Western Region Biosolid Program

Clackamas Short School 2017

Department of Environmental Quality

Paul Kennedy

Eugene, Oregon

(541) 687-7439

If you can read this tghen Alzheimer's is a long , way down the road before it ever gets anywhere near you.

- **I cdnuolt blveiee that I cluod aulaclty uesdnatnrd what I was rdanieg. The phaonmneal pweor of the hmuan mnid, aoccdrnig to a rscheearch at Cmabrigde Uinervtisy, it dseno't mtaetr in what oerdr the ltteres in a word are, the olny iproamtnt tihng is that the frsit and last ltteer be in the rghit pclae. The rset can be a taotl mses and you can still raed it whotuit a pboerlm. This is bcuseaethe huamn mnid deos not raed ervey lteter by istlef, but the word as a wlohe. Azanmig huh? Yaeh and I awlyas tghuhot slpeling was ipmorantt!**

Biosolid Land Application

Paul Kennedy
Eugene DEQ
541.687.7439

kennedy.paul@deq.state.or.us

Site Authorization Documentation Checklist for the Land Application of Biosolids

SITE INFORMATION

- ☐ Vicinity map (e.g., tax lot or county assessor map) indicating location of proposed land application site and acreage, including gross and net (any area or buffer areas not available for biosolids application) acreage.
- ☐ Site location including street address (if not available, then state directions to site), tax reference number, section, township, range, and county.
- ☐ Site owner name, address, and phone number. Site renter name if applicable.
- ☐ Detailed map showing property boundaries, and setbacks from roadways, occupied buildings, other manmade features, surface waters, and domestic water source or wells.
- ☐ Distance (in feet) from biosolids land application site boundary to nearest residence(s), other publicly occupied building(s) (e.g., retail store, school, apartment building), and public use areas such as parks or hiking trails.
- ☐ Site management agreement between the biosolids generating source and the site owner(s) of record and/or authorized representative operator.

SOIL INFORMATION

- ☐ USDA Natural Resources Conservation Service (NRCS) soil survey map.
- ☐ Copy of the soil survey map description for each soil series indicated on a NRCS map at the proposed land application site.
- ☐ *Not required but if available*, the most recent soil analysis (of parameters listed below for biosolids).

AGRICULTURAL AND CROP MANAGEMENT INFORMATION

- ☐ Crop to be grown at the site and intended market (e.g., barley for seed, feed, brewing, food or commodity sale).
- ☐ Crop assimilative capacity (nitrogen).
- ☐ Crop sequences and the time(s) of year biosolids will be land applied to the crop site.
- ☐ Crop harvest method (e.g., silage vs. pasture) and tilling practices.
- ☐ Irrigation practices and fertilizer use.

BIOSOLIDS AND LAND APPLICATION INFORMATION

- ☐ Biosolids characteristics from the most recent biosolids analyses, including data on:
  - Total kjeldahl nitrogen, nitrate nitrogen, ammonium nitrogen, total phosphorus, potassium, total solids, volatile solids (expressed as percent dry weight), pH; and
  - Arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, and if required, silver and chromium (expressed as mg/kg dry weight).
- ☐ Forecast of biosolids application rate (gallons or dry tons/acre/year).
- ☐ Nutrient and metal loadings based on biosolids analyses and total acreage land applied for the year.
- ☐ Calculations used for forecasting annual biosolids application rate.
- ☐ Site life calculations (if applicable).
- ☐ Field staging and/or storage practices (if applicable).

Neighbor Notification Letter

Under the EAP 40 CFR Part 122 regulations the public needs to be notified of your intent to land apply biosolids in their community.

