ATYPICAL PROCEDURE: OFFSITE HYDROLOGY DETERMINATION BY USING RAINFALL DATA WITH FARM SERVICES AGENCY IMAGERY

Introduction:

This procedure is recommended for determining wetland hydrology in cropped or other areas where native vegetation has been altered. The procedures were excerpted from a document entitled "Minnesota Mapping Conventions". These mapping protocols were developed by several federal and state agencies in 1994 to aid in the implementation of the wetland conservation provisions of the Farm Bill and promote consistency between wetland determinations made under the National Food Security Act Manual and the CORPS of Engineers 1987 Manual. The Board of Water and Soil Resources, US Army Corps of Engineers and the USDA Natural Resources Conservation Service were among the collaborators.

Part A:

Farm Service Agency imagery from the mid 1980's to the present is available for viewing in most Soil and Water Conservation District offices in Minnesota. This imagery is typically taken during the last week of June or the first two weeks of July.

Note: A minimum of **five** years of photography representing normal precipitation must be available, or an equal number of wet and dry years must be added to the analysis.

As Farm Service Agency photography is reviewed, the interpretation of a specific wetland feature should be noted with the following terminology:

W- wet: Outline of the wetland in question can readily be seen and photographic signatures are caused by wetness.

WCS- crop stress: obvious difference in crop condition for crop at site due to wetness versus crop in surrounding field(s); may include color (photo tone), size of crop, different planting dates.

WDO- drowned out: site appears to have been tilled through and possibly planted; however, pattern of crop appears as though all or part has been drowned out.

WNC- not cropped: site appears to have natural vegetative cover rather than annual crops; no obvious tillage pattern lines through the site; adjacent cropped area squared-up or otherwise planted to avoid the area.

WSW- standing water

D- dry: Outline of wetland in question cannot readily be seen. Photographic signatures are not due to wetness, and are due to soil or other factors.

DC- cropped site is tilled and planted: crop appears to have same health and vigor as surrounding fields.

DNC- not cropped: site appears to have natural vegetative cover rather than annual crops; no obvious tillage pattern lines through the site; adjacent cropped area squared-up or otherwise planted to avoid the area.

The relationship of the above symbols to primary and secondary indicators of hydrology:

Primary Indicators	Secondary Indicators
WDO, WNC, WSW	WCS

Strong evidence of wetland hydrology exists in the year(s) when the slide shows the site was WDO, WNC, or WSW. As discussed later, before a determination of wetland hydrology can be made, the procedure also requires that an analysis of precipitation be conducted.

The year(s) when the crop was only stressed (WCS) is a weaker indicator of wetland hydrology than those mentioned in the previous paragraph. Crop stress may occur, especially in annual crops, if water persists within 12 inches of the surface for less than 14 days, or ponded for less than 7 days. Crop stress is best described as a secondary indicator. It must be noted that significant rainfall just before the imagery was taken could also cause crop stress and drown- outs. Land not cropped may be a management decision and is not an indicator of hydrology alone. However, the validity of stating that a decision to not crop a site was wetness-related would increase if the non-cropped land were associated with other evidence of wetness. Refer to Part B. The matrix provided in that part incorporates other factors that support an offsite determination and lend support to situations best served by field verification.

The NRCS *Hydrology Tools* for *Wetland Delineation Procedure* (August, 1997) and Corps of Engineers guidance *Assessing and Using Meteorological Data to Evaluate Wetland Hydrology* (April, 2000) recommends evaluation of precipitation for the 3 months prior to the date of the imagery. It is suggested that the southern portion of the State use April, May and June as the three prior months and the northern part of the state use May, June and July.

The NRCS has used this offsite procedure for over 10 years, has refined its use and developed a number of forms. Copies of these forms or data and a summary of their use are provided here. The BWSR is developing generic forms and a WEB-based procedure that performs the precipitation analysis, including calculation of antecedent requirements. Development of the WEB-based procedure is underway by the DNR Office of State Climatology. The NRCS information is listed in approximate order of their use in the procedure.

Exhibit 16:
This form is used to record the interpretation of photographic signatures. Note: the summary of the analysis is recorded at the bottom of the form.

Exhibit 5:
Precipitation data, obtained from NOAA WETS tables or State Climatology Website. The rainfall spreadsheet for the NOAA weather station nearest to the site or data from the State Climatology Office should be used for the climate analysis.

Exhibit 8:
A WETS table: used to determine precipitation normals.

