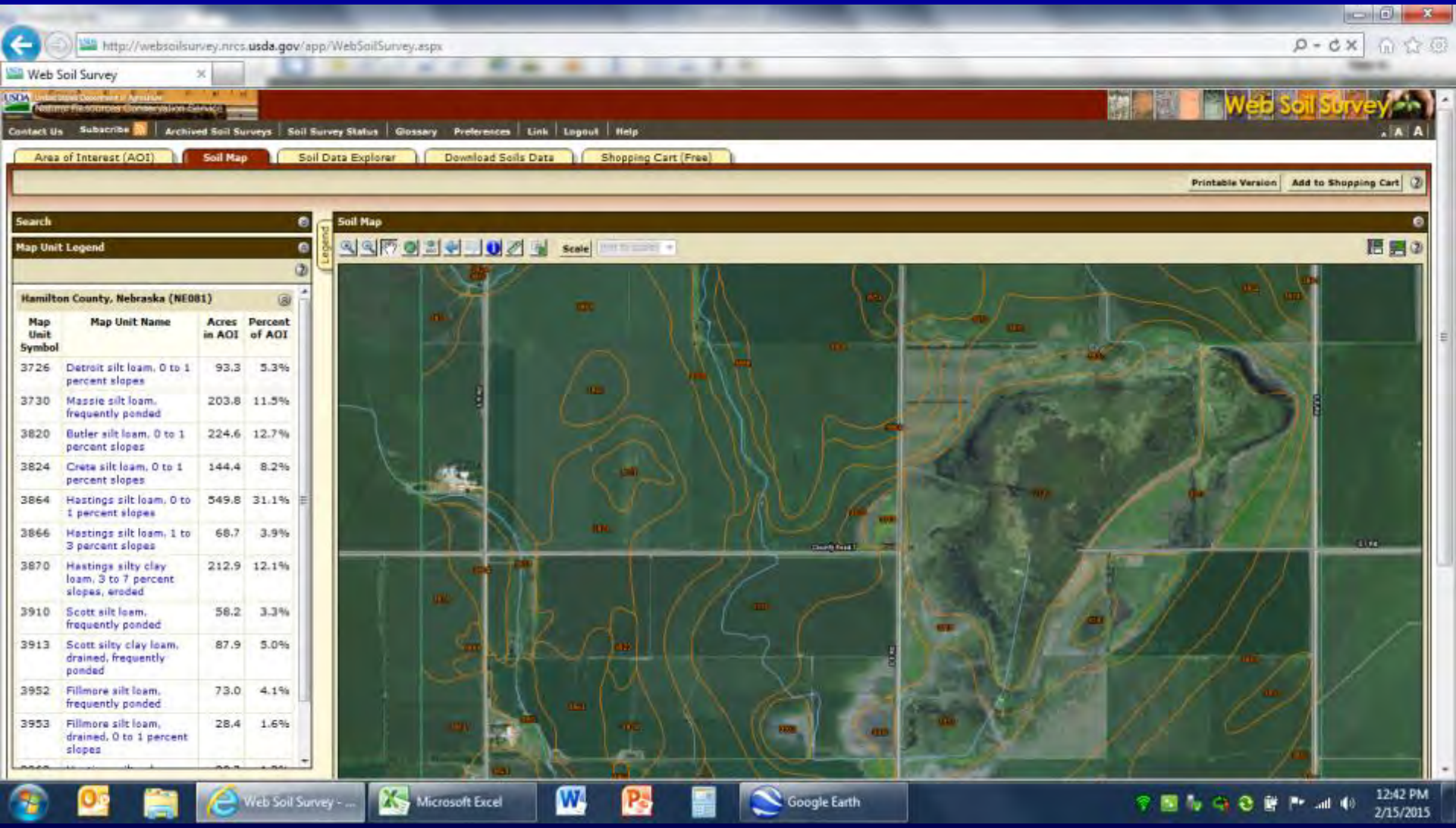
Bio-engineering Teams

Assess Impairments and Develop Restoration Plan



Watershed assessment

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Area of Interest (AOI) | Soil Map | Soil Data Explorer | Download Soils Data | Shopping Cart (Free)
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Map Unit Legend
Hamilton County, Nebraska (NE081)
Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI
3726 | Detroit silt loam, 0 to 1 percent slopes | 93.3 | 5.3%
3730 | Massie silt loam, frequently ponded | 203.8 | 11.5%
3820 | Butler silt loam, 0 to 1 percent slopes | 224.6 | 12.7%
3824 | Crete silt loam, 0 to 1 percent slopes | 144.4 | 8.2%
3864 | Hastings silt loam, 0 to 1 percent slopes | 549.8 | 31.1%
3866 | Hastings silt loam, 1 to 3 percent slopes | 68.7 | 3.9%