- Rudys Properties Inc.
- C-44 S-16 RR#1
- Fort ST. John BC V1J4M
-
- SUBJECT: **Notification of Biosolids Land Application at Beneficial Reuse Site**
-
- Dear Sir or Madam:
-
- This letter is to inform you of future biosolids applications on agricultural land near or bordering your property. The agricultural site identified as Elam Farms – Cook Field is owned and farmed by David Elam of Elam Farms. The site is located near Cook and Duckflat Roads. The site is being considered for authorization by the Department of Environmental Quality (DEQ) as beneficial reuse site for the City of Salem's Biogro Program.
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- The Biogro Program has been involved with farmers in this area for 35 years, and has developed an excellent reputation in the biosolids industry. Biosolids provide nutrients and contribute to long-term improvements in soil fertility. Approximately 95 percent of biosolids generated in Oregon are land applied on DEQ-approved beneficial reuse sites for agricultural purposes including turf, grass seed, pasture, and hay fields.
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- The Biogro Program strictly adheres to all federal and state biosolids regulatory requirements as defined in Environmental Protection Agency Part 503 and Oregon Administrative Rules Chapter 340, Division 50 regulations. The Biogro Program also maintains a Biosolids Management Plan which mandates best management practices for the beneficial reuse of biosolids.
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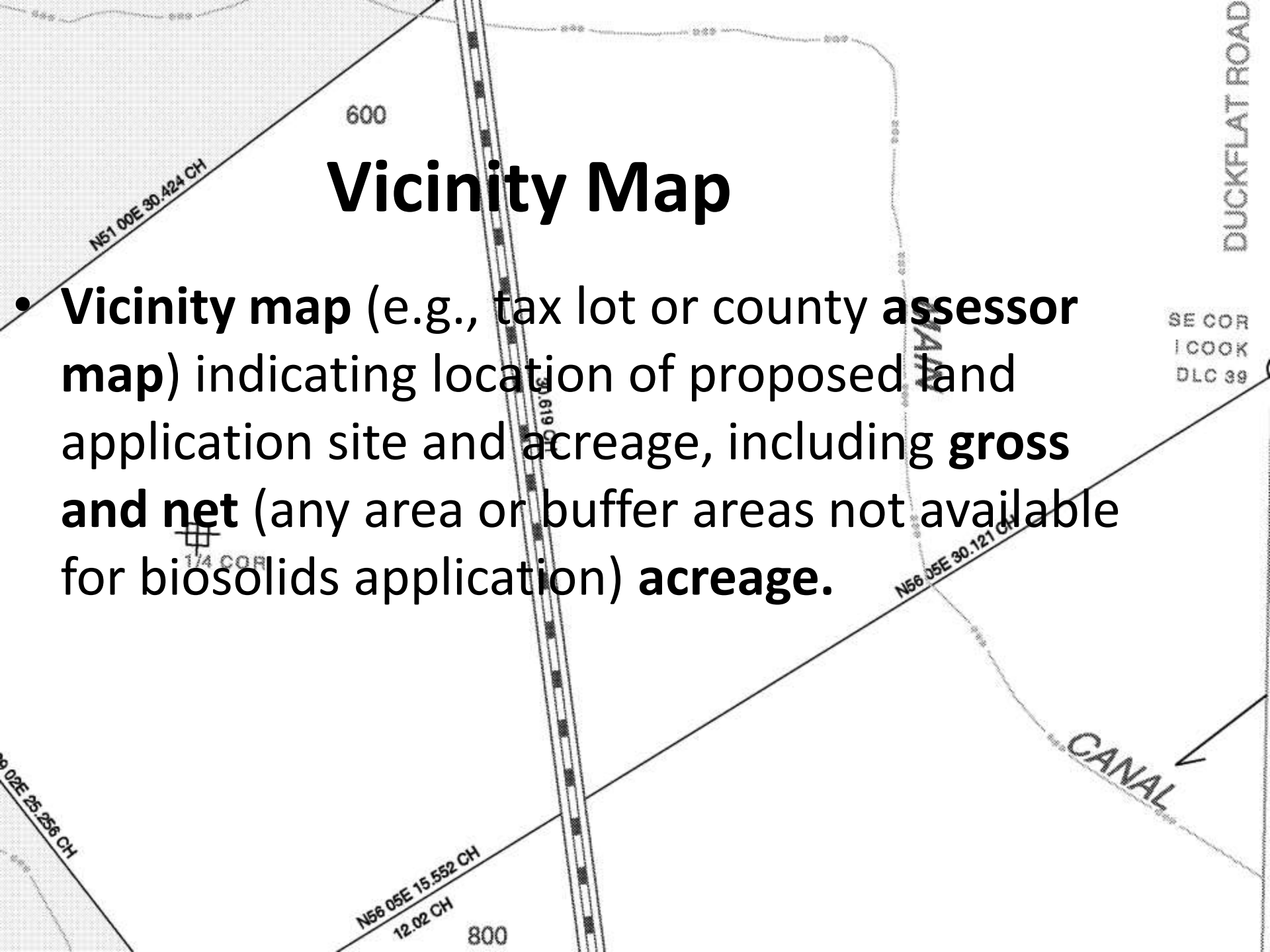
- Enclosures include a site location map and a DEQ Fact Sheet entitled "Biosolids: A Beneficial Resource". For additional information on the Biogro Program, please don't hesitate to call me at 503-588-6380 or Paul Kennedy, Eugene DEQ 541-687-7439.
-
- Sincerely,
-
-
-
- Mark D. Johnston
-
- Residuals Supervisor
-
- TEC/IOD:\\WILLOWLAKE\WLFiles\040-BIOGRO\3. Applications - Authorizations - Inventory\3. Recent Authorizations & Renewals\Elam - Cook Field\Template Letters\6. Site Authorization Notification Letter Template.doc
- Enclosures:
- 1. Location Map
- 2. DEQ Fact Sheet: Biosolids: A Beneficial Resource
- cc: Files

SITE INFORMATION

- **Vicinity map** (e.g., tax lot or county assessor map) indicating location of proposed land application site and acreage, including gross and net (any area or buffer areas not available for biosolids application) acreage.
- **Site location** including street address (if not available, then indicate directions to site), tax reference number, Lat. and Long., township, range, section and county.
- **Site owner** name, address, and phone number. Site renter name if applicable.
- **Detailed map** showing property boundaries, and setbacks from roadways, occupied buildings, other manmade features, surface waters, and domestic water source or wells.
- **Distance** (in feet) from biosolids land application site boundary to nearest residence(s), other publicly occupied building(s) (e.g., retail store, school, apartment building), and public use areas such as parks or hiking trails.
- **Site management agreement** between the biosolids generating source and the site owner(s) of record and/or authorized representative operator.



Vicinity Map

- **Vicinity map** (e.g., tax lot or county **assessor map**) indicating location of proposed land application site and acreage, including **gross and net** (any area or buffer areas not available for biosolids application) **acreage.**

Site Map

- **Site location** including **street address** (if not available, then indicate directions to site), **tax reference number, Lat. And Long., township, range, section and county.**
- **Site owner name, address, and phone** number. Site renter name if applicable.

