



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 aulacly 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.

- 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.

- 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.

- 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\\WFiles\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

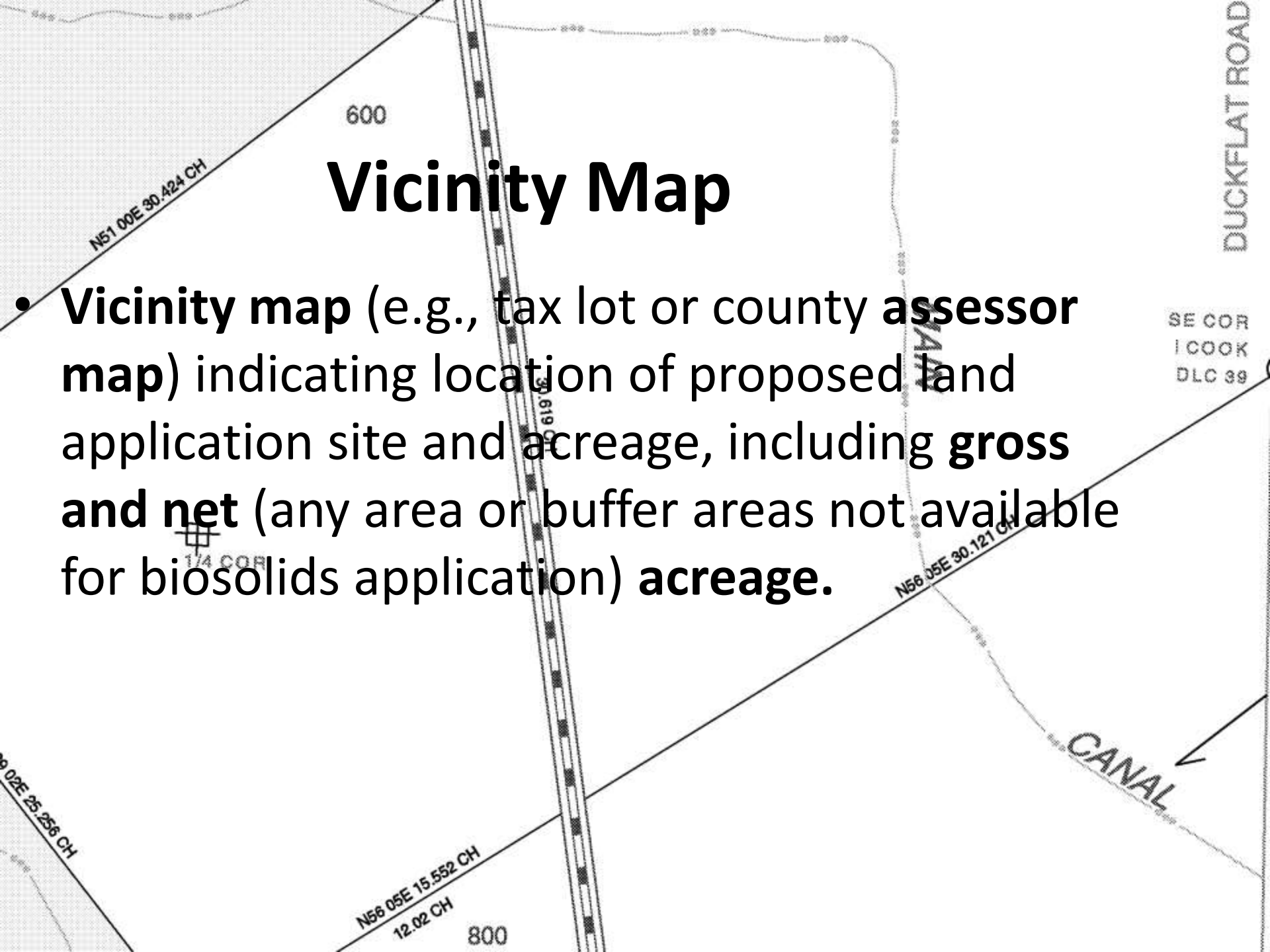
- cc: Files

SITE INFORMATION

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- **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.

