FERTILITY OF SASK. SOILS: FROM PLOUGH TO NOW

AGVISE SOIL FERTILITY SEMINAR

STAYBRIDGE SUITES, SASKATOON
MARCH 14, 2019

by
Les Henry
Henry Perspectives , Saskatoon


LES HENRY
$50.00 GST incl.
Cash or Cheque- Receipt issued
HENRY'S HANDBOOK OF
soil and water

1. The Original Condition
2. Grandfather Breaks the Prairie Sod
3. Summerfallow : The Largest Mining Excercise in Sask.
4. 1960s : Start of Serious N Fertilizer Use : Soil Testing
5. 1990s- Zero Till – Continuous Crop – Proper Fertilizer
6. Now
7. Future

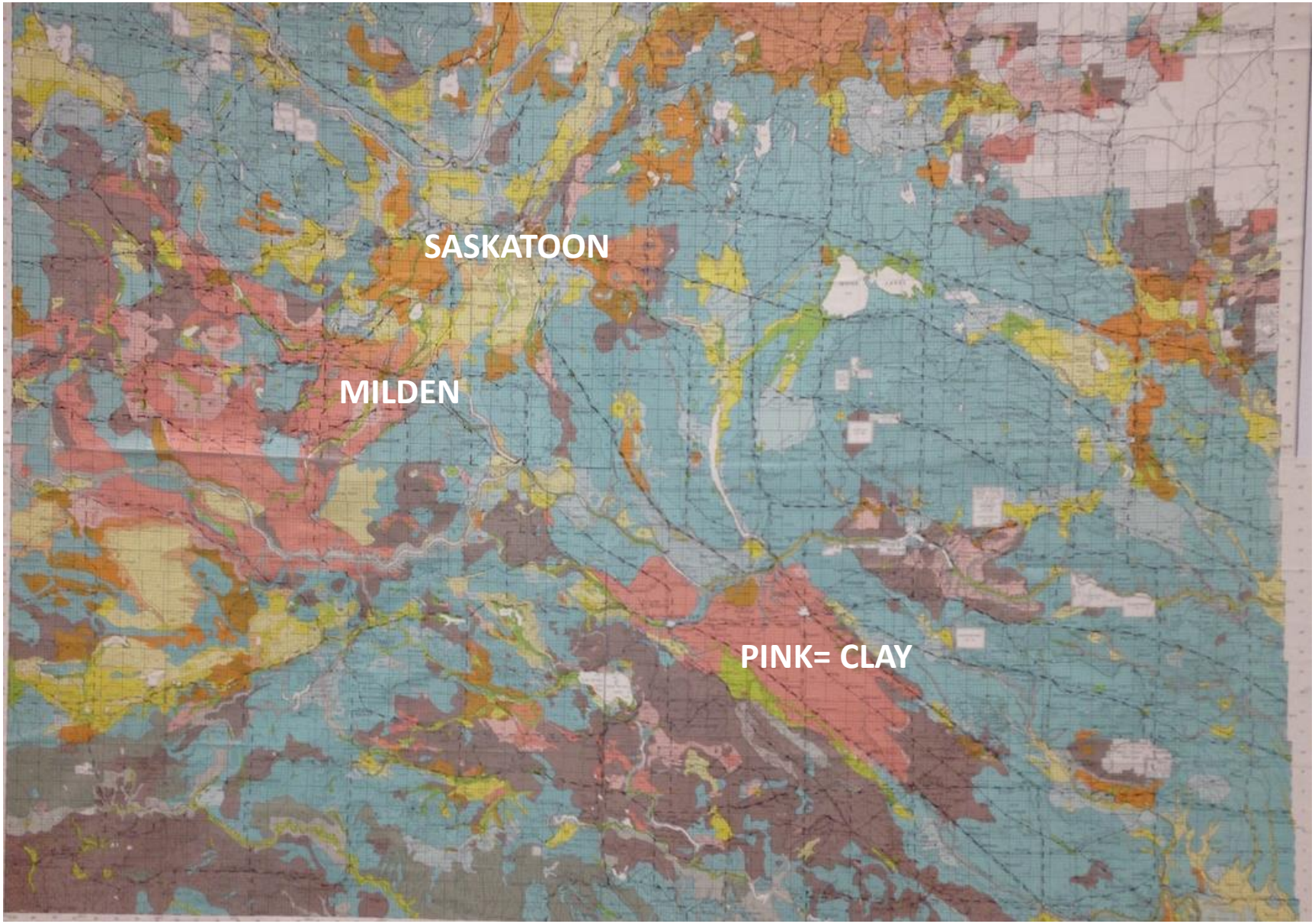
1. THE ORIGINAL CONDITION

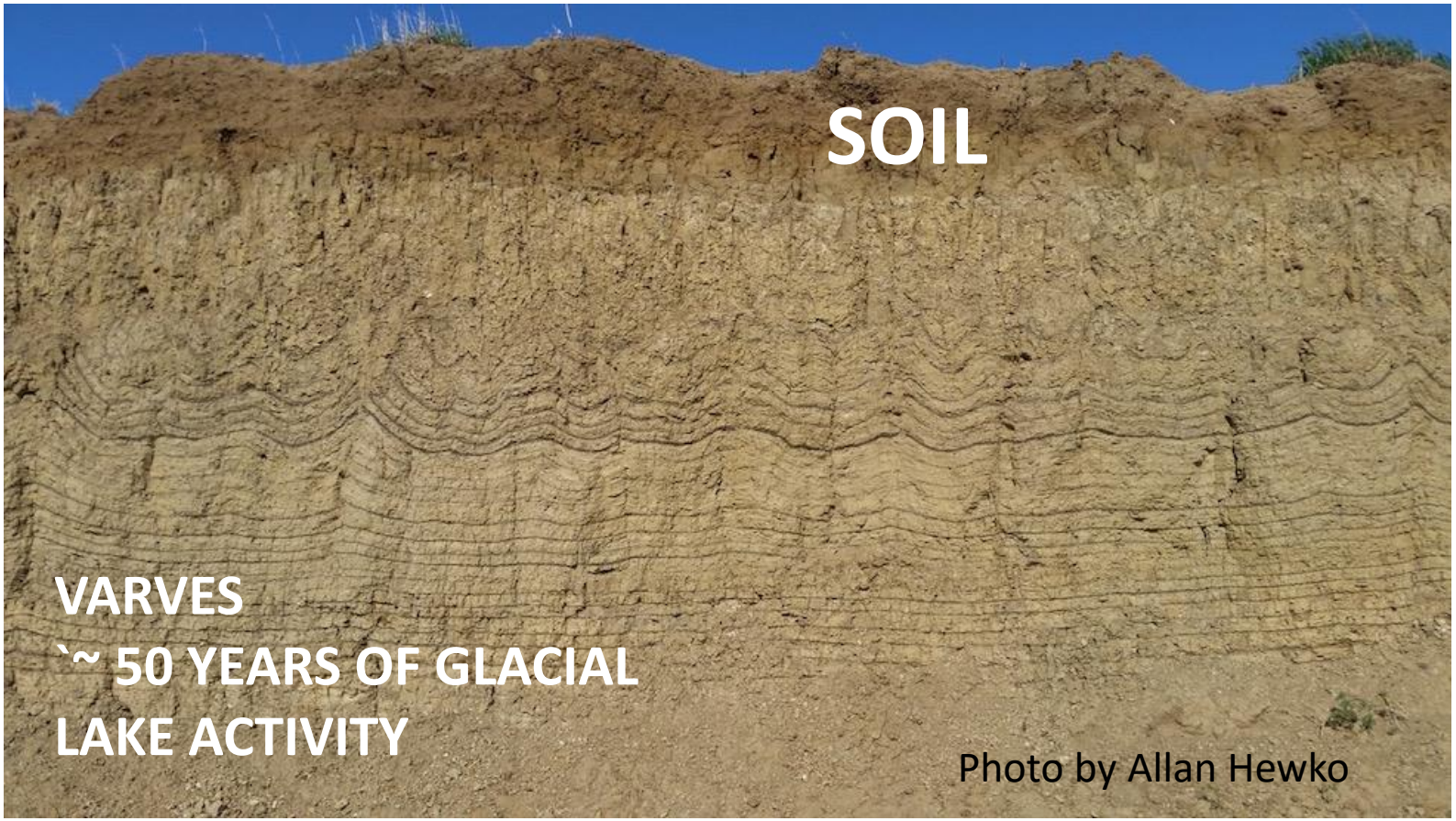
SOIL PARENT MATERIALS

Glacial till – (most common) stones , sloughs

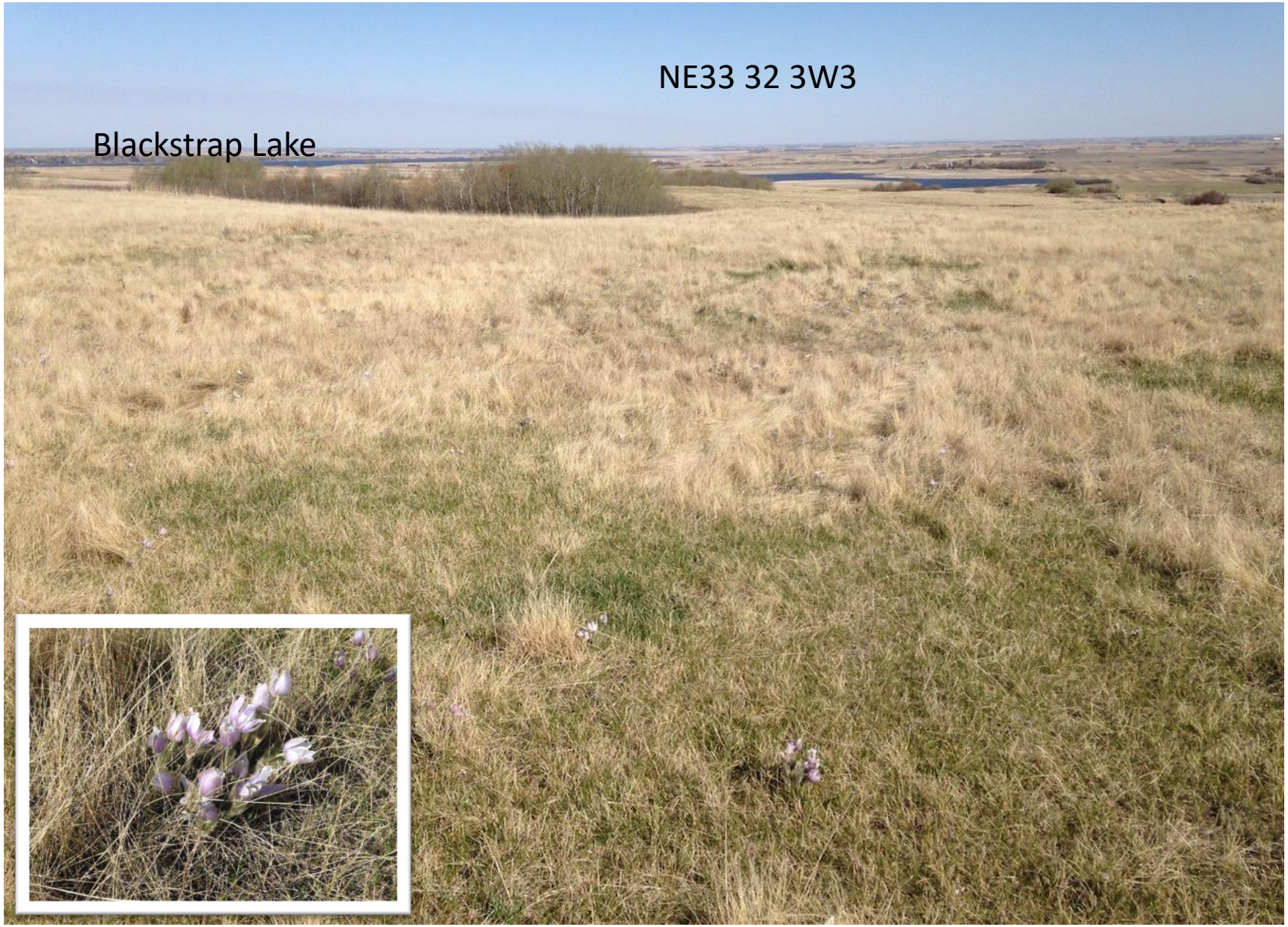
Water Laid - Heavy, Medium, Light textures