Exhibit 9:
A form used to weight precipitation to reflect the influence of antecedent conditions.

Exhibit 12:
A form that summarizes precipitation according to dry, normal and wet conditions, all weighted to reflect antecedent moisture conditions.

Exhibit 17:
A form that documents the combined analysis of photography and climate.

As noted in part B., field verification is strongly recommended! Comparison of a nearby site with native vegetation on a similar soil is also helpful.

Claims that the site has been effectively drained MUST be supported by documentation such as the procedure for Atypical Situations as found in the 1987 Manual.

Part B:

DECISION MATRIX FOR OFF-SITE HYDROLOGY DETERMINATIONS USING FARM SERVICES AGENCY IMAGERY

1. Yes or No- Hydric soils or Hydric Inclusion?
2. Yes or No- Site is identified on NWI?
3. Evaluate Frequency of Signature Occurrence[1]
4. Outline Boundaries of Wetlands Determination as Appropriate.

Hydric Soils Map Unit and Inclusions	**NWI[2]**	**Farm Service Agency Imagery[3]**	**Status**
Yes or No	No	$\leq 30\%$	Non-wetland[4] or ED[5]
Yes or No	No	30%-50%	Field Verify
Yes or No	No	$\geq 50\%$	Wetland
Yes or No	Yes	$\leq 30\%$	Field Verify
Yes or No	Yes	30%-50%	Wetland
Yes or No	Yes	$\geq 50\%$	Wetland

[1] Frequency of occurrence based on normal monthly rainfall.
[2] It is the policy of the FWS to not map farmed wetlands in the NWI unless the wetland is a pothole-like depression or cranberry bog. Therefore, NWI maps under-map wetlands on agricultural lands.
[3] See footnote 1
[4] All designations, including non wetland (NW) or effectively drained (ED) determinations, must reflect the ***long-term*** average conditions of the site.

[5] Claims of ED must be supported by documentation.

—Exhibit 16

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCS CPA-32
2-94

WETLAND DOCUMENTATION RECORD
REMOTELY SENSED DATA SUMMARY

May-June-July Rainfall data for all years

1. Owner/Landuser: Bruce Lee
2. County/State: Sibley Co., MN
3. Slide Reviewer: Jacobsen Date: 11/21/94
4. Site Identification No.: 6200-1
5. (Tract No., Farm No., Plus Site No.): Sec. 24 Arlington TWP

1. ASCS COLOR SLIDE DATA

Date Mo./Yr.	Climate Condition Wet/Dry/Normal	Interpretation - List of signatures observed e.g., drowned crop, standing water
7/31/80	D	dry, cropped
6/30/81	N	wet, cropped do cs
9/13/82	D	dry, cropped (late slide)
7/8/83	N	wet, cropped do
7/84	N	wet, cropped do
7/22/85	N	wet, cropped do
7/29/86	W	wet, cropped do
7/21/87	N	dry, cropped
7/21/88	D	dry, cropped
9/14/89	N	dry, cropped (late slide)
7/16/90	W	wet, cropped cs
7/8/91	N	wet, cropped cs
8/25/92	N	west-not cropped (SA hayed) east-crop stress
8/93	W	wet, cropped cs
		do = drown out
		cs = crop stress
		SA = set aside acres