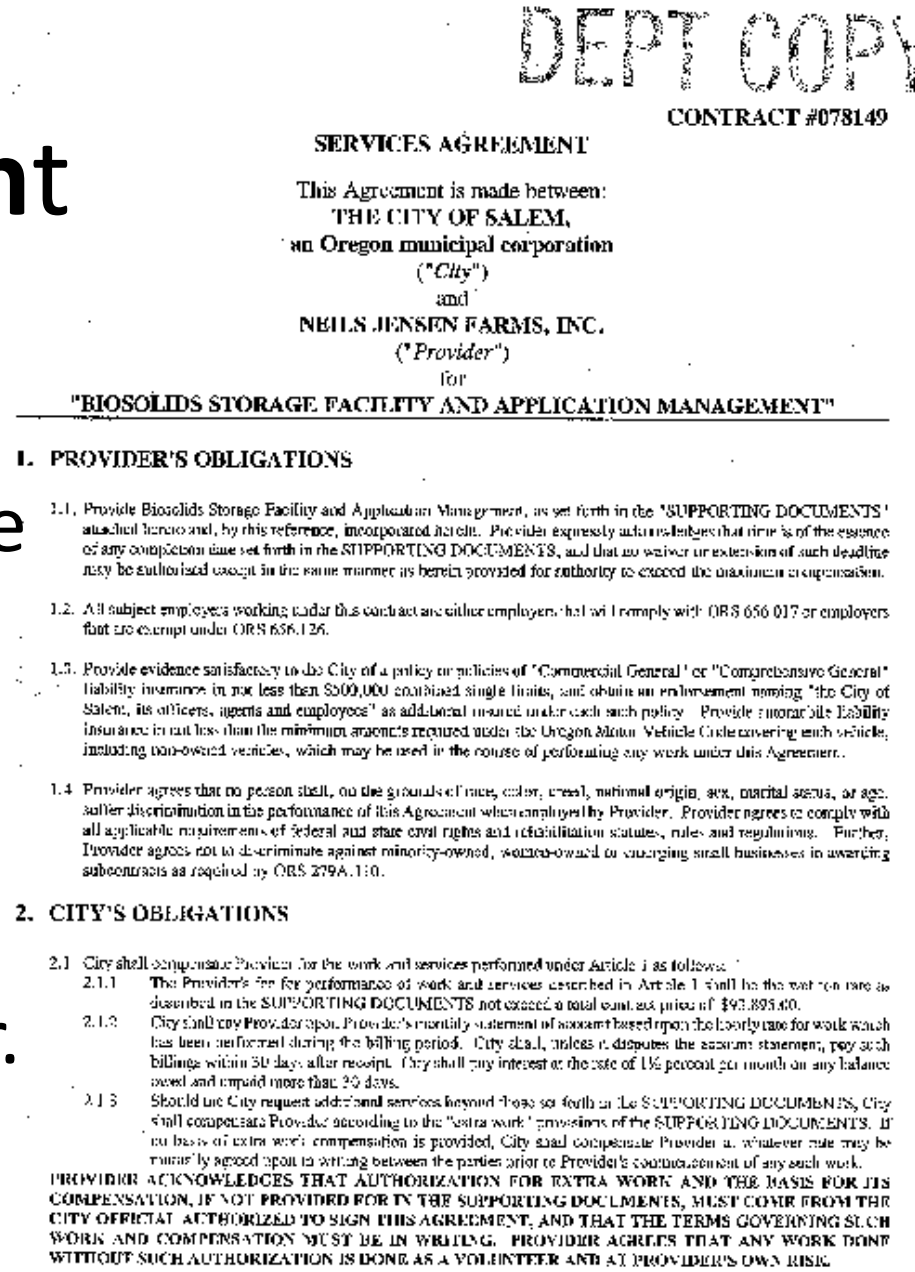
Distance to Wells, Waters of the State, Dwellings, and On-Site Systems

Detailed map showing **property boundaries**, and **setbacks** from roadways, occupied buildings, other manmade features, surface waters, and **domestic water source or wells**.

Distance (in feet) from biosolids land application **site boundary to nearest residence(s),** other publicly occupied building(s) (e.g., housing track, retail store, school, hospital, apartment building), and **public use areas** such as mall, parks or hiking trails.

Site Use Agreement

- **Site management agreement** between the biosolids generating **source** and the **site owner**(s) of record and/or authorized representative operator.



DEPT COPY

CONTRACT #078149

SERVICES AGREEMENT

This Agreement is made between:
THE CITY OF SALEM,
an Oregon municipal corporation
("*City*")
and
NEILS JENSEN FARMS, INC.
("*Provider*")
for
"BIOSOLIDS STORAGE FACILITY AND APPLICATION MANAGEMENT"

1. PROVIDER'S OBLIGATIONS

1.1. Provide Biosolids Storage Facility and Application Management, as set forth in the 'SUPPORTING DOCUMENTS' attached hereto and, by this reference, incorporated herein. Provider expressly acknowledges that time is of the essence of any completion date set forth in the SUPPORTING DOCUMENTS, and that no waiver or extension of such deadline may be authorized except in the same manner as herein provided for authority to exceed the maximum compensation.

1.2. All subject employers working under this contract are either employers that will comply with ORS 656.017 or employers that are exempt under ORS 656.126.