Wind Blown – Sand dunes : Loess plains

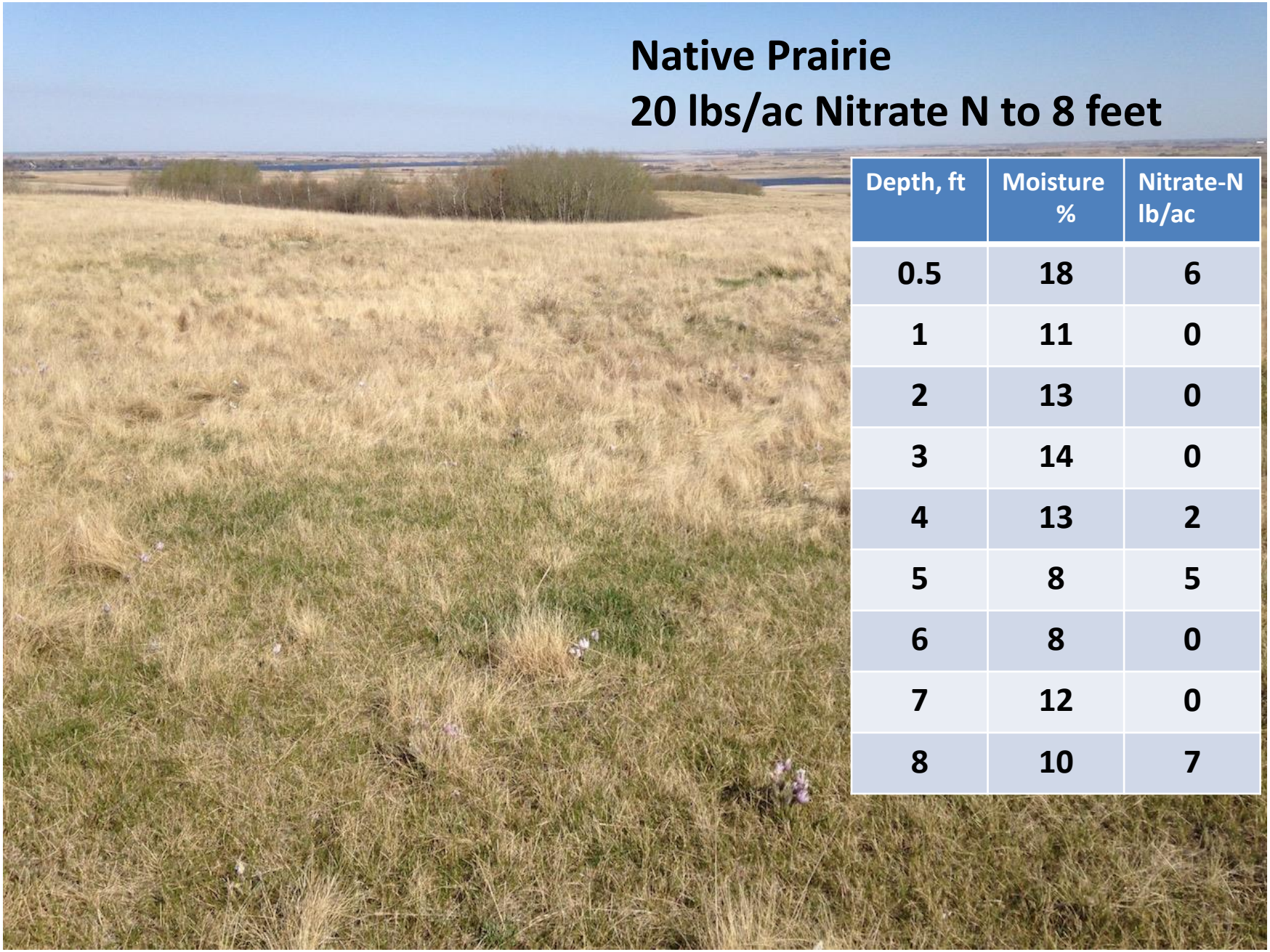

SASKATOON
MILDEN
PINK= CLAY


SOIL
VARVES
`~ 50 YEARS OF GLACIAL
LAKE ACTIVITY
Photo by Allan Hewko

And then there was 10,000 years of this ……..


NE33 32 3W3
Blackstrap Lake

Native Prairie
20 lbs/ac Nitrate N to 8 feet



Depth, ft	Moisture %	Nitrate-N lb/ac
0.5	18	6
1	11	0
2	13	0
3	14	0
4	13	2
5	8	5
6	8	0
7	12	0
8	10	7

Then Comes Grandfather Jerome with his Steam engine and plough

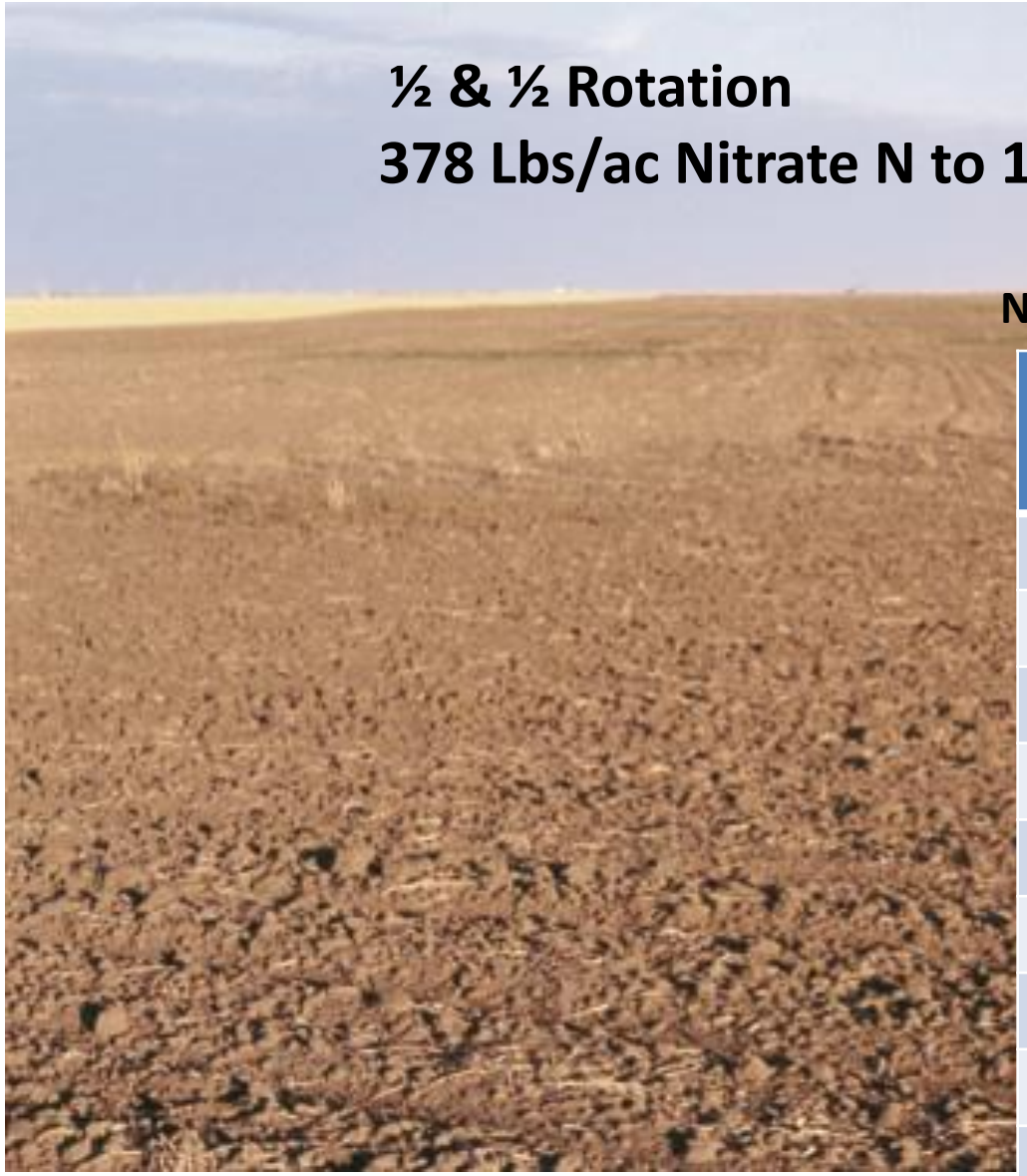
BRUNSWICK FARM 1906-1963- NO FERTILIZER USED

Jerome Henrys steam engine & plow.

½ & ½ Rotation
378 Lbs/ac Nitrate N to 12 feet

Depth, ft	Moisture , %	Nitrate-N lb/ac
0.5	22	19
1	21	6
2	20	9
3	17	12
4	16	39
5	20	85
6	22	92
7	21	68
8	21	48
9	9	35
10	17	27
11	13	16
12	8	11

½ & ½ Rotation
378 Lbs/ac Nitrate N to 12 feet



Native Prairie

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3. SUMMERFALLOW- Largest Mining Exercise in Sask.

1910-1920 :

Easy pickings

Fertile prairie soils (Brits said we were unfair competition)

Wheat prices high

Farmers rich:"We will all be millionaires by 1930"

Jerome Henry

built this house

in 1917

<u>ALL amenities</u>
Central heat
Hot& cold water
Flush toilet
Electric lights

with$ 35/bus wheat

Brunswick Farm 1906 – 1963:
Never a pound of fertilizer used

1920s

Early 20s – recession

Late 1920s – boom times

Land bought at prices too high .....