3870 | Hastings silty clay loam, 3 to 7 percent slopes, eroded | 212.9 | 12.1%
3910 | Scott silt loam, frequently ponded | 58.2 | 3.3%
3913 | Scott silty clay loam, drained, frequently ponded | 87.9 | 5.0%
3952 | Fillmore silt loam, frequently ponded | 73.0 | 4.1%
3953 | Fillmore silt loam, drained, 0 to 1 percent slopes | 28.4 | 1.6%
Soil Map
Legend
Scale
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Microsoft Excel
Google Earth
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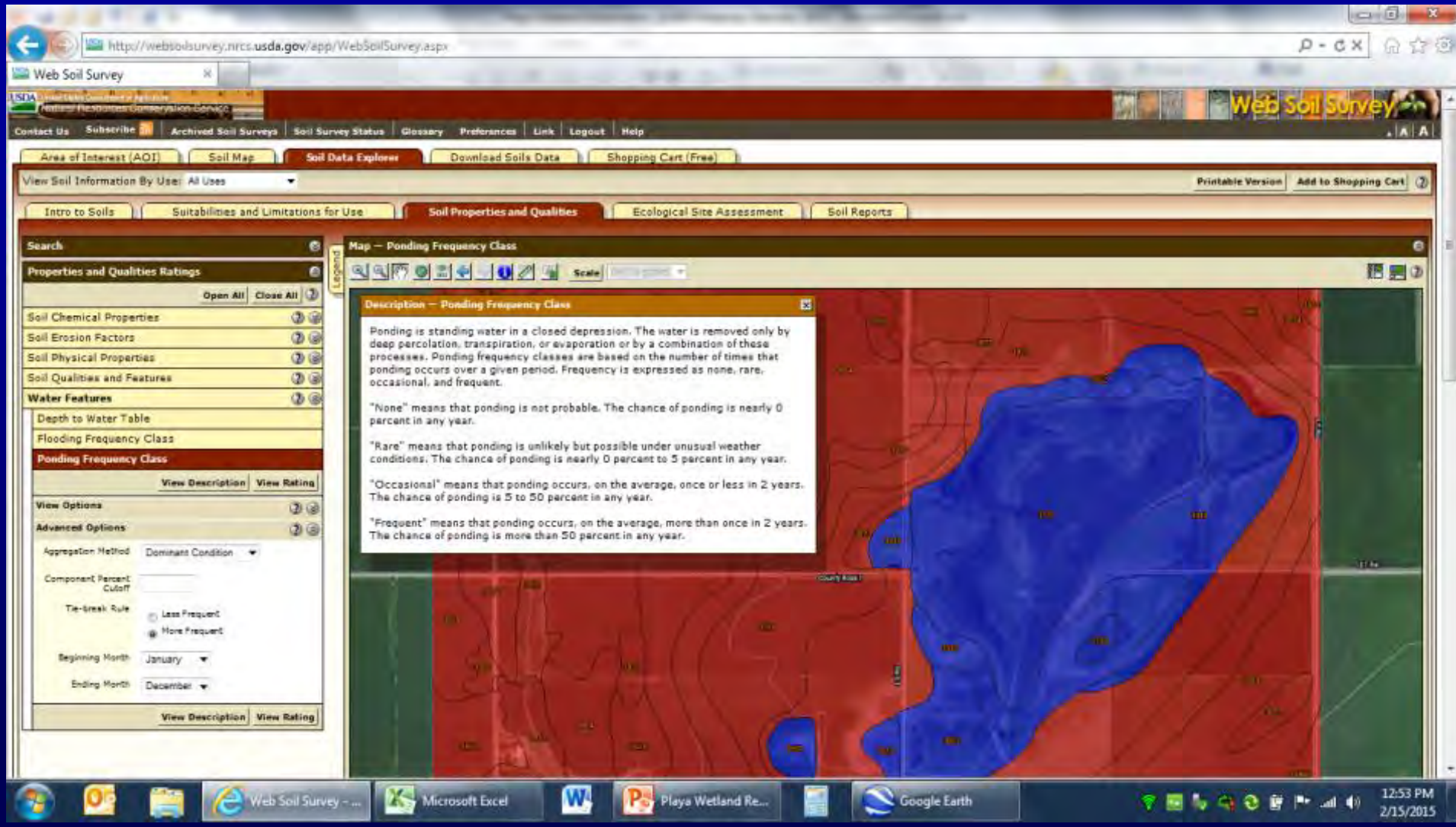
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Soil Physical Properties
Soil Qualities and Features
Water Features
Depth to Water Table
Flooding Frequency Class
Ponding Frequency Class
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View Rating
