

WHAT'S ALL THE STINK ABOUT BIOSOLIDS

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WHAT ARE BIOSOLIDS

BIOSOLIDS ARE THE BY-PRODUCTS OF THE BIOLOGICAL TREATMENT OF ORGANIC WASTES

THEY ARE COMPOSED OF ORGANIC MATERIAL, PLANT NUTRIENTS, AND OTHER ELEMENTS WHICH REFLECT THE ORIGIN OF THE WASTE

TYPICALLY FROM SEWAGE, HOWEVER OTHER ORGANIC WASTEWATERS CAN PRODUCE SIMILAR MATERIALS

AKA = SLUDGE

BIOSOLIDS CATEGORIES

(MUNICIPAL SEWAGE SLUDGE)

MANAGED FOR:

- **PATHOGENS**
- **HEAVY METALS**
- **VECTOR ATTRACTION**

CLASS "B"



CLASS "A"



APPLYING BIOSOLIDS IN WISCONSIN

NR 204 CREATED TO REGULATE THE USE AND DISPOSAL OF SEWAGE SLUDGE

THE INTENT OF THE CODE IS TO: *“PROTECT PUBLIC HEALTH, AND TO PROTECT AND RESTORE THE PHYSICAL, CHEMICAL, AND BIOLOGICAL INTEGRITY OF THE SOIL, AIR, AND WATER”*

LAND APPLICATION IS ENCOURAGED OVER LANDFILLING AND INCINERATION

APPROXIMATELY 80,000 ACRES ARE APPROVED FOR APPLICATION IN WISCONSIN

TOP TEN EXPRESSED CONCERNS FOR LAND APPLICATION OF BIOSOLIDS

- 1. WHAT ARE BIOSOLIDS**
- 2. WHO CONTROLS BIOSOLID APPLICATION**
- 3. IS THERE A HEALTH RISK**
- 4. WHAT IS NEEDED TO APPROVE A SITE**
- 5. BIOSOLIDS AND NUTRIENT PLANNING**
- 6. IS THERE TOO MUCH PHOSPHORUS**
- 7. ARE HEAVY METALS A PROBLEM**
- 8. WILL NITRATES LEACH TO GROUNDWATER**
- 9. LONG-TERM EFFECTS OF BIOSOLID USE**
- 10. HOW CAN WE FINE-TUNE BIOSOLID MGT.**

IS THERE A HEALTH RISK

**THERE IS A POTENTIAL FOR PATHOGENIC ORGANISMS
AND HEAVY METALS IN BIOSOLIDS**

**ACCESS TO CLASS “B” BIOSOLID AMENDED LAND IS
DETERMINED BY THE TYPE OF CROP GROWN AND
WHETHER THE BIOSOLID IS INCORPORATED INTO
THE SOIL**

**ADJUST SOIL pH AND LIMIT CONCENTRATION TO
REDUCE HEAVY METAL RISK**

DURATION BETWEEN APPLICATION AND HARVEST/GRAZING/ACCESS FOR CLASS B BIOSOLID (NR 204)

<u>CROP SITUATION</u>	<u>WAIT PERIOD (mo.)</u>
FOOD CROP TOUCHING SOIL (BEANS, MELONS)	14
FOOD CROP GROWN IN SOIL (POTATO, CARROT)	20/38
OTHER (FIELD CORN, HAY SWEET CORN)	1
LIVESTOCK GRAZING	1
PUBLIC ACCESS	
– HIGH POTENTIAL	12
– LOW POTENTIAL	1

SELECTED SITE RESTRICTIONS FOR BIOSOLID APPLICATION (NR 204)

<u>SITE CRITERIA</u>	<u>SURFACE</u>	<u>INCORP.</u>	<u>INJ.</u>
BEDROCK	3 ft.	3 ft.	3 ft.
GROUNDWATER	3 ft.	3 ft.	3 ft.
WATER SETBACK			
– 0-6 % SLOPE	200 ft.	150 ft.	100 ft.
– 6-12 % SLOPE	NA	200 ft.	150 ft.
SLOPE	0-6 %	0-12 %	0-12 %
COMM. WELL	1000 ft.	1000 ft.	1000 ft.
PRIVATE WELL	250 ft.	250 ft.	250 ft.
SCHOOLS	1000 ft.	1000 ft.	500 ft.
PROPERTY LINES	50 ft.	25 ft.	25 ft.