1930s :The Dirty 30s

Drought: Serious wind erosion

Low prices

Disaster : Many farms abandoned


THE DIRTY 30S

Strasbourg June 1979

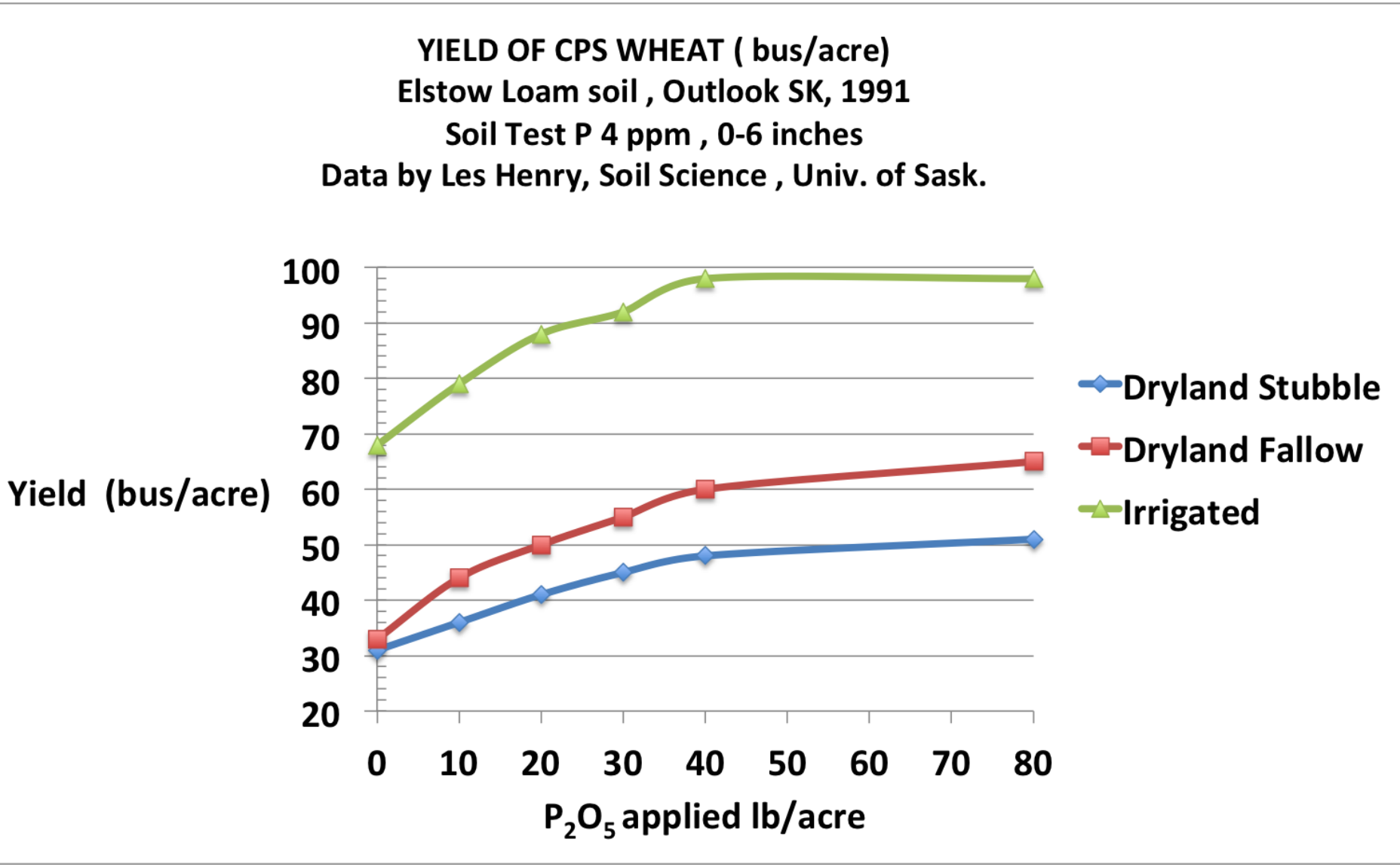
1940s – wet cycle – good crops

WW 2 - good prices- mortgage paid

1950s – wet cycle – good crops – poor markets

By the 1950s the mining excercise of summerfallow had seriously depleted available Phosphorus supplies

Strip tests in the 1950s showed that P was seriously low on FALLOW


YIELD OF CPS WHEAT (bus/acre)
Elstow Loam soil , Outlook SK, 1991
Soil Test P 4 ppm , 0-6 inches
Data by Les Henry, Soil Science , Univ. of Sask.
Yield (bus/acre)
100
90
80
70
60
50
40
30
20
0
10
20
30
40
50
60
70
80
P2O5 applied lb/acre
Dryland Stubble
Dryland Fallow
Irrigated

Paynton SK May 1952 :

6th Continuous Crop of Spring Rye : Black fine sandy loam

No Fert = 27 , 20 lb/ac P_2O_5 = 32, 20N + 20 P_2O_5 = 38 bus/ac

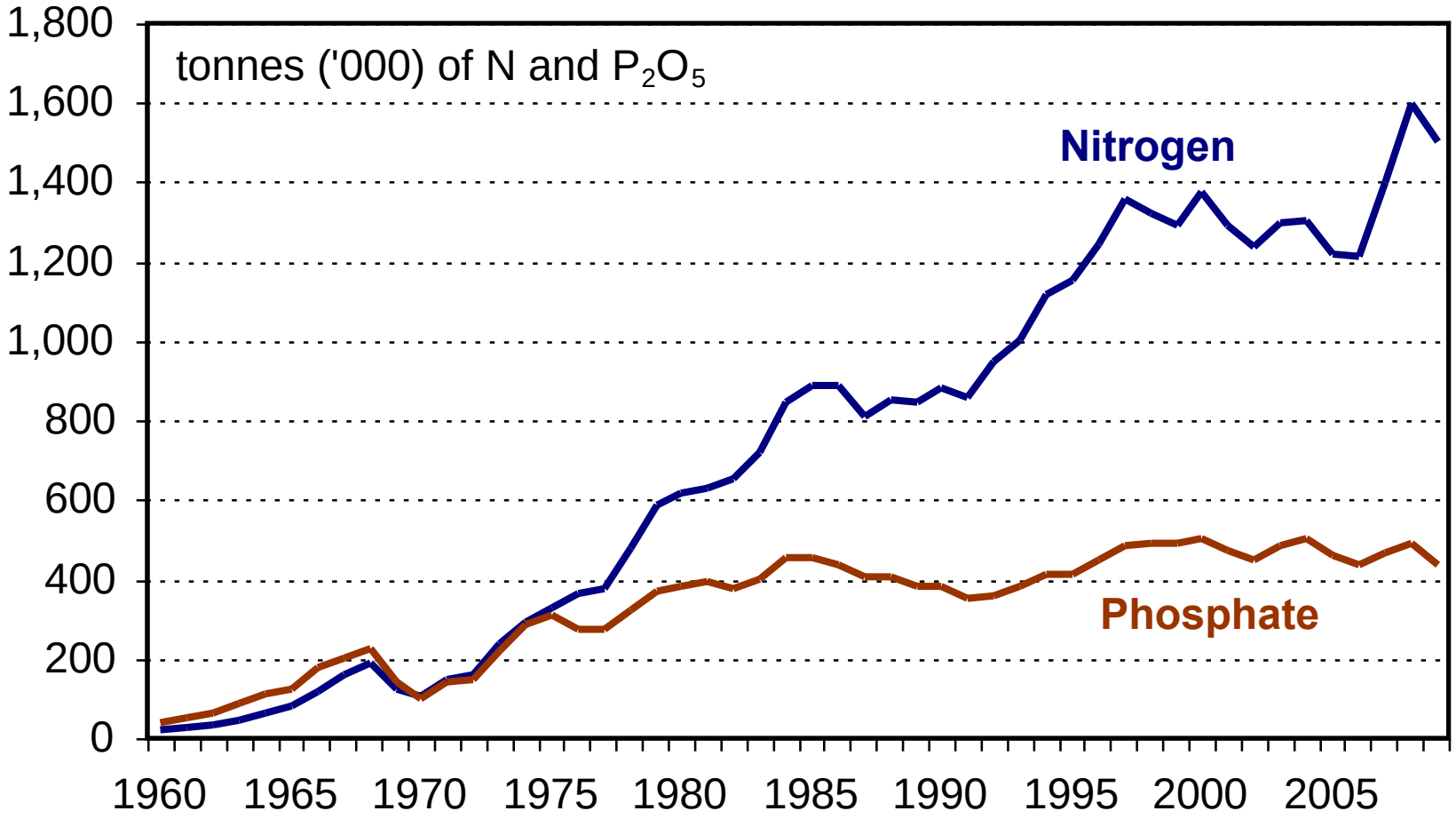
Truck is 1.5 ton International :
Bought with ONE truckload of spring rye