NWI CLASSIFICATION

6 of 8 normal years have wet signature

0/3 dry years
3/3 wet years

2. Number of years observed that have wet signatures.

9/14 total 9/14 balancing equal # wet & dry years

Total 1979-1993 prcp
Station : MN3076, GAYLORD
---------- Unit = inches

yr	jan	feb	mar	apr	may	jun	jul	aug	sep	oct	nov	dec	annl
79	1.54	1.13	3.06	0.75	3.41	4.74	2.01	10.09	2.98	4.12	1.18	0.00	35.01
80	0.45	0.92	0.90	0.80	3.45	3.24	1.05	4.49	5.20	0.89	0.27	0.19	21.85
81	0.19	1.77	1.13	3.46	1.89	4.21	5.74	13.60	0.76	3.09	2.62	1.25	39.71
82	1.83	0.24	1.45	2.37	4.06	0.96	1.37	4.60	4.95	3.18	3.27	3.30	31.58
83	0.39	0.60	2.50	2.14	3.19	5.39	3.63	4.97	2.01	2.74	3.66	1.36	32.58
84	1.12	1.17	2.03	3.75	2.00	6.49	2.91	5.00	2.22	5.94	0.00	2.22	34.85
85	1.00	M0.27	4.89	3.31	3.66	5.47	2.80	5.28	3.80	3.33	1.59	1.92	37.32
86	0.99	1.00	1.49	M6.27	3.07	8.10	5.74	3.80	6.57	1.04	0.39	0.39	38.85
87	0.48	0.00	0.97	0.10	1.52	5.09	2.64	3.70	2.45	0.27	1.56	0.93	19.71
88	1.60	0.55	0.93	1.52	2.59	1.28	2.26	4.45	2.99	0.25	2.24	0.64	21.30
89	0.54	0.83	3.13	2.82	1.82	4.01	3.30	2.20	0.77	0.29	M1.62	M0.29	21.62
90	0.09	0.49	2.74	M3.68	4.11	6.44	7.30	3.95	2.10	1.43	0.70	M0.00	33.03
91	0.19	M1.68	M1.87	1.98	5.37	3.22	4.26	3.63	5.94	1.26	M4.55	M0.30	34.25
92	M0.00	1.00	M0.00	M1.69	2.21	5.37	4.40	M3.86	6.45	2.55	2.22	1.15	30.90
93	M0.84	M0.29	M0.75	M2.17	7.97	10.85	M4.84	M5.84	3.35	M0.00	1.72	M1.00	39.62

Notes: Data missing in any month have a 'M' flag
Data missing for all days in a month is blank

—Exhibit 8

WETS Station : GAYLORD, SIBLEY COUNTY, MN3076
Start yr. - 1961 End yr. - 1990
Temperature: 30 years available out of 30 requested in this analysis
Precipitation: 30 years available out of 30 requested in this analysis

Month	Temperature (Degrees F.)			Precipitation (Inches)		
					30% chance will have	
	avg daily max	avg daily min	avg	avg	less than	more than
January	22.0	2.5	12.3	0.76	0.40	0.96
February	28.1	8.6	18.3	0.76	0.41	0.95
March	40.4	21.6	31.0	1.89	1.20	2.28
April	58.0	35.8	46.9	2.88	1.73	3.50
May	72.0	47.6	59.8	3.37	2.47	3.95
June	81.3	57.2	69.2	4.22	3.06	4.98
July	85.4	61.8	73.6	3.91	2.50	4.72
August	81.8	58.7	70.3	4.04	2.62	4.86
September	72.7	49.4	61.1	3.02	1.89	3.64
October	61.1	38.3	49.7	2.22	0.98	2.71
November	41.9	24.9	33.4	1.50	0.70	1.89
December	26.4	9.3	17.9	0.95	0.56	1.25
Yearly :						
Average	55.9	34.6	45.3	-----	-----	-----
Extreme	105	-34	-----	-----	-----	-----
Total	-----	-----	-----	29.52	25.62	32.67

GROWING SEASON DATES

Requested years of data: 30 Available years of data: 30
Years with missing data 24 deg = 0, 28 deg = 0, 32 deg = 0
Years with no occurrence 24 deg = 0, 28 deg = 0, 32 deg = 0
Data years used 24 deg = 30, 28 deg = 30, 32 deg = 30

Probability	Temperature		
	24 F or higher	28 F or higher	32 F or higher
	Beginning and Ending Dates Growing Season Length		
50 percent *	4/ 8 TO 10/22 197 days	4/19 to 10/12 176 days	4/29 to 10/ 2 156 days
70 percent *	4/ 4 TO 10/26 205 days	4/14 to 10/17 185 days	4/25 to 10/ 6 164 days

* Percent chance of the growing season occurring between the Beginning and Ending dates.

February 23, 1994

RAINFALL DOCUMENTATION
USE WITH PHOTOGRAPHS

DATE: 11/21/94

PREPARED BY: SUJ

WEATHER STATION: Gaylord

LANDOWNER: Bruce Lee

TRACT NO: 6200

COUNTY: Sibley

STATE: MN

SOIL NAME: Glencoe

GROWING SEASON: 4/19 to 10/12
176 days

PHOTO DATE: 6/30/81

	LONG TERM RAINFALL RECORDS							
	MONTH	3 YRS IN 10 LESS THAN	AVERAGE	3 YRS IN 10 MORE THAN	RAIN FALL	CONDITION DRY, WET, NORMAL	CONDITION VALUE	MONTH WEIGHT VALUE	PRODUCT OF PREVIOUS TWO COLUMNS
1ST PRIOR MONTH*	June	3.06	4.22	4.98	4.21	N	2	3	6
2ND PRIOR MONTH*	May	2.47	3.37	3.95	1.89	D	1	2	2
3RD PRIOR MONTH*	Apr	1.73	2.89	3.50	3.46	N	2	1	2
								SUM =	10
									N