View Options
Advanced Options
Aggregation Method
Dominant Condition
Component Percent Cutoff
Tie-break Rule
Less Frequent
More Frequent
Beginning Month
January
Ending Month
December
View Description
View Rating
Legend
Map — Ponding Frequency Class
Scale
Description — Ponding Frequency Class
Ponding is standing water in a closed depression. The water is removed only by deep percolation, transpiration, or evaporation or by a combination of these processes. Ponding frequency classes are based on the number of times that ponding occurs over a given period. Frequency is expressed as none, rare, occasional, and frequent.
"None" means that ponding is not probable. The chance of ponding is nearly 0 percent in any year.
"Rare" means that ponding is unlikely but possible under unusual weather conditions. The chance of ponding is nearly 0 percent to 5 percent in any year.
"Occasional" means that ponding occurs, on the average, once or less in 2 years. The chance of ponding is 5 to 50 percent in any year.
"Frequent" means that ponding occurs, on the average, more than once in 2 years. The chance of ponding is more than 50 percent in any year.
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Google Earth
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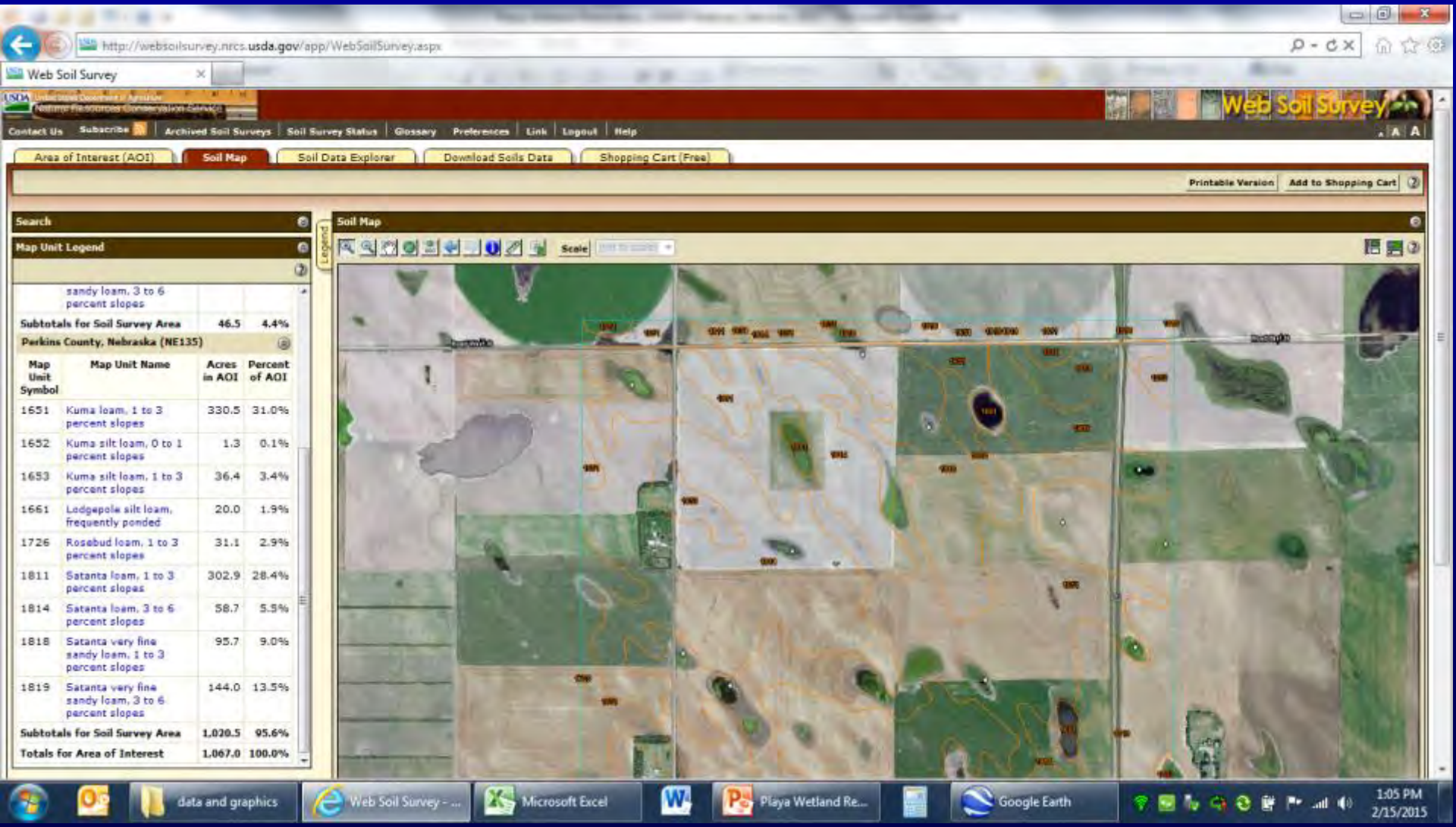
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Printable Version | Add to Shopping Cart
Search
Map Unit Legend
Soil Map
Legend
Scale
sandy loam, 3 to 6 percent slopes
Subtotals for Soil Survey Area 46.5 4.4%
Perkins County, Nebraska (NE135)