4. 1960S-START OF SERIOUS N

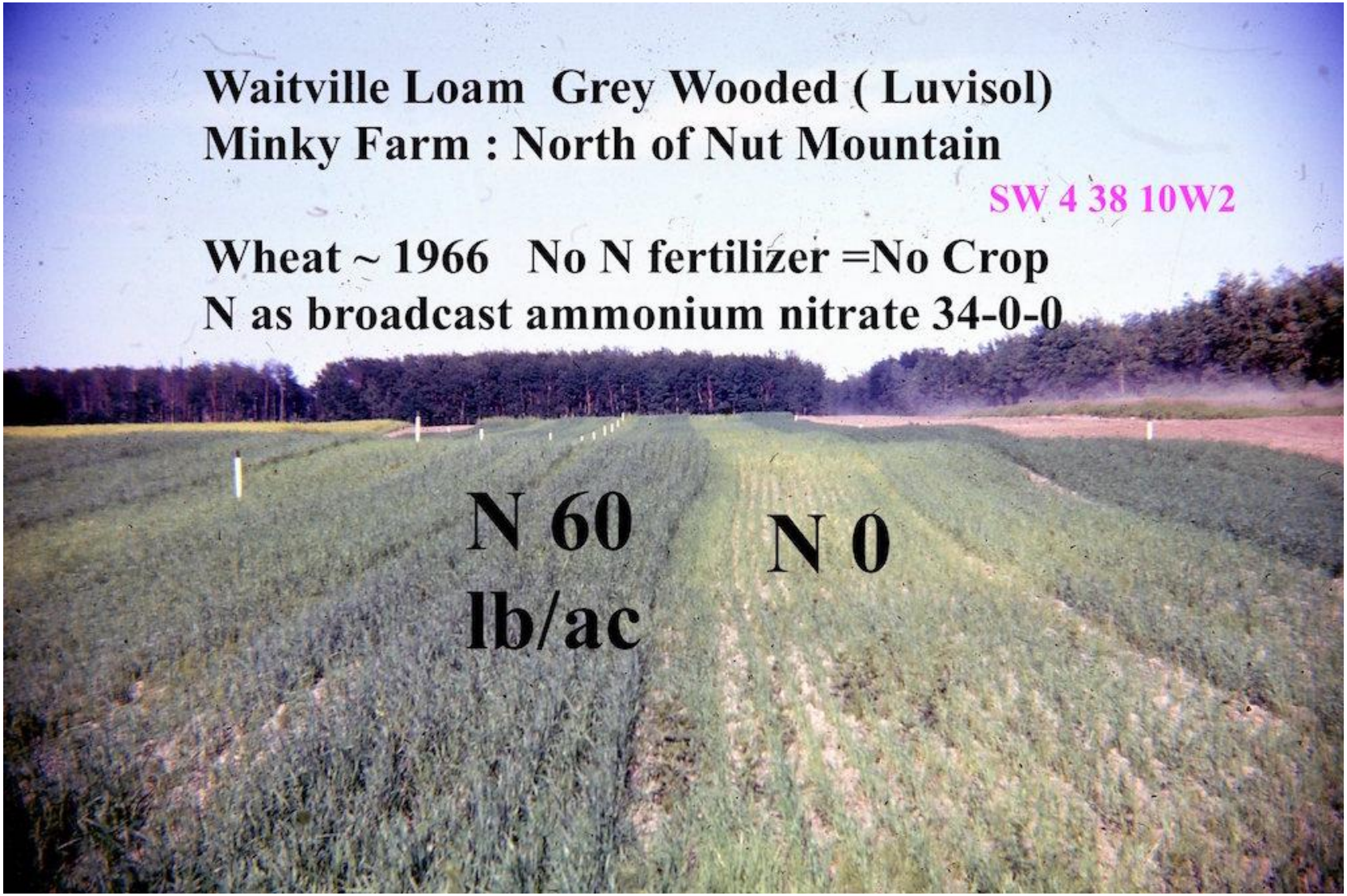
FERTILIZER USE-

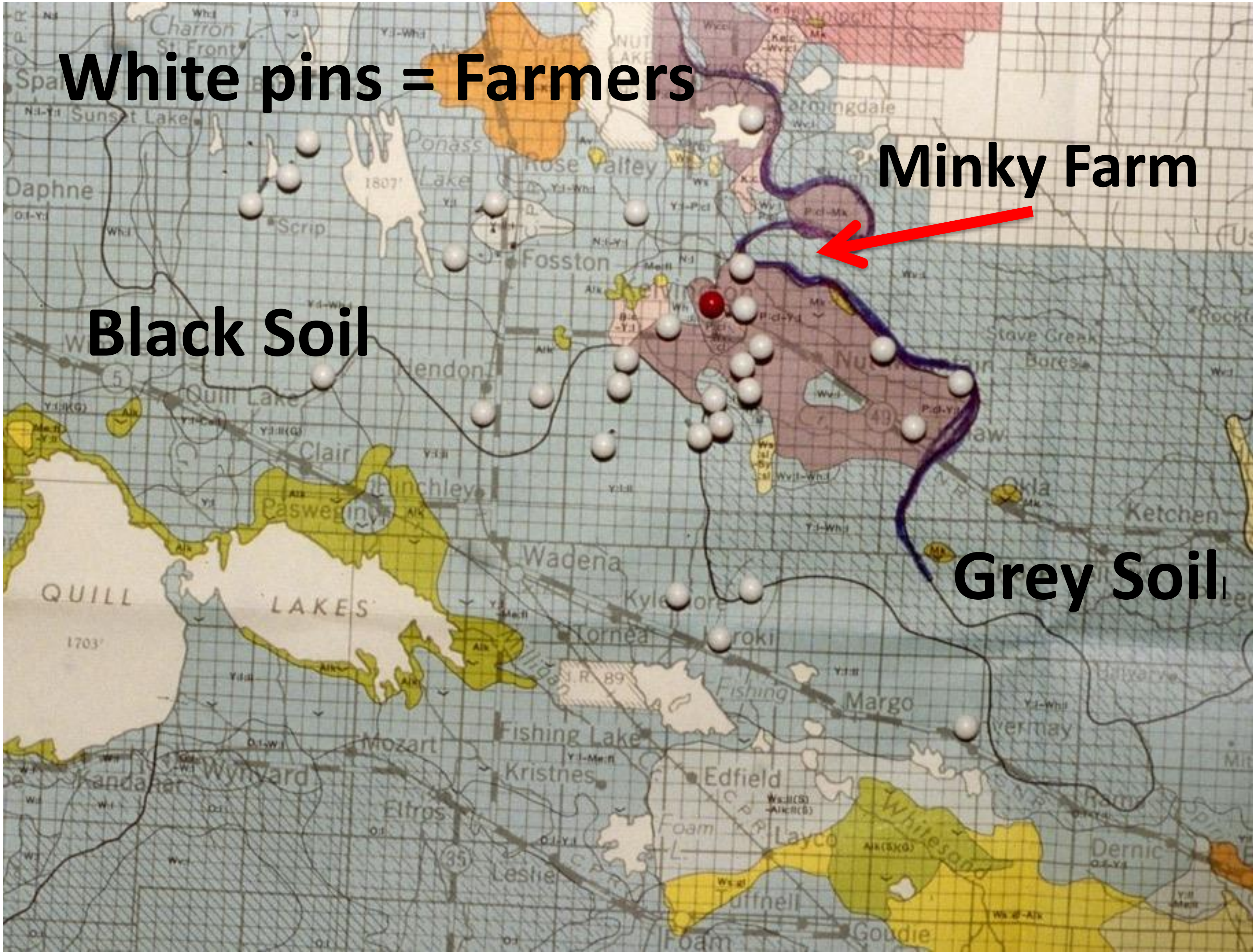
SOIL TESTING

Fertilizer Consumption in W. Canada

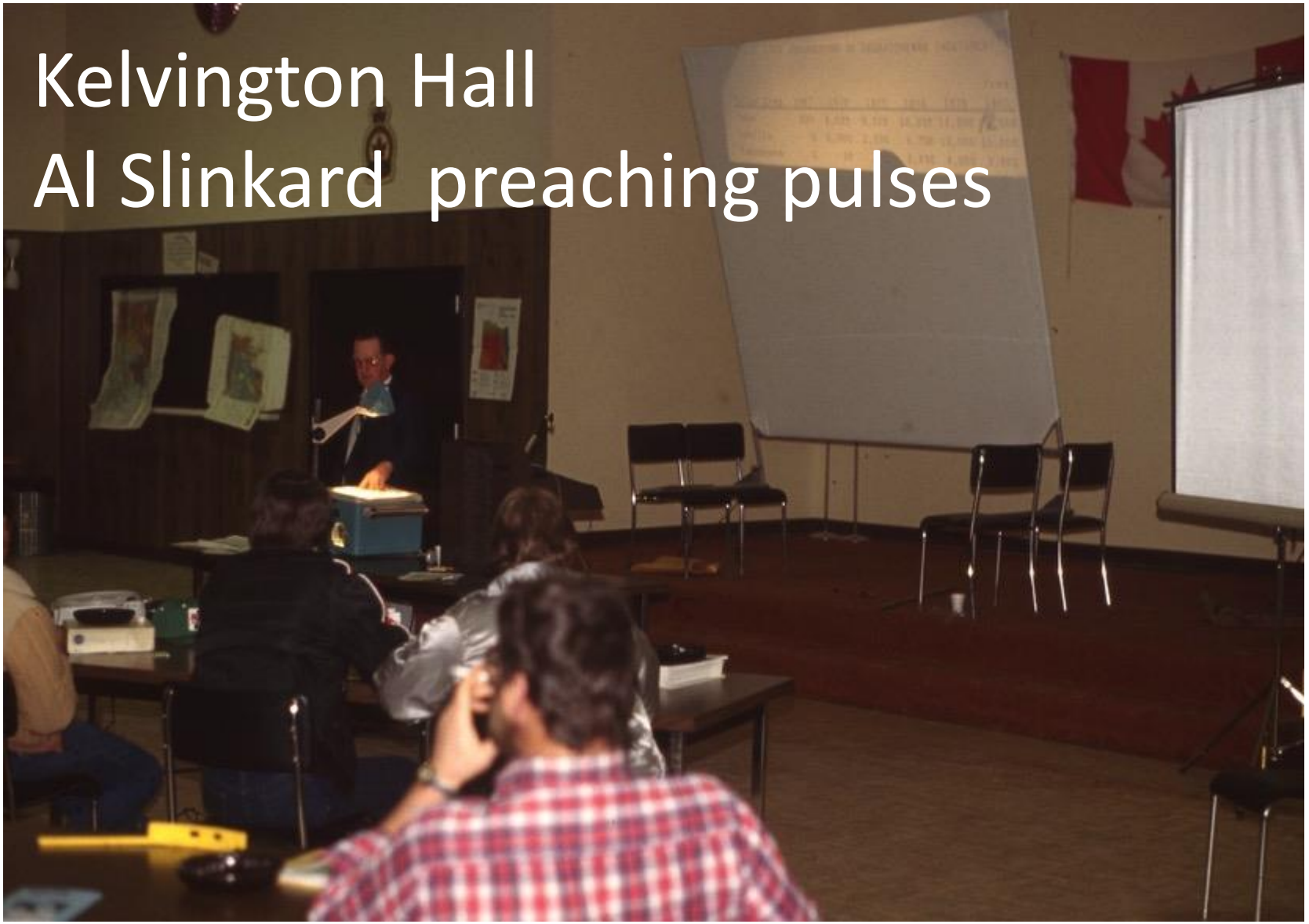


Hundreds of Field strip tests for Soil test N Calibration

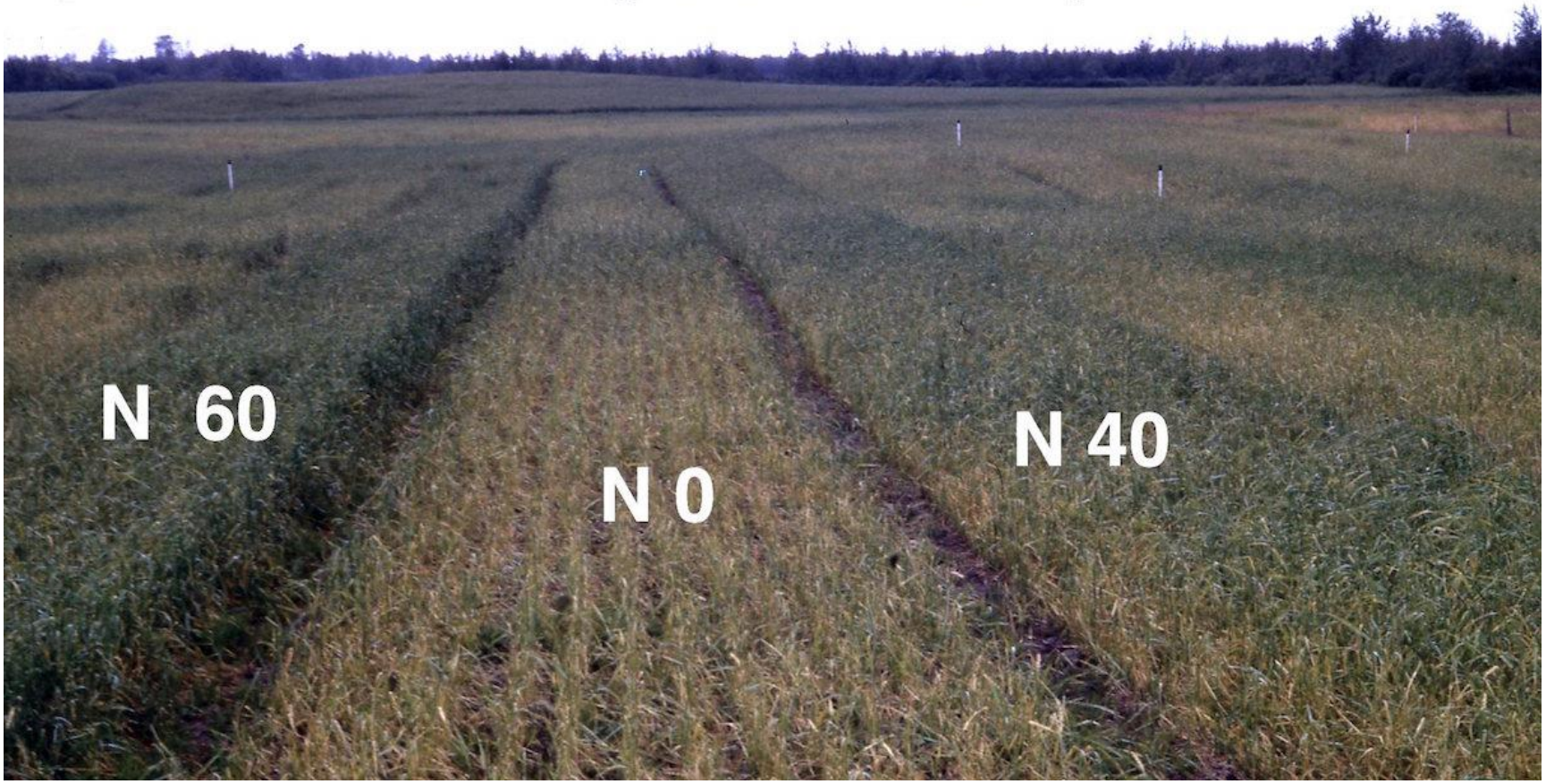



White pins = Farmers
Minky Farm
Black Soil
Grey Soil
Charron L.
Sunset Lake
Daphne
Scrip
Ponass Lake
Rose Valley
Fosston
Farmingdale
Stave Creek
Okla
Ketchen
Quill Lake
Clair
Paswegin
Wadena
QUILL LAKES
Tornea
Fishing Lake
Margo
Mozart
Kristnes
Edfield
Wynyard
Kandahar
Elfros
Leslie
Foam L.
Whitesand
Tuffnell
Goudie
Dernic

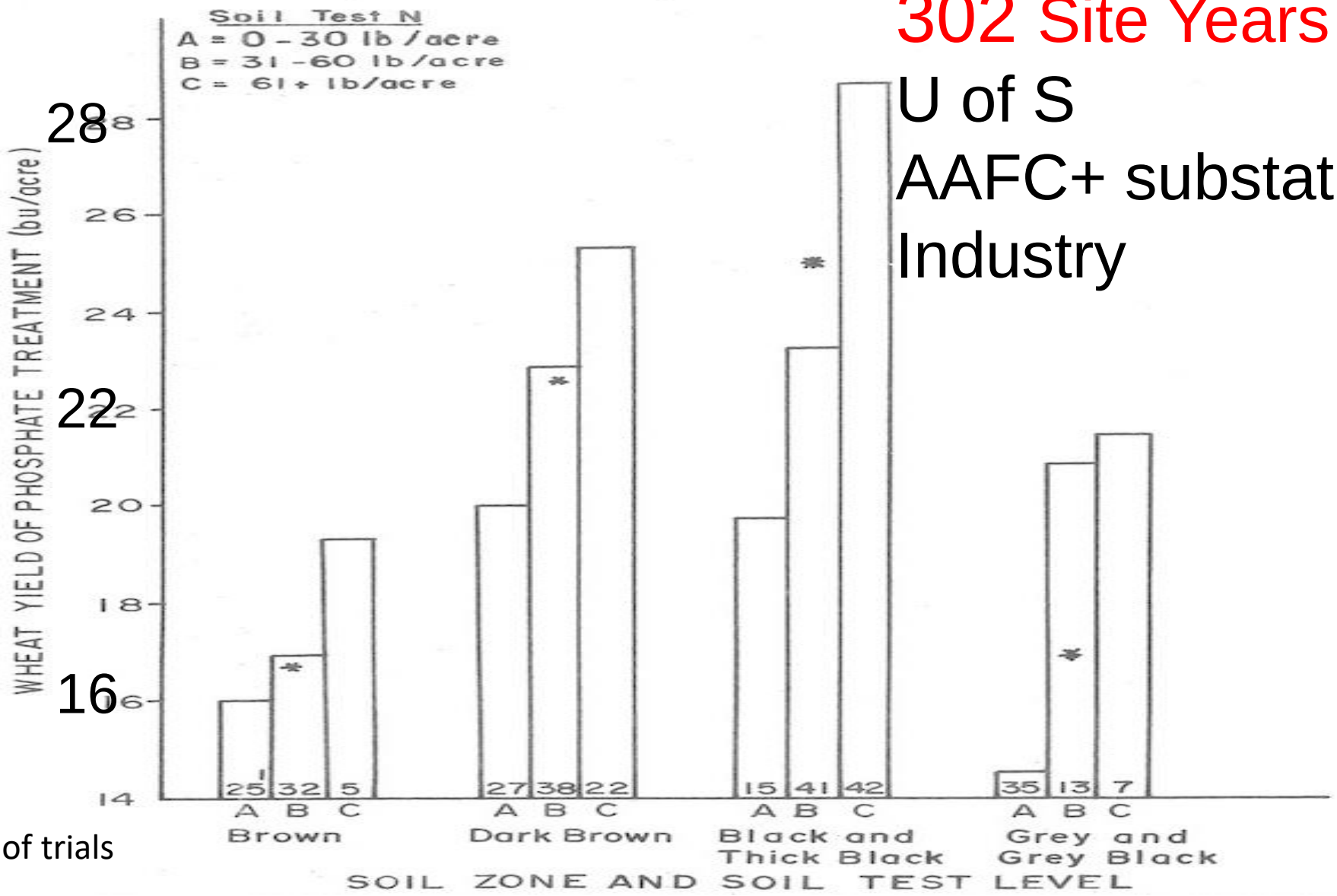
Kelvington Hall
Al Slinkard preaching pulses



Wilson Farm Okla SK : 1966: N Fertlizer test with Wheat:
Soil Wv Loam: N as broadcast Ammonium Nitrate 34-0-0
N Rate. Lbs N/ acre