1.3. Provide evidence satisfactory to the City of a policy or policies of "Commercial General" or "Comprehensive General" liability insurance in not less than $500,000 combined single limits, and obtain an endorsement naming "the City of Salem, its officers, agents and employees" as additional insured under each such policy. Provide motorvehicle liability insurance in not less than the minimum amounts required under the Oregon Motor Vehicle Code covering each vehicle, including non-owned vehicles, which may be used in the course of performing any work under this Agreement..

1.4 Provider agrees that no person shall, on the grounds of race, color, creed, national origin, sex, marital status, or age, suffer discrimination in the performance of this Agreement when employed by Provider. Provider agrees to comply with all applicable requirements of federal and state civil rights and rehabilitation statutes, rules and regulations. Further, Provider agrees not to discriminate against minority-owned, women-owned or emerging small businesses in awarding subcontracts as required by ORS 279A.110.

2. CITY'S OBLIGATIONS

2.1 City shall compensate Provider for the work and services performed under Article 1 as follows:

2.1.1 The Provider's fee for performance of work and services described in Article 1 shall be the set on rate as described in the SUPPORTING DOCUMENTS not exceed a total contract price of $93,895.00.

2.1.2 City shall pay Provider upon Provider's monthly statement of account based upon the hourly rate for work which has been performed during the billing period. City shall, unless it disputes the account statement, pay such billings within 30 days after receipt. City shall pay interest at the rate of 1½ percent per month on any balance owed and unpaid more than 30 days.

2.1.3 Should the City request additional services beyond those set forth in the SUPPORTING DOCUMENTS, City shall compensate Provider according to the "extra work" provisions of the SUPPORTING DOCUMENTS. If no basis of extra work compensation is provided, City shall compensate Provider at whatever rate may be mutually agreed upon in writing between the parties prior to Provider's commencement of any such work.

PROVIDER ACKNOWLEDGES THAT AUTHORIZATION FOR EXTRA WORK AND THE BASIS FOR ITS COMPENSATION, IF NOT PROVIDED FOR IN THE SUPPORTING DOCUMENTS, MUST COME FROM THE CITY OFFICIAL AUTHORIZED TO SIGN THIS AGREEMENT, AND THAT THE TERMS GOVERNING SUCH WORK AND COMPENSATION MUST BE IN WRITING. PROVIDER AGREES THAT ANY WORK DONE WITHOUT SUCH AUTHORIZATION IS DONE AS A VOLUNTEER AND AT PROVIDER'S OWN RISK.

SOIL INFORMATION

- USDA Natural Resources Conservation Service (**NRCS) soil survey map**.
- Copy of the soil **survey map description for each soil series** indicated on a NRCS map at the proposed land application site.
- *Not required but if available*, the **most recent soil analysis** (of parameters listed below for biosolids).