BIOSOLIDS AND HEAVY METALS

**HEAVY METALS IN BIOSOLIDS OCCUR
NATURALLY OR COME FROM INDUSTRY AND
VARY BETWEEN COMMUNITIES**

**HEAVY METALS ARE TIGHTLY HELD IN SOILS
ABOVE pH 5.5**

**CROP UPTAKE IS MINIMAL (ESPECIALLY IN
GRAIN)**

**NR 204 SETS CEILING CONCENTRATIONS AND
MAXIMUM LIFETIME LOADING LIMITS**

HEAVY METAL CEILING CONCENTRATIONS AND LIFETIME LOADING LIMITS FOR BIOSOLID APPLICATION (NR 204)

ELEMENT	CEILING CONC. (ppm)	LOADING (lb/a)
ARSENIC	75	36
CADMIUM	85	34
COPPER	4300	1339
LEAD	840	268
MERCURY	57	15
MOLYBDENUM	75	?
NICKEL	420	375
SELENIUM	100	89
ZINC	7500	2500



HEAVY METALS IN WIS. BIOSOLIDS

ELEMENT	CEILING CONC.	APPLETON	WAUPACA	WEYAWEGA
	----- ppm -----			
ARSENIC	75	3.8	7.3	2.0
CADMIUM	85	2.0	8.1	0.5
COPPER	4300	403	700	68
LEAD	840	74	41	6.8
MERCURY	57	1.2	1.1	0.4
MOLYB.	75	2.3	bd	6.8
NICKEL	420	24	16	8.0
SELENIUM	100	1.4	2.7	1.1
ZINC	7500	709	820	123

WHAT IS NEEDED TO APPROVE A SITE

- 1. LOCATION OF THE SITE DELINEATED ON AN APPROVED MAP SHOWING SEPARATION DISTANCES**
- 2. OWNERSHIP OF THE SITE**
- 3. RESULTS OF A CURRENT UWEX SOIL TEST**
- 4. NUTRIENT PLAN IF N > 30 % OF CROP NEED**
- 5. PRESENT USE OF SITE AND ADJACENT PROPERTIES**
- 6. TOTAL ACREAGE OF SITE**
- 7. CROP TO BE GROWN**

BIOSOLIDS AND NUTRIENT PLANNING

**BIOSOLID APPLICATION RATE BASED ON PLAN
PREPARED ACCORDING TO NRCS TECH. GUIDE 590**

**MAXIMUM APPLICATION RATE BASED ON THE N
RECOMMENDATION AS IDENTIFIED BY THE SOIL
TEST AND CROP TO BE GROWN (NO 20 % OVERAGE)**

**ACCOUNT FOR N FROM LEGUMES, MANURE, AND
OTHER SOURCES**

**ASSUMED THAT 25% OF ORGANIC N AND ALL
AMMONIUM-N AVAILABLE IN YEAR ONE**

NUTRIENT CONTENT OF THREE BIOSOLIDS

PARAMETER	APPLETON	WAUPACA	WEYAWEGA
	----- % dmb -----		
TOTAL SOLIDS	20.8	3.7	32.6
TOTAL N	3.2	4.8	2.4
NH₄ -N	0.7	1.3	0.5
P	1.9	2.2	2.0
K	0.1	0.2	0.1

BIOSOLIDS AND PHOSPHORUS LOADING

**1 ppm P IN EFFLUENT REQUIRED, THEREFORE P IS
CONCENTRATED IN BIOSOLID**

**BIOSOLID APPLICATION RATES BASED ON CROP N NEED
WILL OVER APPLY P**

**EXEMPTION ALLOWS BIOSOLID TO BE APPLIED
ACCORDING TO NR204, NOT NR151**

- PERMITS APPLICATION TO HIGH P SOILS

MANAGEMENT:

- APPLY TO LOWER P TESTING FIELDS PERIODICALLY

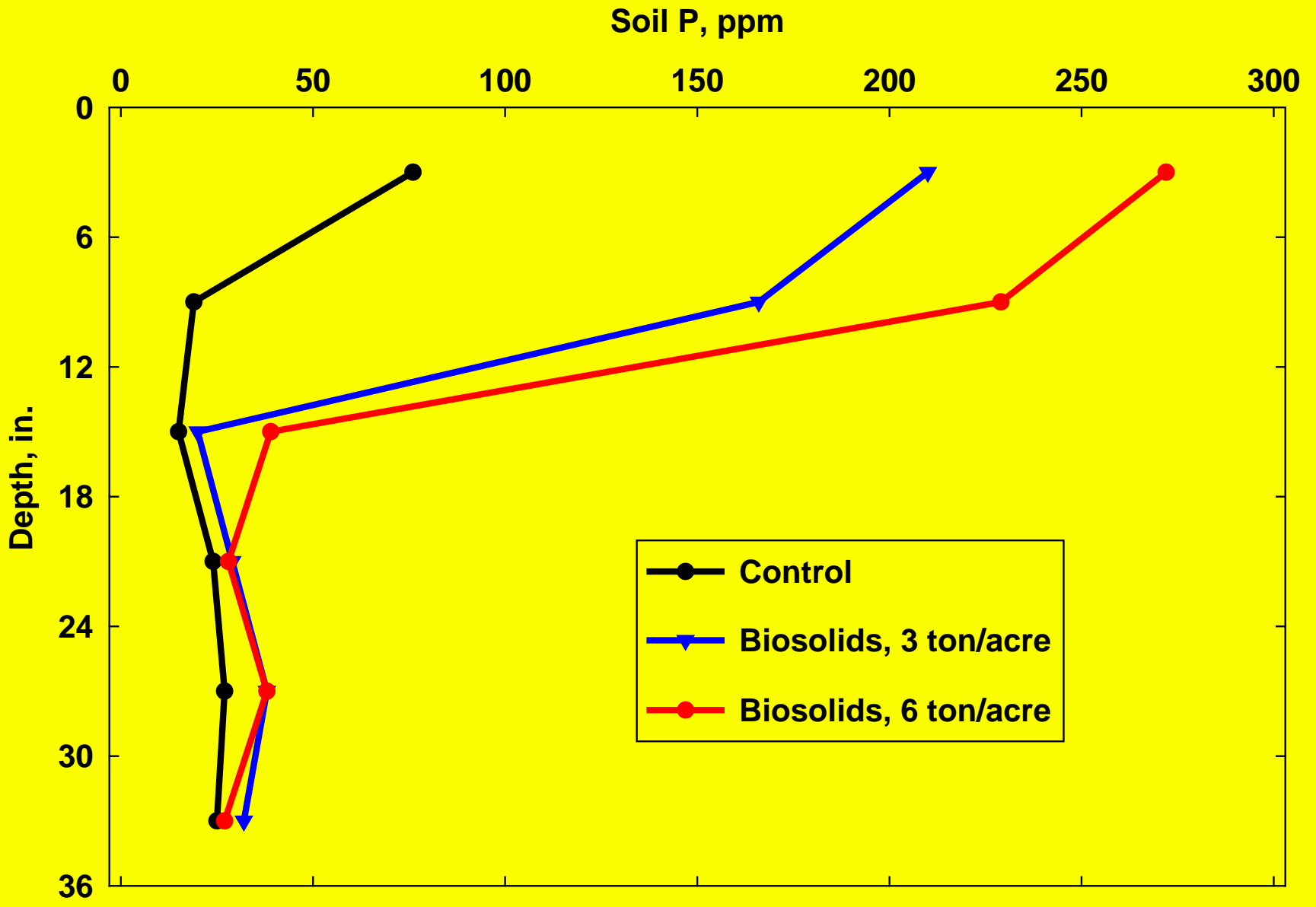
- USE SOIL CONSERVATION PRACTICES

- PLANT CROPS THAT REMOVE LARGE AMOUNTS OF P

PHOSPHORUS INPUTS, REMOVALS, AND CHANGE IN SOIL P IN BIOSOLIDS TREATMENTS, ELKHORN, WI, 1979-2002 (L.G. BUNDY)

Treatment	Biosolids P added	P crop removal *	Soil test P	
			1979	2002
	----- lb P/acre -----		----- ppm -----	
Control	0	1080	115	76
Biosolids, 3 t/a	2100	1080	---	210
Biosolids, 6 t/a	4200	1080	---	272

* Estimated @ 45 lb P/acre /yr



Effect of long-term biosolids application (1979 - 1993) on soil test P distribution with depth at Elkhorn, WI, December 2002.