Hail damage June 24 : Photo July ?



to 2 feet



302 Site Years

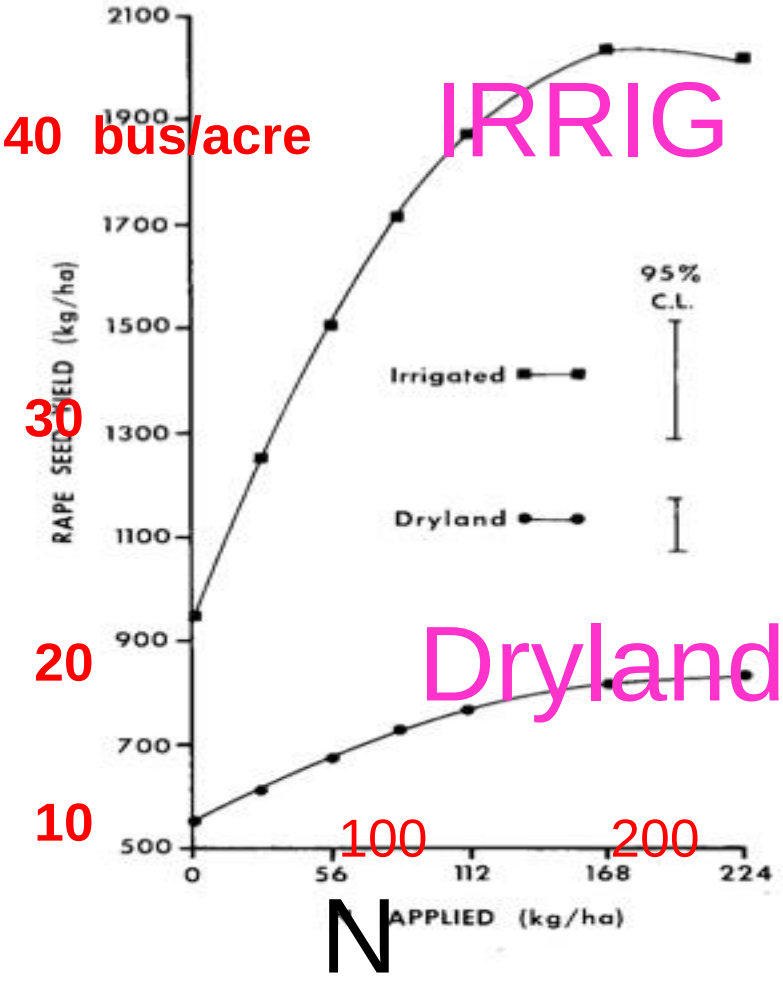
U of S

AAFC+ substat.

Industry

1: # of trials

The N- Water interaction is HUGE!!



Outlook SK Irrigation District 1970s – Soil NO3-N to 2 feet = very low
Dark Brown soils, low OM, not much N fertilizer in past CJSS 1985 and 4th Ed 'Soil Fert" page 30

Sask. Soil Testing Lab : 1966
SEPTEMBER 1966: SOIL TESTING BLITZ

*** 2 farm Field days in each of 42 Ag Rep (Extension) districts- and it all happened in a week.**

*** Coordinated by U of S Extension, all staff from Soil Science U of S , Soil Survey, AAFC Research stations, Sask Ag specialists helped. Anybody with a degree in Soils and a driver's license – even Les Henry**

*** The field day demonstrated how to take a sample, how to decide where to sample, and distributed kits with bulletins, soil test boxes etc.**