NRSC Soils Map

N

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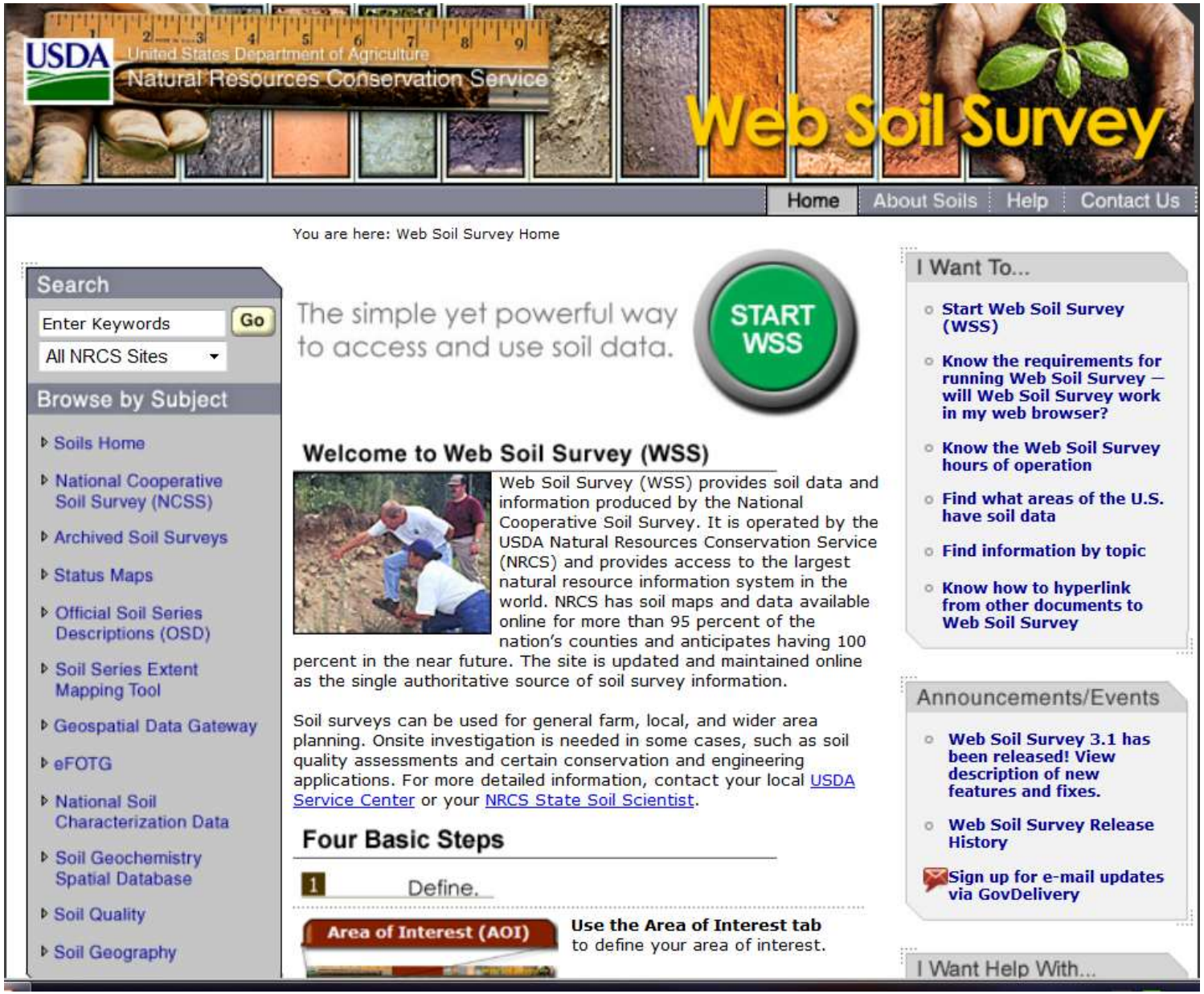
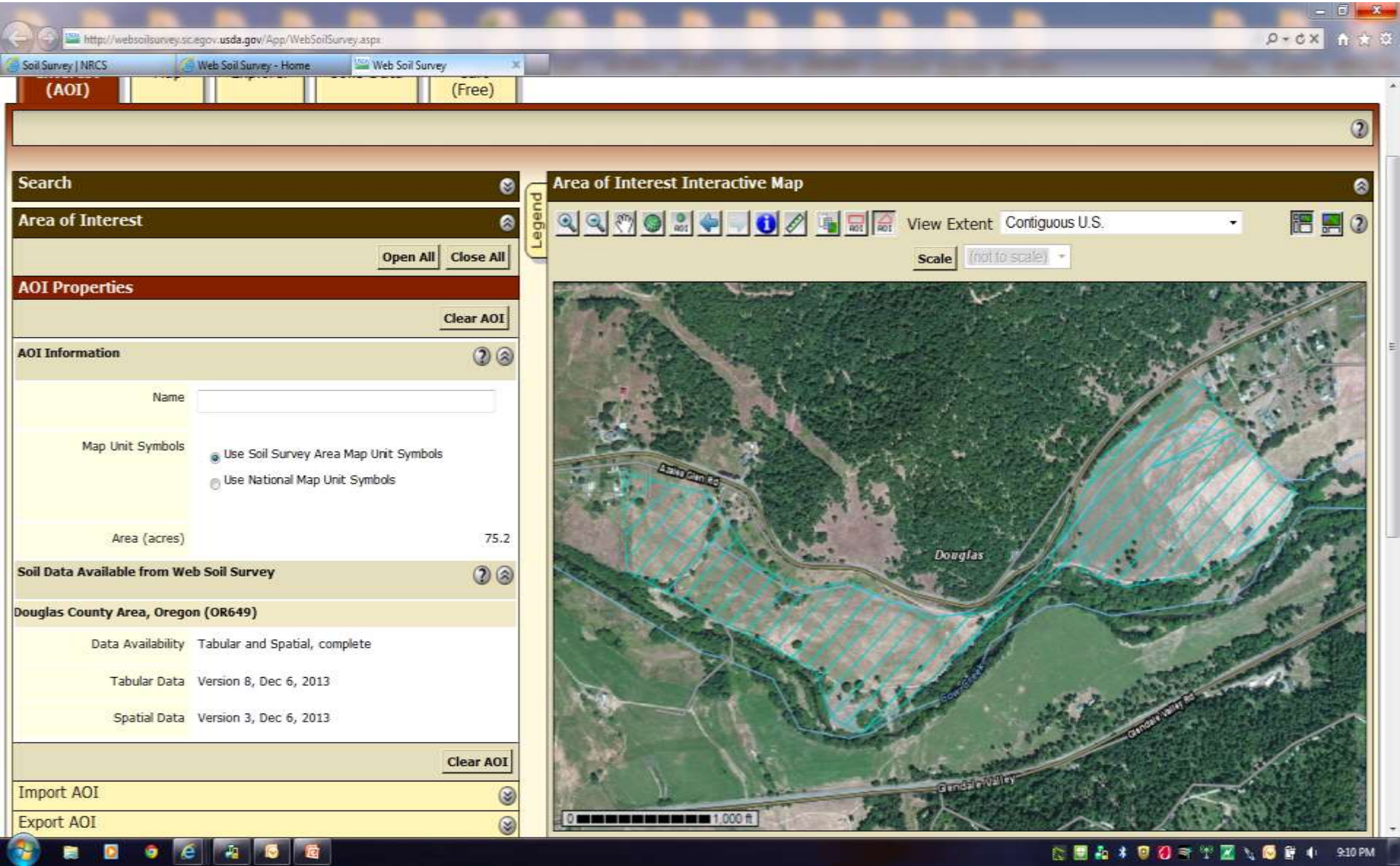
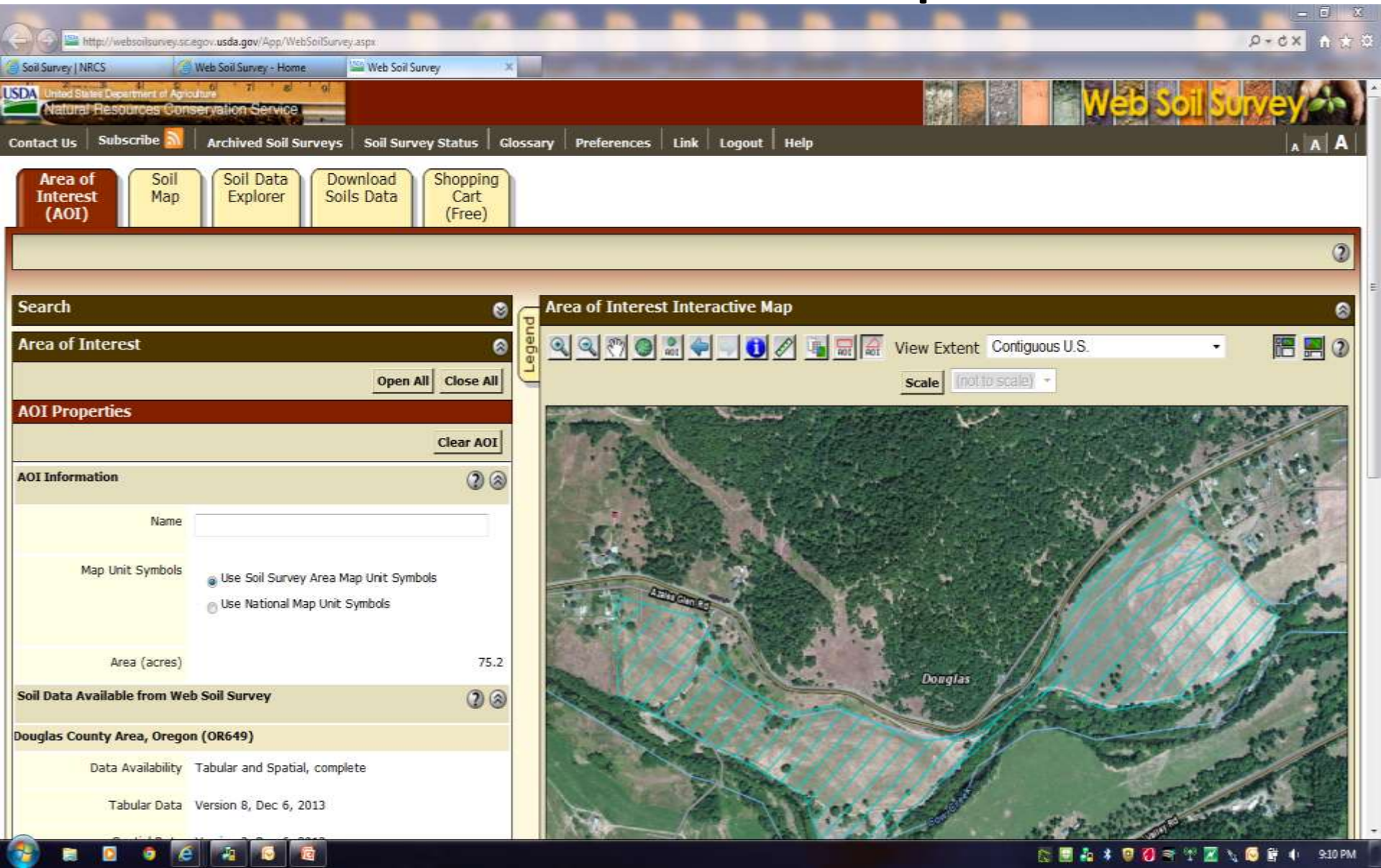
soil survey