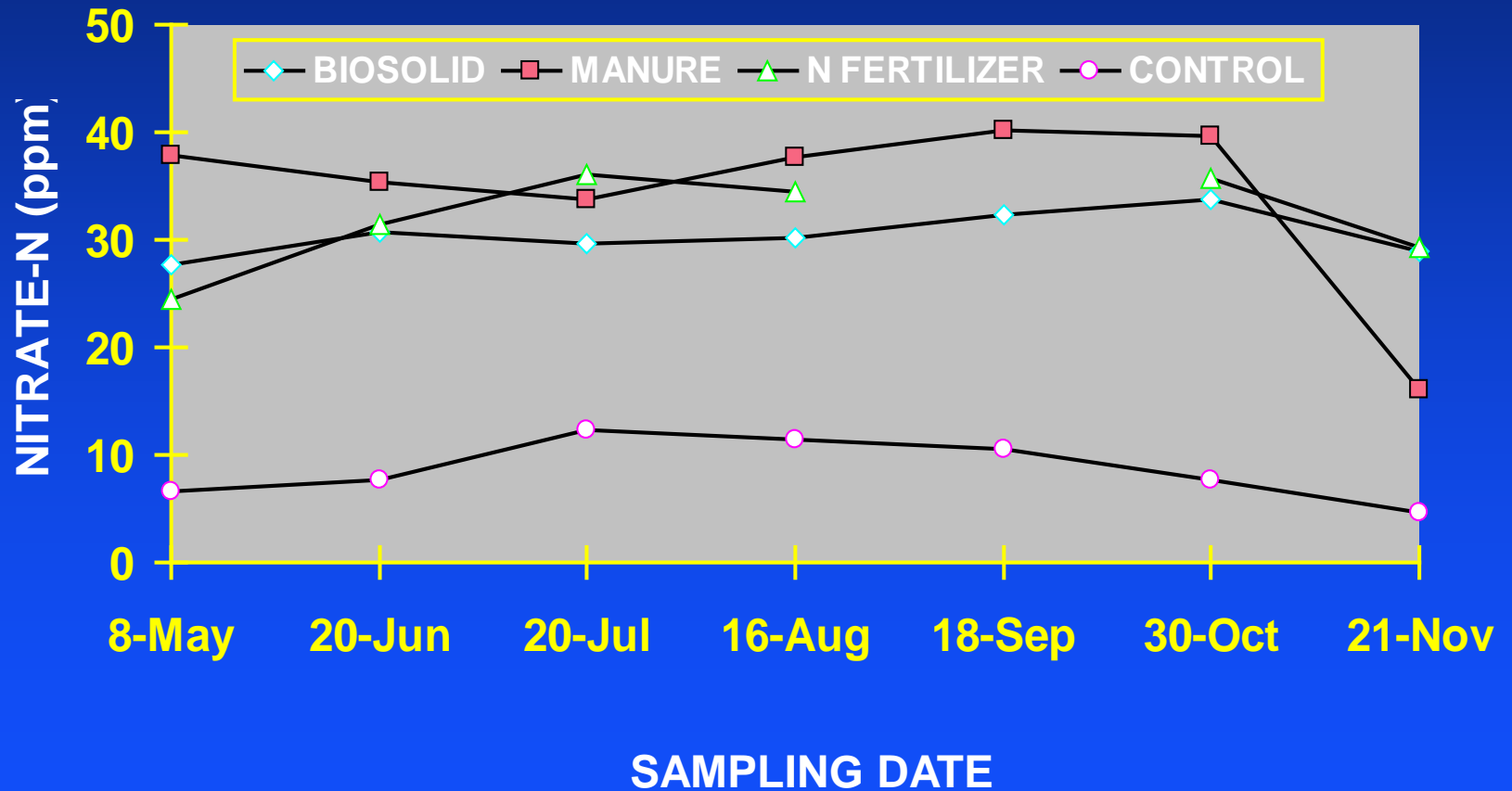
WILL NITRATE LEACH TO GROUNDWATER WHERE BIOSOLIDS ARE APPLIED

**NITRATE LEACHING IS A CONCERN
REGARDLESS OF NUTRIENT SOURCE**

**FOLLOWING SOIL TEST RECOMMENDATION
WILL MINIMIZE CONCERN**

**CONSIDER DELAYING FALL BIOSOLID
APPLICATION ON SANDY SOILS UNTIL SOIL
TEMPERATURE IS BELOW 50 F**

NITRATE-N MEASURED IN POROUS CUP SAMPLERS IN BIOSOLID, MANURE AND FERTILIZER AMENDED PLOTS, MADISON, WIS., 1995 (A. PETERSON)