NOTE: If sum is

6 - 9 then prior period has been drier than normal

10 - 14 then prior period has been normal

15 - 18 then prior period has been wetter than normal

* Photo Date

Condition Value:
Dry = 1
Normal = 2
Wet = 3

CONCLUSIONS:

—Exhibit 12

Rainfall Data
Gaylord, MN
Station # 21-3076
Sibley County, MN

Year	Monthly Rainfall in Inches					Wetness Evaluation					July slides May-July	
	April	May	June	July	Aug	April	May	June	July	Aug	Product	Eval
1979	0.75	3.41	4.74	2.01	10.09	1	2	2	1	3	9	1
1980	0.80	3.45	3.24	1.05	4.49	1	2	2	1	2	9	1
1981	3.46	1.89	4.21	5.74	13.60	2	1	2	3	3	14	2
1982	2.37	4.06	0.96	1.37	4.60	2	3	1	1	2	8	1
1983	2.14	3.19	5.39	3.63	4.97	2	2	3	2	3	14	2
1984	3.75	2.00	6.49	2.91	5.00	3	1	3	2	3	13	2
1985	3.31	3.66	5.47	2.80	5.28	2	2	3	2	3	14	2
1986	6.27	3.07	8.10	5.74	3.80	3	2	3	3	2	17	3
1987	0.10	1.52	5.09	2.64	3.70	1	1	3	2	2	13	2
1988	1.52	2.59	1.28	2.26	4.45	1	2	1	1	2	7	1
1989	2.82	1.82	4.01	3.30	2.20	2	1	2	2	1	11	2
1990	3.68	4.11	6.44	7.30	3.95	3	3	3	3	2	18	3
1991	1.98	5.37	3.22	4.26	3.63	2	3	2	2	2	13	2
1992	1.69	2.21	5.37	4.40	3.86	1	1	3	2	2	13	2
1993	2.17	7.97	10.85	4.84	5.84	2	3	3	3	3	18	3

Normals are for 1961-1990 data

April	2.89
May	3.37
June	4.22
July	3.91
August	4.04

Normal: inside 30% chance value
Dry: < lower bound for 30% chance
Wet: > upper bound for 30% chance

1 = Dry, 2 = Normal, 3 = Wet

Month	30% chance Lower Bound - D	N	30% chance Upper Bound - W
April	1.73	2.89	3.50
May	2.47	3.37	3.95
June	3.06	4.22	4.98
July	2.50	3.91	4.72
August	2.62	4.04	4.86
PGS-May-July	8.03	10.48	13.65

1st month prior = 3
2nd month prior = 2
3rd month prior = 1

—Exhibit 17

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SCS CPA-37
2-94

WETLAND DOCUMENTATION RECORD
HYDROLOGY DATA
ANALYTICAL METHOD

1. Owner/Landuser: Bruce Lee
2. County/State: Sibley Co., MN
3. Field Investigator: Jacobsen
4. Site Identification No.: 6200-1 Date: 11/21/94
5. (Tract No., Farm No., Plus Site No.): T6200 Sec. 24 Arlington TWP

INDICATE ANSWER BY PLACING "X" IN PROPER COLUMN

Indicate if any of the following analytical procedures(s) were used to determine Wetland Hydrology. Attach all relevant calculations worksheets, etc.	YES	NO
1. Frequency and duration analysis of stream/lake gage data.		
2. Development of water budget for depressional areas.		
3. Correlation of wetland signatures with climatological data.	X	
4. DRAINMOD model (version 4.0) evaluation.		
5. Drainage guides.		
6. Monitoring well data analysis.		

7. Describe findings and make conclusions.

Wet signatures were observed in:
0 of 2 dry years
5 of 8 normal years (63%)
4 of 4 wet years

Ignore 1990 and 1993 to get 12 years with equal numbers of wet & dry years
5 of 8 normal years have wet signatures, and/or
9 of 14 total years have wet signatures (64%)

∴ >50%; by MN mapping conventions, wetland hydrology is present