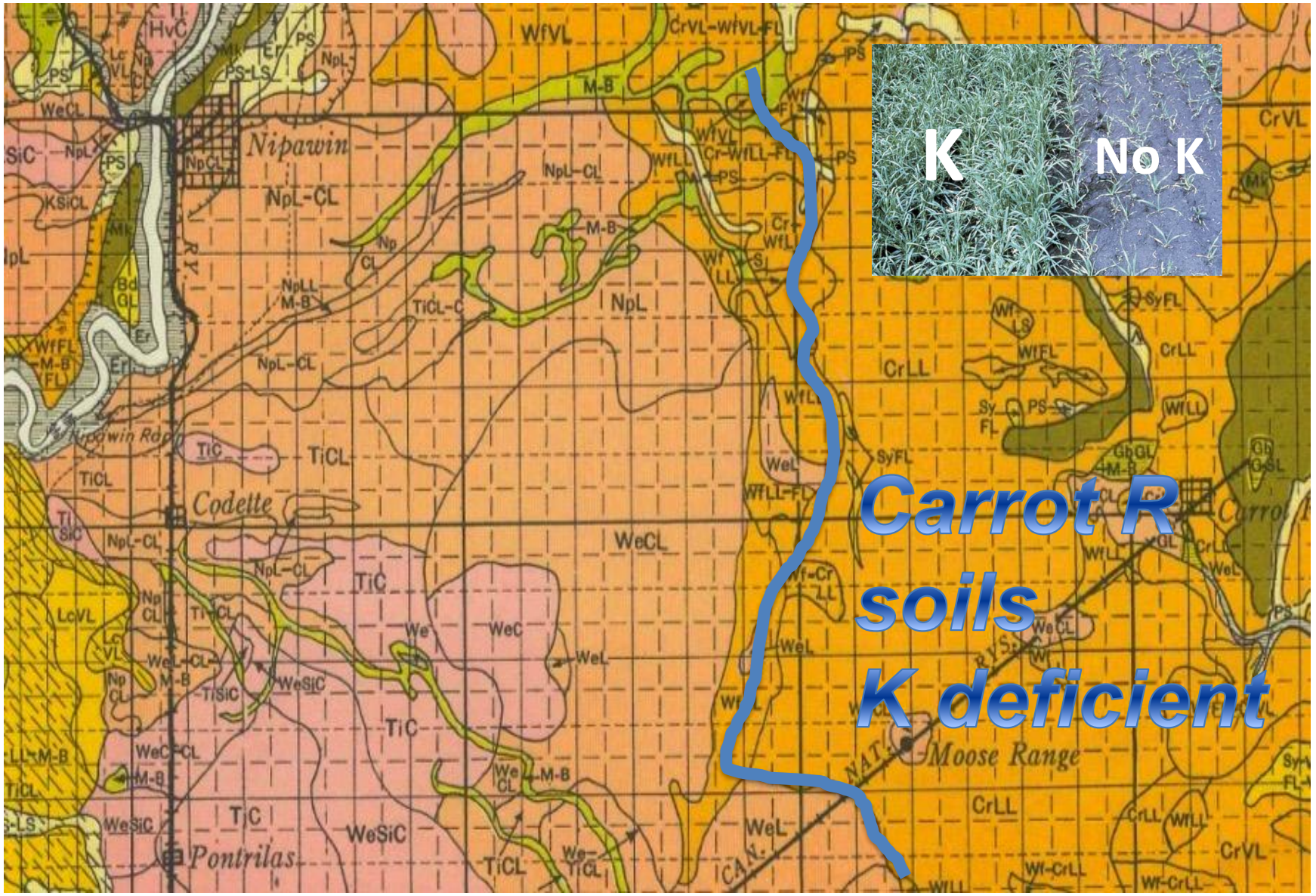
1966 : Ed Halstead:

- **set up lab to run N,P AND K. Lesser lights like Les Henry said " why do K – we have filing cabinets full of field experiments that say we do not need it"**

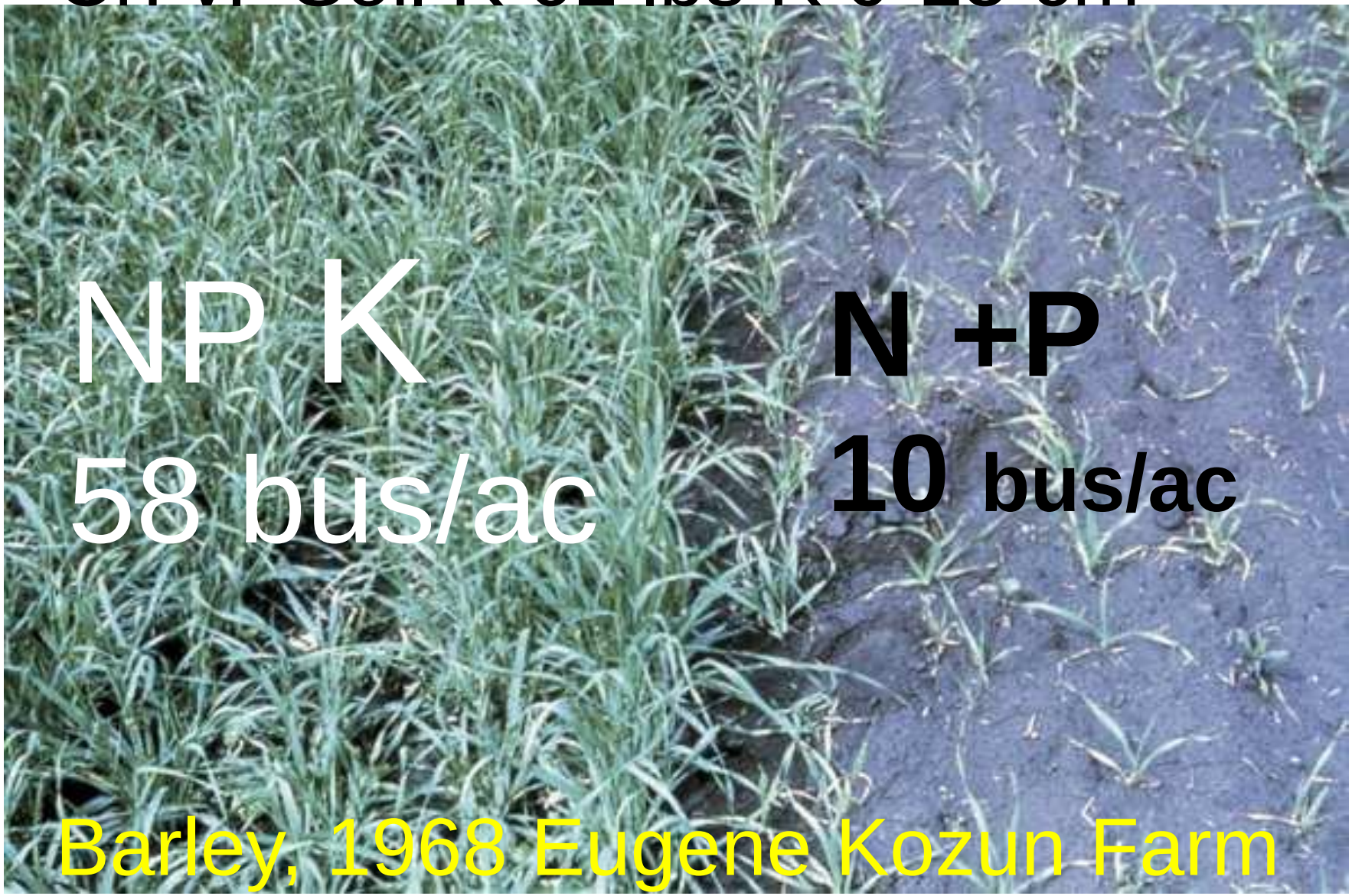
- **Roy Lanz- Elephant Brand dealer at Nipawin said some of his customers had great response to K. The U of S etc field experiments had not been done on the deficient soils**

- **The first year of soil testing found extremely K deficient soils. Yes Virginia, we do have K deficient soils in Sask**

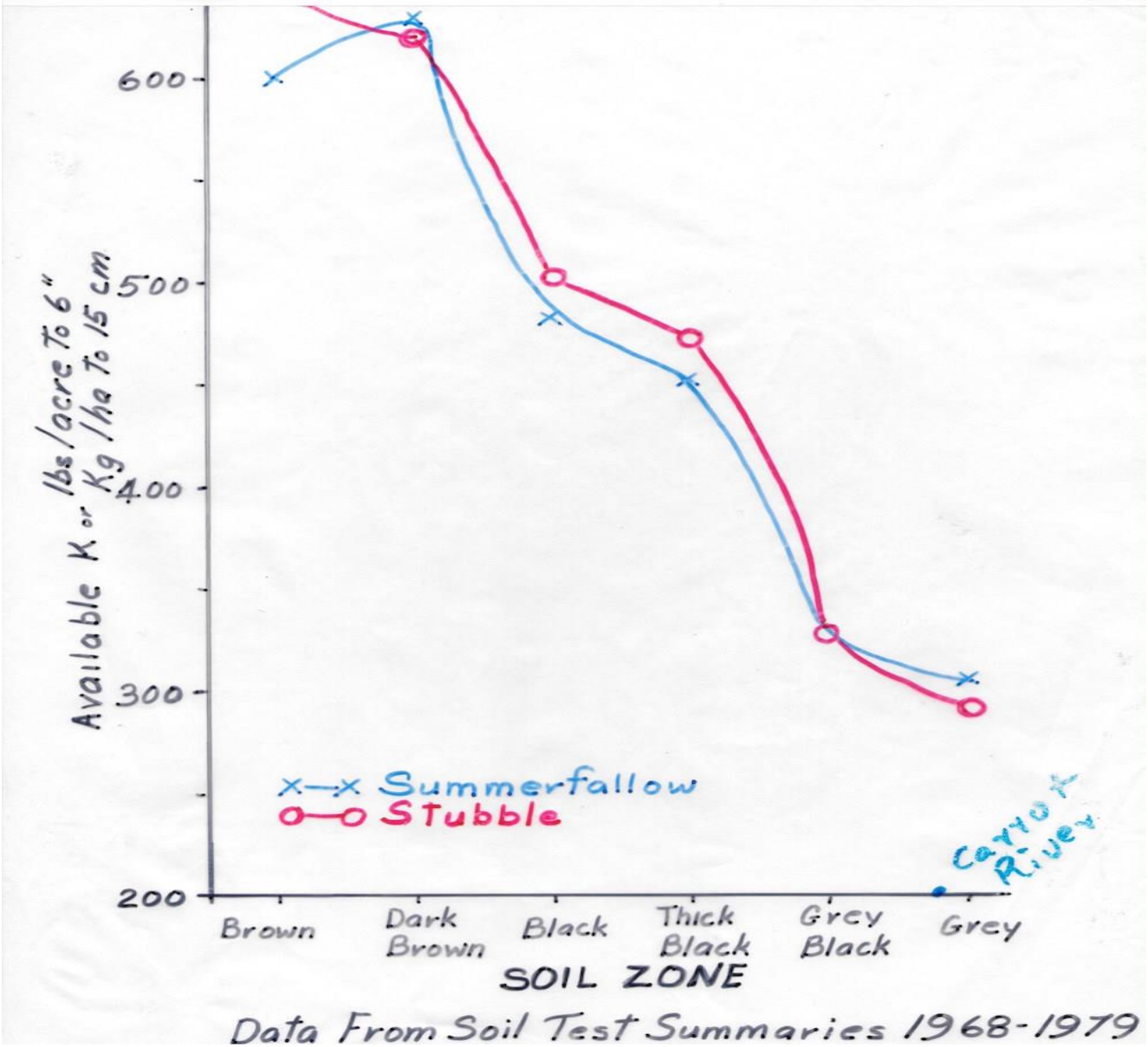
- **Carrot River soils on #13 Soils Map shows it all.**