LONG-TERM BIOSOLID APPLICATION AND CROP PRODUCTION

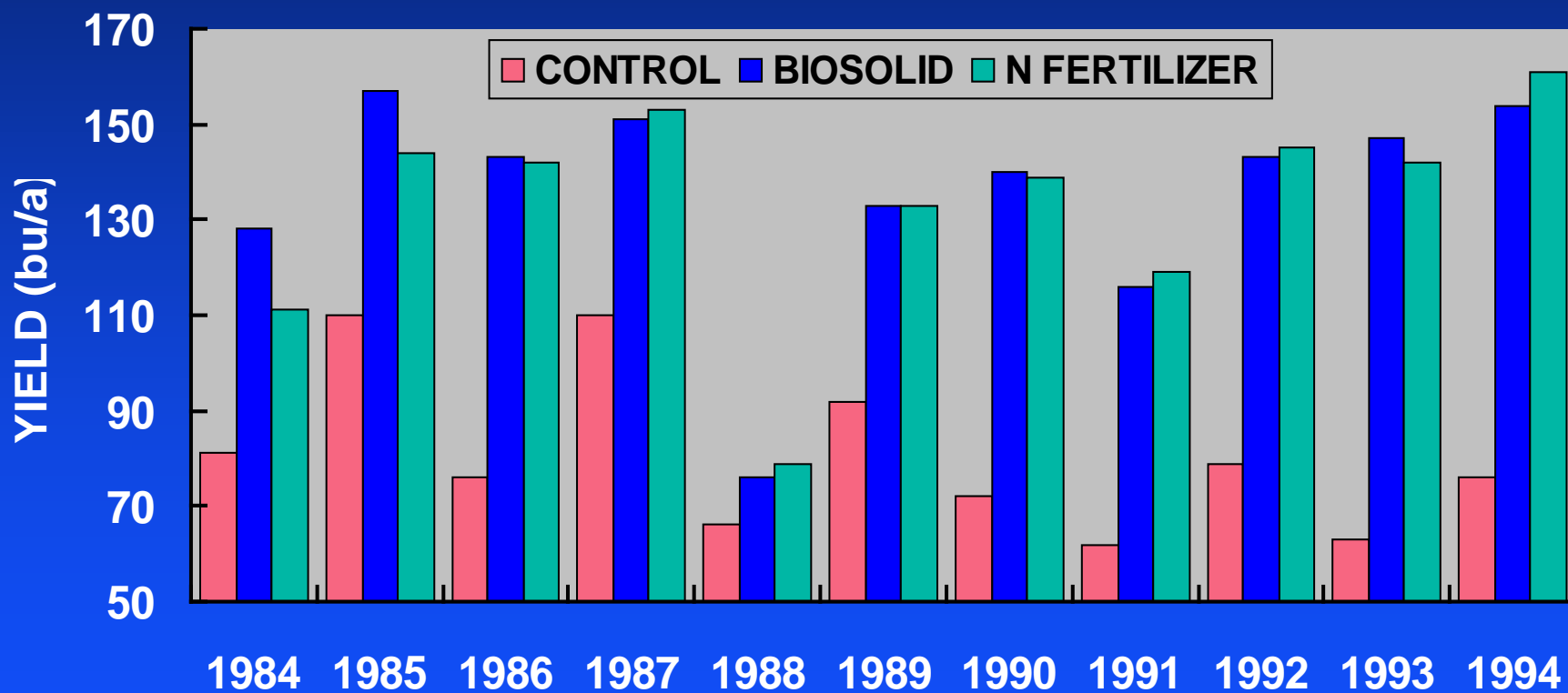
*NOTE TILLAGE DONE
BY INJECTOR*



LAKELAND FARM SITE, ELKHORN, WIS.



LONG-TERM EFFECT OF BIOSOLID APPLICATION ON CORN YIELD, ELKHORN, WIS. 1984-1994 (A. PETERSON)