Map Unit Symbol | Map Unit Name | Acres in AOI | Percent of AOI
1651 Kuma loam, 1 to 3 percent slopes 330.5 31.0%
1652 Kuma silt loam, 0 to 1 percent slopes 1.3 0.1%
1653 Kuma silt loam, 1 to 3 percent slopes 36.4 3.4%
1661 Lodgepole silt loam, frequently ponded 20.0 1.9%
1726 Rosebud loam, 1 to 3 percent slopes 31.1 2.9%
1811 Satanta loam, 1 to 3 percent slopes 302.9 28.4%
1814 Satanta loam, 3 to 6 percent slopes 58.7 5.5%
1818 Satanta very fine sandy loam, 1 to 3 percent slopes 95.7 9.0%
1819 Satanta very fine sandy loam, 3 to 6 percent slopes 144.0 13.5%
Subtotals for Soil Survey Area 1,020.5 95.6%
Totals for Area of Interest 1,067.0 100.0%
data and graphics
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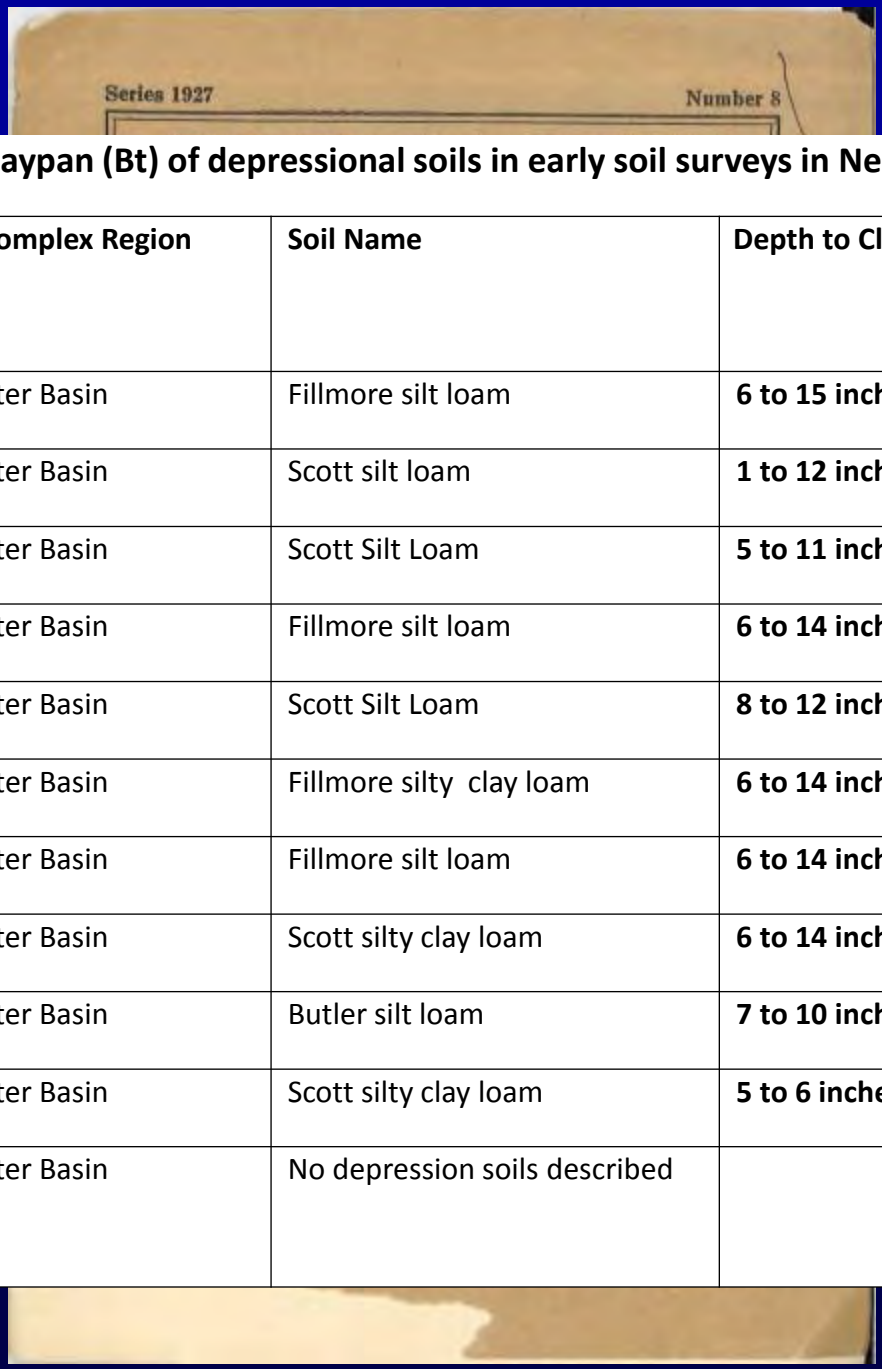
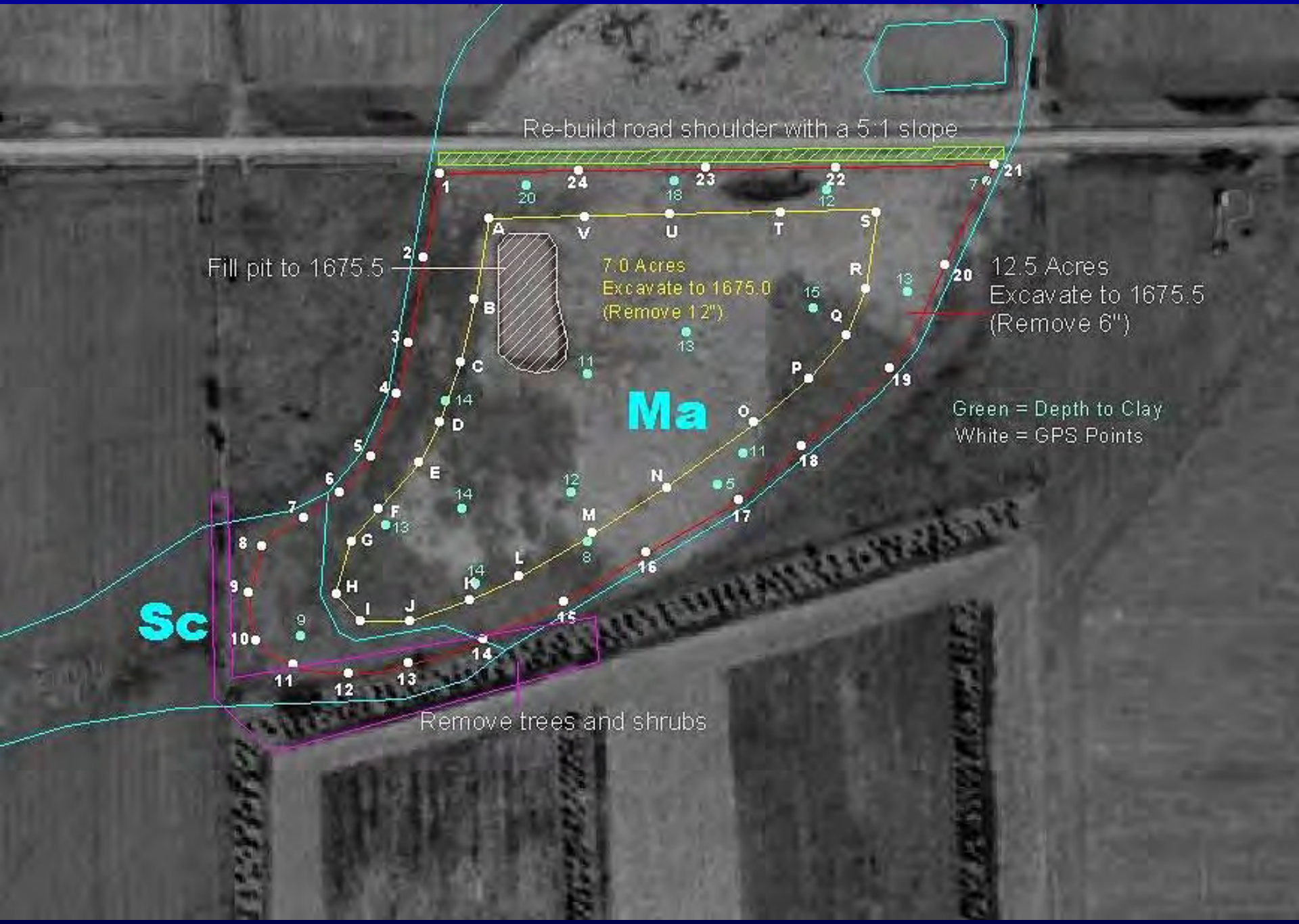