K
No K
Carrot R
soils
K deficient
Nipawin
Codette
Pontrilas
Moose Range

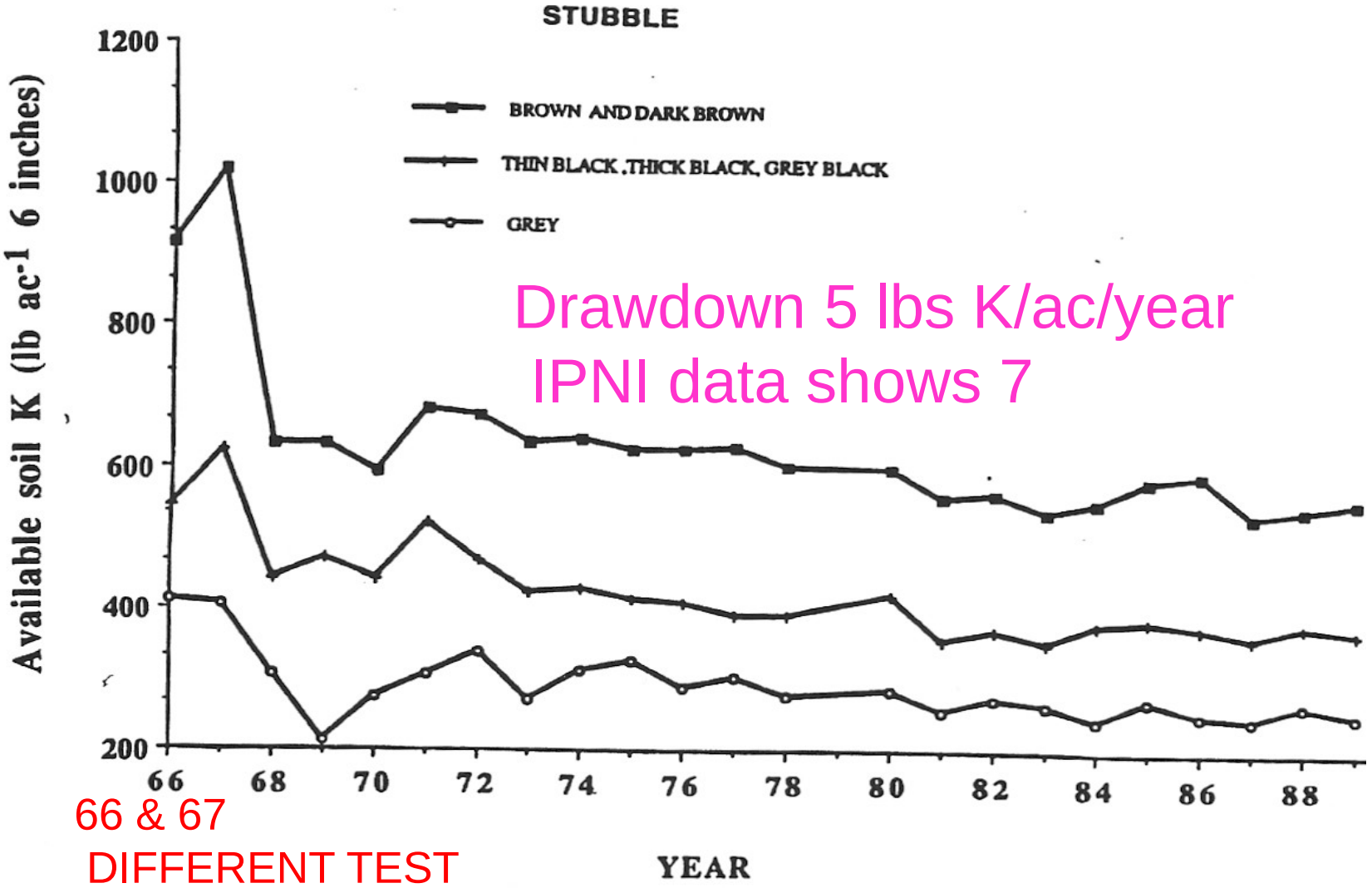
Cr: vl Soil K 61 lbs K 0-15 cm




Likely the same field ~ 2010
Photo by Lyle Cowell (Nutrien)
? 15 lbs K_2O/ac with seed
Barley – green plants are wild oats


600
500
400
300
200
Available K or lbs/acre To 6"
Kg /ha To 15 cm
x—x Summerfallow
o—o Stubble
Carrot River
Brown
Dark Brown
Black
Thick Black
Grey Black
Grey
SOIL ZONE
Data From Soil Test Summaries 1968-1979

Sask – old soil test summaries



Drawdown 5 lbs K/ac/year
IPNI data shows 7

66 & 67
DIFFERENT TEST

Figure 20. Soil K on stubble - Saskatchewan.

5. 1990s

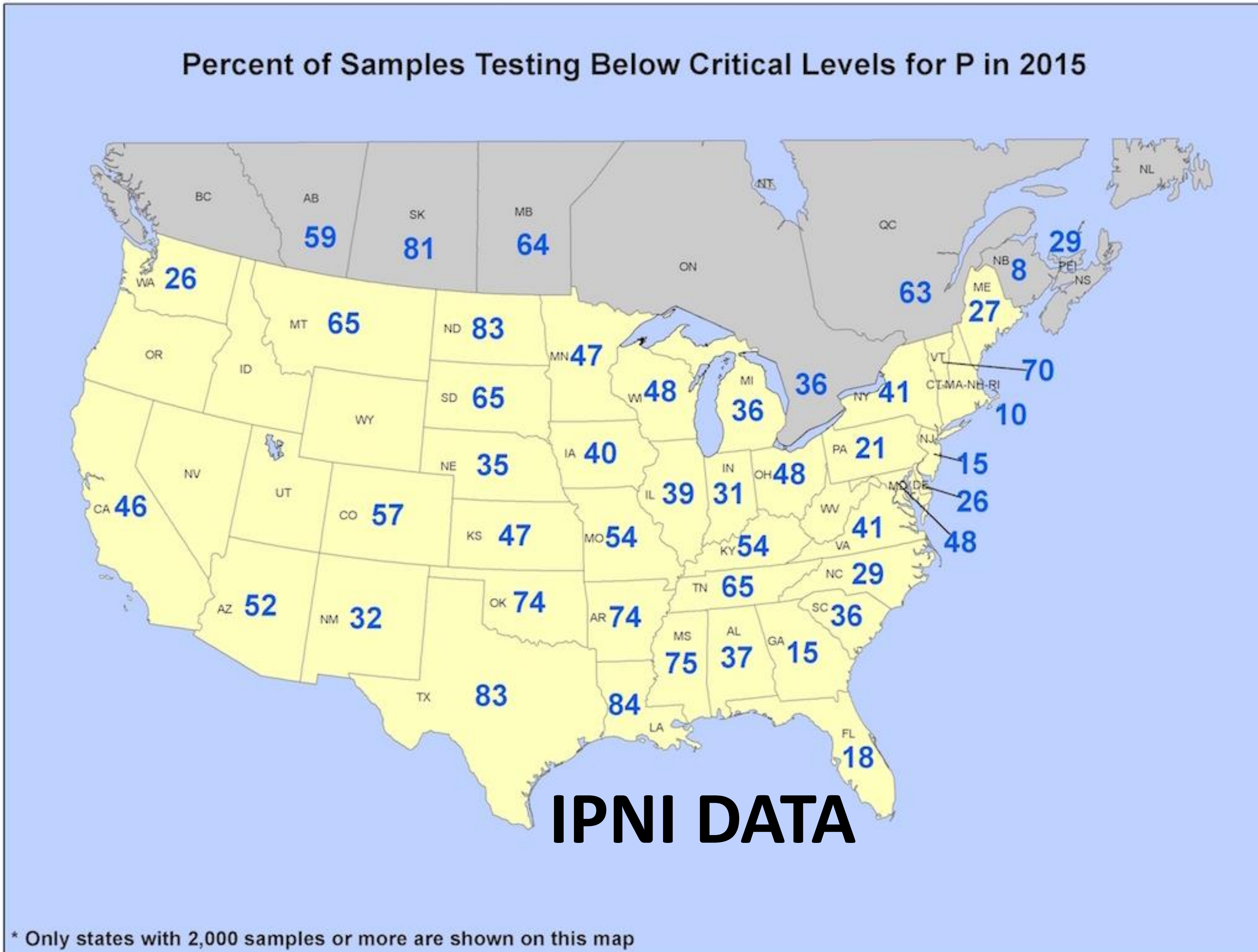
- **Continuous cropping**
- **Zero Till**
- **N rates high enough to get big yields**
- **Cereal, Oilseed, PULSE* rotation**
  *** thanks to Al Slinkard**

6. NOW

Since 2010 irrigation farming without the pivot compliments Mother Nature

Big N rates + big rain = Big Crops

Serious drawdown of soil P reserves. ? micros


Percent of Samples Testing Below Critical Levels for P in 2015
BC
AB 59
SK 81
MB 64
ON
QC 63
NL
NB 8
PEI 29
NS
WA 26
OR
ID
MT 65
ND 83
SD 65
WY
NE 35
NV
UT
CA 46
CO 57
KS 47
MN 47
IA 40
MO 54
WI 48
MI 36
36
IL 39
IN 31
OH 48
KY 54
TN 65
AZ 52
NM 32
OK 74
TX 83
AR 74
LA 84
MS 75
AL 37
GA 15
FL 18
SC 36
NC 29
VA 41
WV
PA 21
NY 41
ME 27
VT 70
CT-MA-NH-RI 10
NJ 15
DE 26
MD 48
IPNI DATA
* Only states with 2,000 samples or more are shown on this map