***ASK GENE OR MARK HOW TO DETERMINE
THE VALUE OF A LIME-AMENDED BIOSOLID***

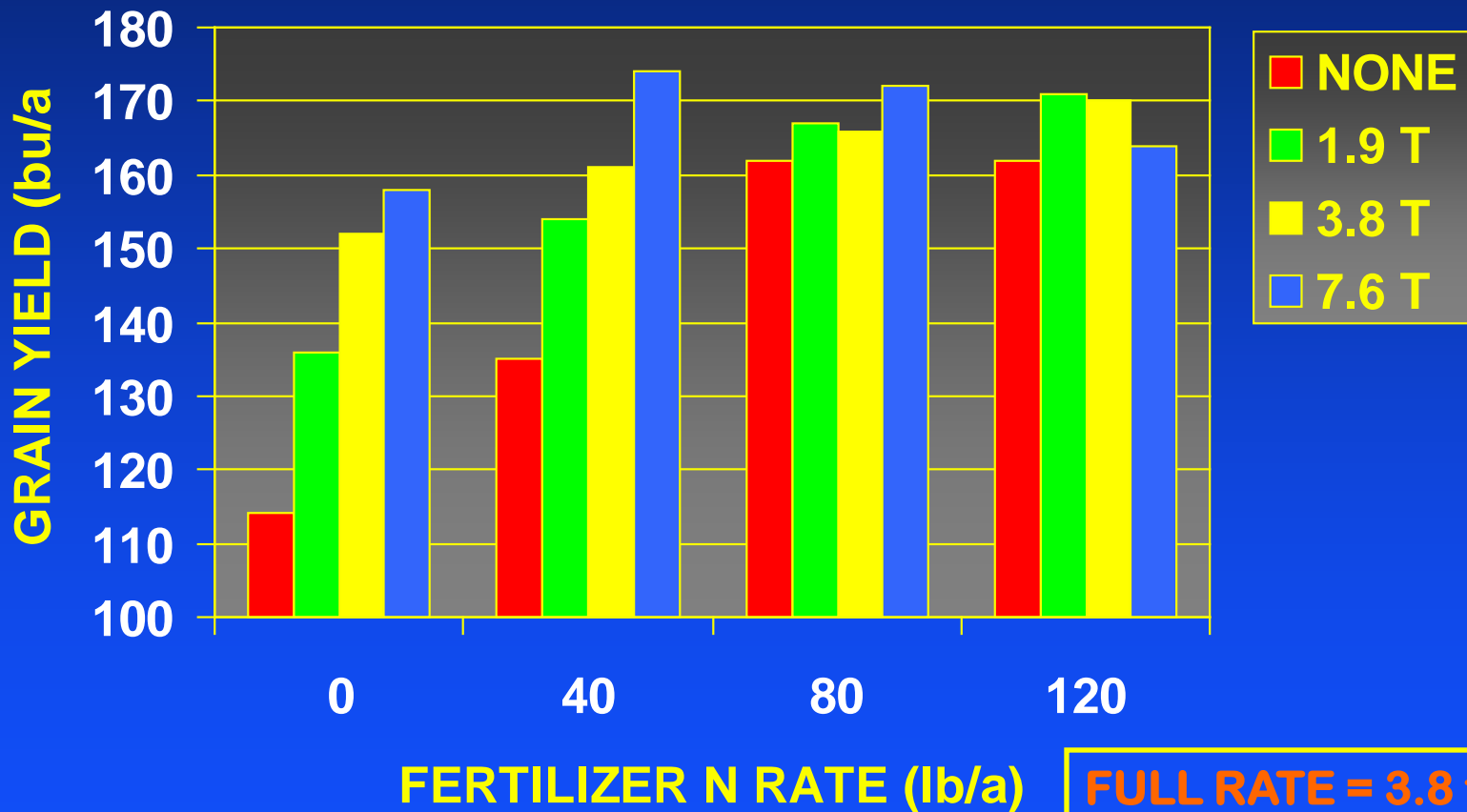


EFFECT OF A LIME-AMENDED BIOSOLID ON SOIL pH, ARLINGTON, WIS. (2000-2002)

TREATMENT	2000	2001	2002
CONTROL	5.8	5.9	6.6
1.9 T DM/A	6.1	6.2	6.6
3.8 T DM/A	6.7	6.9	6.8
7.6 T DM/A	6.9	7.0	7.1

NI = 37.2

CORN RESPONSE TO A LIME-AMENDED BIOSOLID, ARLINGTON, WIS. 2000-2001 (2 YEAR AVG.)



FULL RATE = 3.8 t/a
(25 lb AVAIL. N/a)

FINE-TUNING BIOSOLIDS MANAGEMENT

- 1. WORK WITH MUNICIPALITIES OR COMPANIES TO EVALUATE THEIR MATERIAL**
- 2. INSIST ON PROPER APPLICATION ON APPROVED SITES ONLY**
- 3. USE UWEX NUTRIENT RECOMMENDATIONS AND ADJUST FOR NUTRIENT CREDITS**
- 4. APPLY TO LOWER P TESTING FIELDS FIRST**
- 5. MAINTAIN CROP RESIDUE AND OTHER CONSERVATION PRACTICES**
- 6. ROTATE TO DIFFERENT FIELDS EACH YEAR**