NRCS Area of Interest



NRCS Soils Map



AGRICULTURAL AND CROP MANAGEMENT INFORMATION

- **Crop(s)** to be grown at the site and intended market (e.g., barley for seed, feed, brewing, food or commodity sale).
- **Crop assimilative** capacity (nitrogen).
- **Crop sequences** (farming) and the time(s) of year biosolids will be land applied to the crop site. **Crop harvest** method (e.g., silage vs. pasture) and tilling practices.
- **Farm Management**: irrigation practices, grazing, field tiled and fertilizer use.

OSU FG 63
Reprinted January 2000

Pastures

Western Oregon and Western Washington

J. Hart, G. Pirelli, L. Cannon, and S. Fransen

OSU Fertilizer guides

In western Oregon and Washington, forage shortages typically occur in late fall and early spring. In contrast, an excess supply may exist in late spring. By fertilizing in early fall and late winter, you can increase forage supply in deficient times. To reduce production in times of excess, reduce or eliminate late spring fertilization.

A single fertilization program will not fit all pastures. Determine which combination of grazing management, fertilization, and irrigation fits your resources and environment.

Use a soil test and an assessment of forage supply and forage species to determine fertilizer need.

If suitable species are not present, fertilization will not compensate. In this case, consider renovating the pasture.

New Seedings

Match the pasture species to site conditions and livestock needs when renovating a pasture. Cows prefer grasses over legumes and graze perennial ryegrass before tall fescue. Sheep graze selectively, preferring clover and grass mixtures with short, lush feed to tall, coarse plants.

Horses are selective grazers, eating a wide range of plants. The horse digestive system cannot handle large amounts of legumes. Small and frequent amounts of forage are best.