Depth to claypan (Bt) of depressional soils in early soil surveys in Nebraska

County	Year printed	Playa Complex Region	Soil Name	Depth to Claypan (Bt) Range
Adams	1923	Rainwater Basin	Fillmore silt loam	**6 to 15 inches**
Adams	1923	Rainwater Basin	Scott silt loam	**1 to 12 inches**
Butler	1929	Rainwater Basin	Scott Silt Loam	**5 to 11 inches**
Clay	1927	Rainwater Basin	Fillmore silt loam	**6 to 14 inches**
Clay	1927	Rainwater Basin	Scott Silt Loam	**8 to 12 inches**
Franklin	1926	Rainwater Basin	Fillmore silty clay loam	**6 to 14 inches**
Hamilton	1927	Rainwater Basin	Fillmore silt loam	**6 to 14 inches**
Hamilton	1927	Rainwater Basin	Scott silty clay loam	**6 to 14 inches**
Harlan	1930	Rainwater Basin	Butler silt loam	**7 to 10 inches**
Harlan	1930	Rainwater Basin	Scott silty clay loam	**5 to 6 inches**
Jefferson	1925	Rainwater Basin	No depression soils described	


Re-build road shoulder with a 5:1 slope
Fill pit to 1675.5
7.0 Acres
Excavate to 1675.0
(Remove 12")
12.5 Acres
Excavate to 1675.5
(Remove 6")
Green = Depth to Clay
White = GPS Points
Ma
Sc
Remove trees and shrubs

Yellow Machine Phase

Removal of Culturally-accelerated Sediment

Removal of Berms and other Fill

Filling Drainage/Irrigation Reuse Pits

Re-contouring Road Ditches

Installation of Water-control Structures

Tree Removal

Installation of Grazing Infra-structure

Installation of Supplemental Water Sources

Seeding

Upland Pit Fill
to help restore watershed


Buffers

River Bulrush

Reed Canary Grass

Purple Loosestrife

Trees

Phragmites

Wetland Invaders

Joel Jorgensen, NGPC

Playa Restoration Recommendations

Cause of Failure	Recommendation	Selected Measures
Not understanding wetland type, function, and dynamics.	Understand and assess wetland type, function, and dynamics.	Tools such as HGM classification, soils maps, Cowardin classification are very valuable. So is understanding wetland dynamics, something that wildlife agencies and natural heritage programs can help with.
Not fully assessing and fixing alterations to the wetland.	Fully assess and fix wetland alterations to the extent possible.	Locate any outlet drains and/or pits and remove them. Measure sediment depth or depth to the clay pan and remove culturally-accelerated sediment if needed.
Not fully assessing and fixing alterations to the watershed.	Fully assess and fix watershed alterations to the extent possible.	Define and examine the watershed. Seek ways to improve water delivery and reduce inputs of culturally-accelerated sediment.
Failure to use an interdisciplinary team.	Understand when you need help and get it.	Establish bio-engineering teams, and work together collaboratively.
Failure to implement wetland management.	Consider the need for wetland management in the restoration design. Get management input and implement management.	Wetland management can require a different skill set than restoration does. Seek help from wildlife agency staff with management expertise.

Questions?

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Thank you for your participation!
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