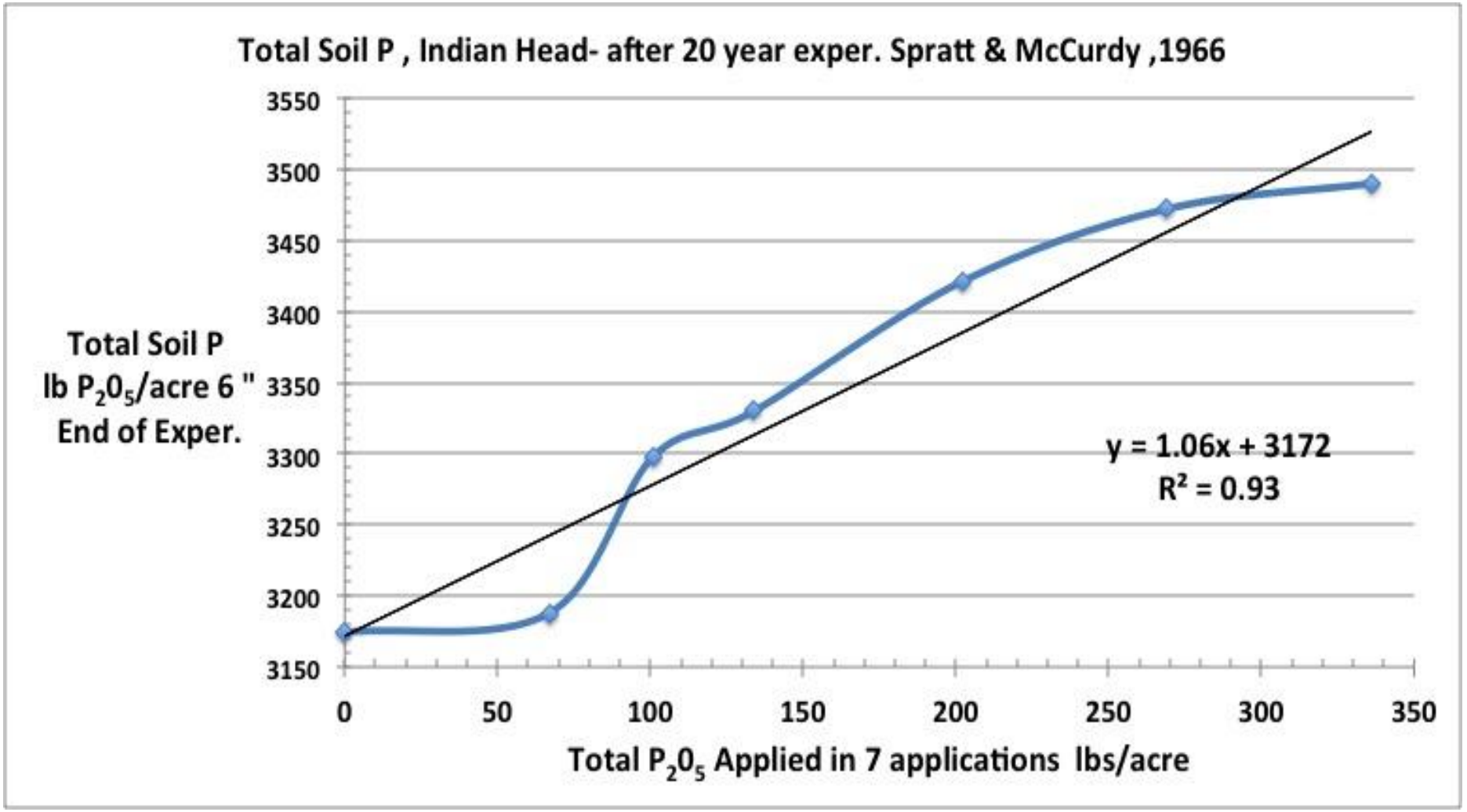
7. THE FUTURE

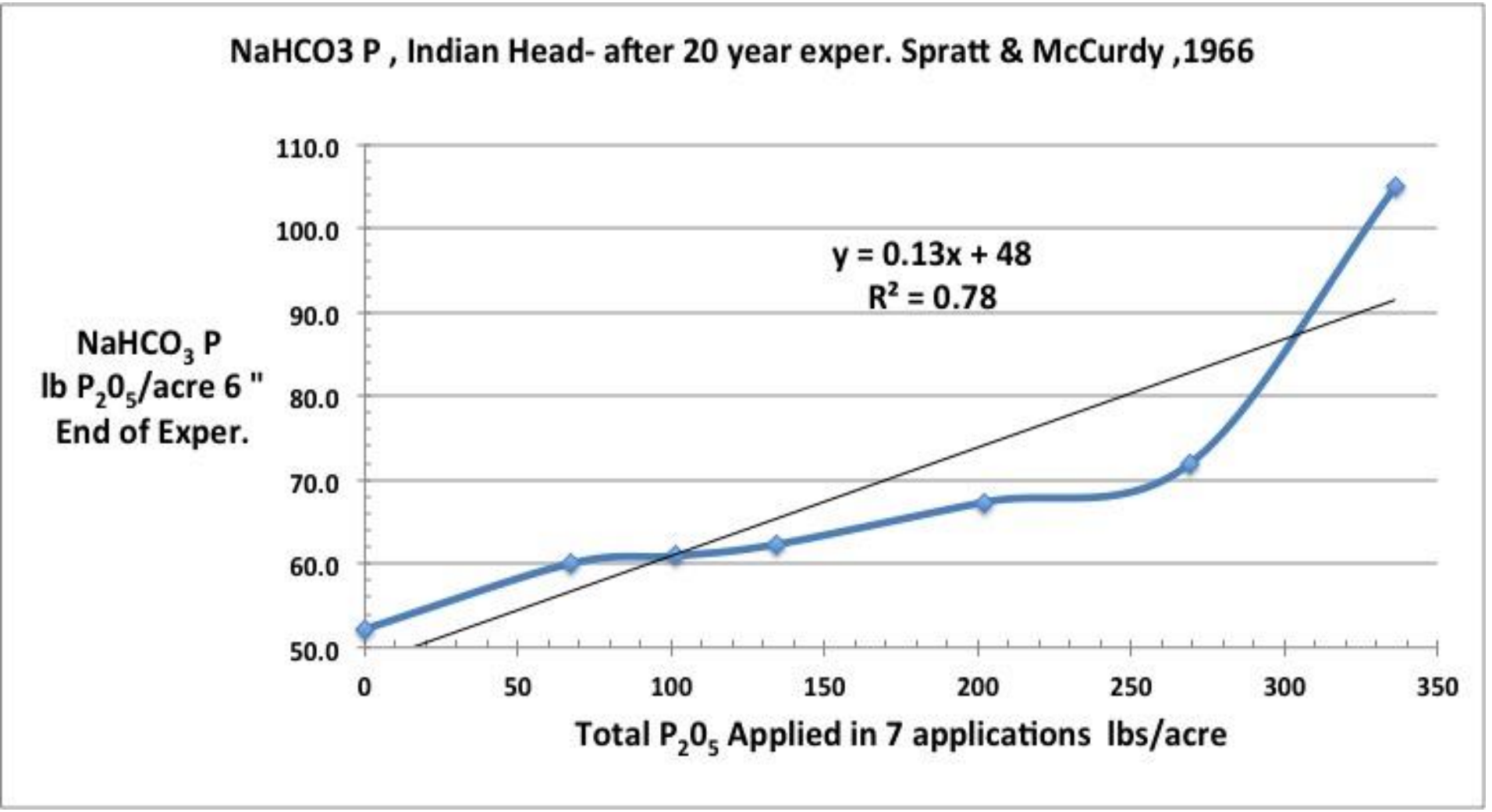
- **Soil building with P fertilizer – big rates if P gets cheaper**
- **P good candidate for variable rate**
- **Micros: some good recent greenhouse data- need to take to field**
- **???? Life after Glyphosate – should be thinking about**

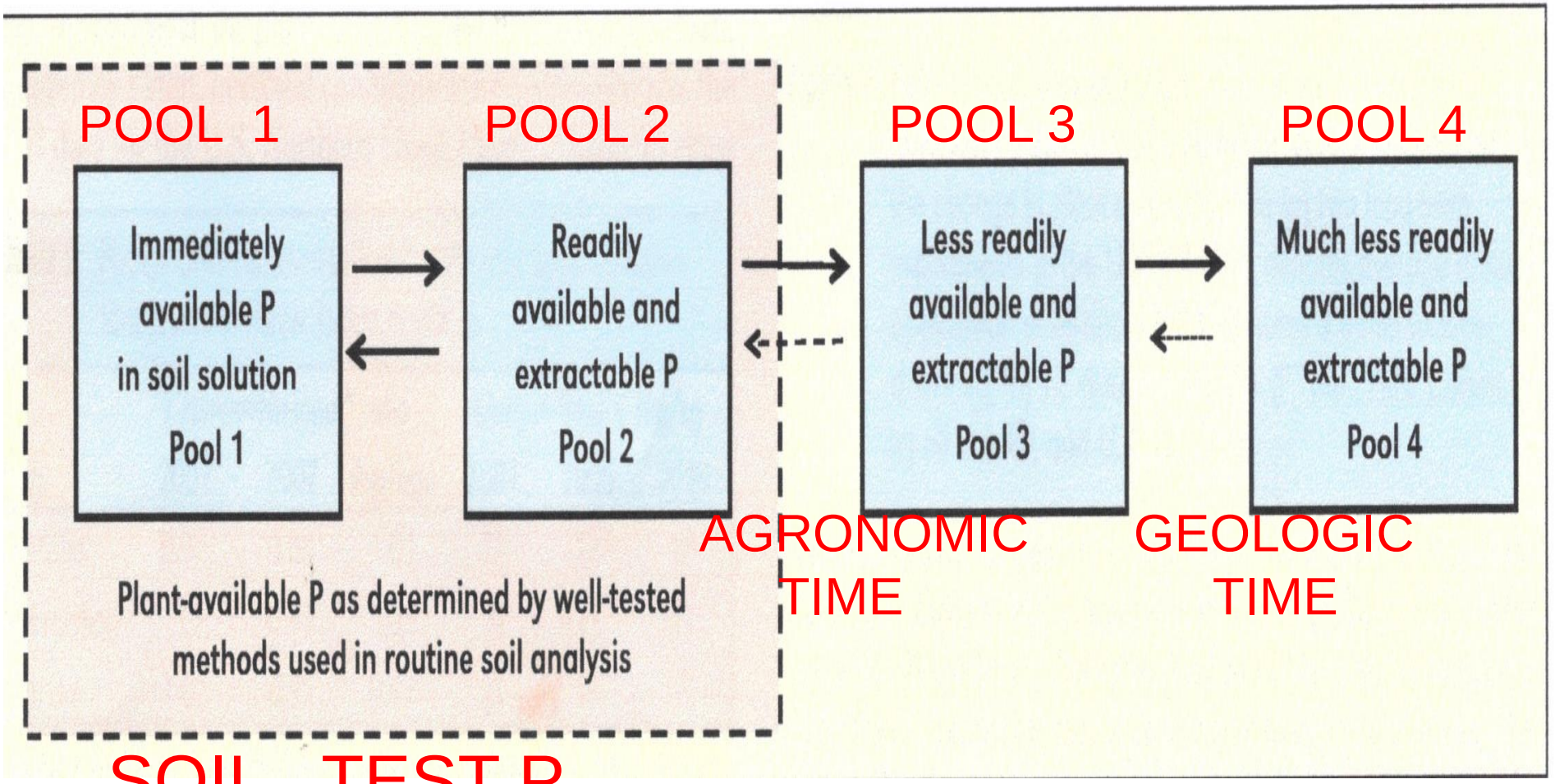
THE
END
??????????

..... Appendix – some additional info for browsing

Spratt & McCurdy,1966: Can.J. Soil Sci. 46: 29-36: Indian Head Clay
Wheat,Wheat, Fallow: 0, 9.6, 14.4, 19.2, 28.8, 38.4, 48 lbs P_2O_5/acre
to fallow wheat only . Experiment ran for 20 years.




NaHCO3 P , Indian Head- after 20 year exper. Spratt & McCurdy ,1966
NaHCO3 P
lb P2O5/acre 6 "
End of Exper.
110.0
100.0
90.0
80.0
70.0
60.0
50.0
y = 0.13x + 48
R² = 0.78
0
50
100
150
200
250
300
350
Total P2O5 Applied in 7 applications lbs/acre



From : Johnson et al. , 2014
Better Crops... Vol. 98 No.4 Page 22