Soil pH indicates whether lime is needed, and the SMP buffer or lime requirement (LR) test estimates the amount of lime needed. Estimate the rate of lime application from the following SMP buffer table.

Table 1.ÑLime application rates for grass or white clovergrass pastures.

If the SMP buffer test for lime is:	**Apply this amount of lime (t/a):**
under 5.5	4Ð5
5.5Ð5.8	3Ð4
5.8Ð6.1	2Ð3
6.lÐ6.5	1Ð2
over 6.5	0Ð1

If soil pH is below 5.5, incorporate lime for stand establishment and longevity. Mix lime into the seedbed before seeding to allow time for lime to neutralize soil acidity.

Exceptions to Table 1 are subclover seedings and pastures on coastal county bottomland soils. For new subclover seedings where the pH of the top 2 to 3 inches of soil is 5.5 or lower, mix 1 to 2 t lime/a into the surface 2 inches of soil before seeding. Using lime-pelleted seed also can improve seedling establishment on acidic soils.

If your pasture is on coastal county bottomland soils, apply a maximum of 2 t lime/a if the soil pH is below 5.5. Additional information about lime requirement and the SMP buffer is in FG 52, *Fertilizer and Lime Materials*.

Nitrogen fertilization usually is necessary to establish grass forages in western Oregon and Washington. Broadcast 20 to 40 lb N/a at planting, or band this amount 1 to 2 inches below the seed. When P or K is needed, N can be banded with these nutrients. The total N plus K2O in the band should not exceed 100 lb/a. *Do not include B in band applications because this concentration of B can be toxic to seedlings.*

Working P into the top 2 inches of the soil during seedbed preparation is more effective than broadcasting after seeding.

The most effective P application method is banding. If you band P, place the band 1 to 2 inches to the side or below the seed. Some soil should separate seed from fertilizer.

Phosphorus fertilization rates are given in Table 2.

In new clover or clover and grass seedings, broadcast K and work it into the seedbed anytime before seeding. See Table 3 for fertilization rates based on a soil test.

Horses avoid grazing near their own manure and urine; therefore, managing grazing on horse pastures is difficult.

Cool season forages such as tall fescue, perennial ryegrass, orchardgrass, subclover, and white clover are suited for our climate.

After choosing the appropriate forage species and planting method, use a soil test as the basis for fertilization. EC 628, *How to Take a Soil Sample . . . and Why*, contains instructions for obtaining a soil sample.

For a preplant soil test, obtain samples from the tillage depth, generally the surface to 6 inches. If you use a minimum tillage method of planting, you may wish to divide the sample into two parts: the top 2 inches and the lower 4 inches.

Analyze the soil sample for the following:

- pH
- Lime requirement (SMP or LR)
- Phosphorus (P)
- Potassium (K)
- Calcium (Ca)
- Magnesium (Mg)

BIOSOLIDS AND LAND APPLICATION INFORMATION

- **Biosolids characteristics** from the most recent biosolids analyses, including data on:
- **Nutrients:** Total kjeldahl nitrogen, nitrate nitrogen, ammonium nitrogen, total phosphorus, potassium, total solids, volatile solids (expressed as percent dry weight), pH; and
- **Metals**: Arsenic, cadmium, copper, lead, mercury, molybdenum, nickel, selenium, zinc, and if required, silver and chromium (expressed as mg/kg dry weight).
- **Forecast** of biosolids application rate (gallons or dry tons/acre/year).
- **Calculations** used for forecasting annual biosolids application rate are based on current nutrient and metal biosolids analyses for all acreage land applied for the year.
- **Site life** calculations (if applicable).
- **Field staging and/or storage practices (if applicable).**

Background Soil Analysis

although not required it is a very good idea to take soil samples for metals and nutrients of all the new land application sites you add to your biosolid management plan and permit.

Biosolids Nutrient Analysis

Land applied anaerobic liquid Class B biosolid 2,673,550 gallons at 1.93% total solids using the pounds equation, the dry tons generated would be

(2,673,550 gal. x 8.34/2000) x (1.93/100) = **215.17** dry tons of biosolids

(% X 20= lb/ton)

- TKN-N 10.7% 10.7 X 20 = **214** lb/ton
  - To convert % to ppm take % x 10,000 = ppm; ppm X 0.002= lb/ton
- NH4-N 5.45% (5.45 X 10,000)X 0.002= **109.3** lb/ton
- NO3-N 0.015% 0.015 X 20 = **0.3** lb/ton
- Organic –N (TKN-NH4) 10.7-5.45 = 5.25;
  5.25 X 20 = **105.0** lb/ton
- P 0.78% 0.78 X 20 = **15.6** lb/ton
- K 0.0015 0.0015 X 20 = **0.3** lb/ton

Annual Biosolids Metal Analysis

Always send me a copy of your biosolid lab result (I do not need the lab's QA/QC)

ppm X 0.002 = lb/ton

	ppm	lb/ton
As	3	0.006
Cd	24	0.05
Cr	4	0.008
Cu	627	1.254
Hg	442.5	0.89
Mo	5	0.01
Ni	72	0.14
Pb	104	0.208
Se	7	0.014
Zn	1060	2.12

Biosolid Nutrient Loading Calculations

- For corn the fertilizer guide suggests 265 lb N/ac

Last year's soil analysis indicates there is 30 lb carry over N in the soil

- Biosolid nutrient needed for corn is 235 lb N/ac
- Available NH4 **109** lb/ton 50% volatilization=**54** lb/ton
- Available NO3 is **0.3** lb/ton
- Available organic N 105 with a mineralization rate of 35% yields **36.75** lb/ton
- Total plant available nitrogen PAN-Nitrogen in biosolid is 54+0.3+36.75 = **91.05** lb PAN-N/ton
- Agronomic loading rate (ALR) is biosolid N needed for crop divided by available N in biosolid

ALR = 230/91 = **2.5 tons per acre**

Metal Loading Calculation

trace metal calculation

Remember 2,673,550 gallons of 1.93% TS is 215 dry tons

(3.0 mg As/1,000,000 mg TS) X (215 ton X 2000 lb./ton of dry solids) = 1.29 lb. As/yr.

3 ppm As X 0.002 = 0.006 lb/ ton

215 ton X 2000 lb/ton = 502000 lb

and say we land apply on 52 acres

(3.0 mg As/ 1000000 mg TS) x (502000 lb. TS) / 52 ac = 0.029 lb. As/ac-yr.

(EPA Table 2 cumulative loading limit for As is 41 total lb. As/ac
41 lb As/ac / 0.029 lb. As/ac-yr.) = 1413 yr. site life for As

(0.029 lb. As/ac-yr.) x 1.12 conversion factor = 0.032 kg/ha-yr.

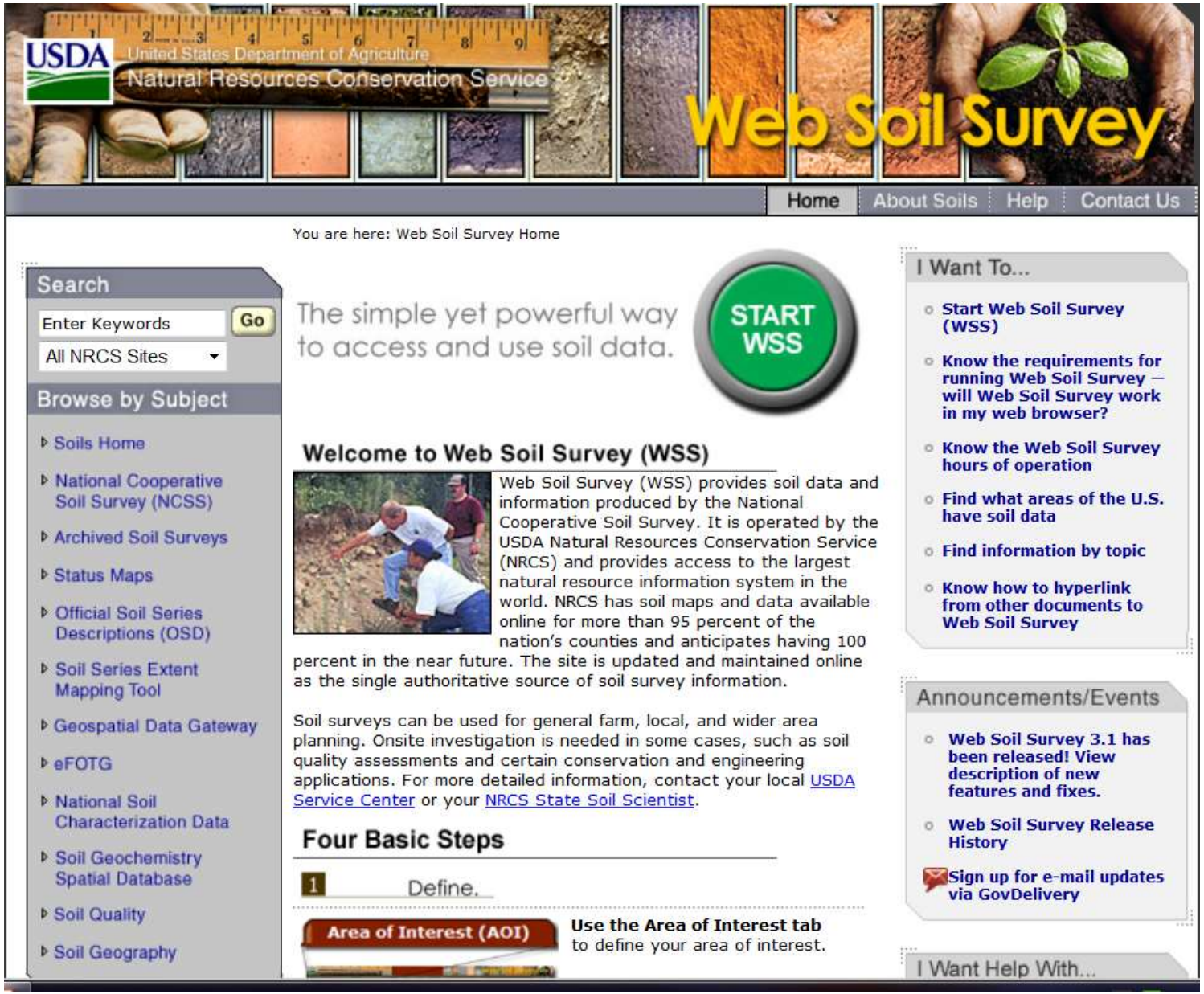
N

R

C

S

soil survey



The End

Questions?

Eugene DEQ Water Quality Program

Paul Kennedy, CPSS EHS

kennedy.paul@deq.state.or.us

541.687.7439

Biosolids-Recycled Water Coordinator