Elam - Cook Field
100 acres
78 acres with buffers

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

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"

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

I. 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 employees working under this contract are either employees that 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 automobile 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 rate as described in the SUPPORTING DOCUMENTS not exceed a total combined price of \$93,893.60.
 - 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 1% 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 on 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





USDA United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

Home About Soils Help Contact Us

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Search


Enter Keywords

All NRCS Sites ▾

Browse by Subject

- Soils Home
- National Cooperative Soil Survey (NCSS)
- Archived Soil Surveys
- Status Maps
- Official Soil Series Descriptions (OSD)
- Soil Series Extent Mapping Tool
- Geospatial Data Gateway
- eFOTG
- National Soil Characterization Data
- Soil Geochemistry Spatial Database
- Soil Quality
- Soil Geography


The simple yet powerful way to access and use soil data.



I Want To...

- Start Web Soil Survey (WSS)
- Know the requirements for running Web Soil Survey — will Web Soil Survey work in my web browser?
- Know the Web Soil Survey hours of operation
- Find what areas of the U.S. have soil data
- Find information by topic
- Know how to hyperlink from other documents to Web Soil Survey

Welcome to Web Soil Survey (WSS)




Web Soil Survey (WSS) provides soil data and information produced by the National Cooperative Soil Survey. It is operated by the USDA Natural Resources Conservation Service (NRCS) and provides access to the largest natural resource information system in the world. NRCS has soil maps and data available online for more than 95 percent of the nation's counties and anticipates having 100 percent in the near future. The site is updated and maintained online as the single authoritative source of soil survey information.

Soil surveys can be used for general farm, local, and wider area planning. Onsite investigation is needed in some cases, such as soil quality assessments and certain conservation and engineering applications. For more detailed information, contact your local [USDA Service Center](#) or your [NRCS State Soil Scientist](#).


Four Basic Steps

1 Define.



Use the Area of Interest tab to define your area of interest.

Announcements/Events

- **Web Soil Survey 3.1 has been released! View description of new features and fixes.**
- **Web Soil Survey Release History**
-  **Sign up for e-mail updates via GovDelivery**

I Want Help With...

NRCS Area of Interest

The screenshot displays the NRCS Area of Interest Interactive Map web application. The browser address bar shows the URL: <http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>. The application interface includes a search bar, a map titled "Area of Interest Interactive Map", and a sidebar with various controls and information.

Search

Area of Interest

Open All Close All

AOI Properties

Clear AOI

AOI Information

Name

Map Unit Symbols

- Use Soil Survey Area Map Unit Symbols
- Use National Map Unit Symbols

Area (acres) 75.2

Soil Data Available from Web Soil Survey

Douglas County Area, Oregon (OR649)

Data Availability Tabular and Spatial, complete

Tabular Data Version 8, Dec 6, 2013

Spatial Data Version 3, Dec 6, 2013

Clear AOI

Import AOI

Export AOI

Area of Interest Interactive Map

Legend

View Extent Contiguous U.S.

Scale (not to scale)

The map shows a satellite view of a rural area in Douglas County, Oregon. A large area is outlined in cyan, representing the Area of Interest. The map includes labels for "Douglas", "Douglas River", "Gendale Valley", and "Gendale Valley Rd". A scale bar at the bottom indicates 1,000 feet.

NRCS Soils Map

The screenshot displays the NRCS Soils Map web application. At the top, the browser address bar shows the URL <http://websoilsurvey.sc.egov.usda.gov/App/WebSoilSurvey.aspx>. The page header includes the USDA logo and the text "United States Department of Agriculture" and "Natural Resources Conservation Service". A navigation menu contains links for "Contact Us", "Subscribe", "Archived Soil Surveys", "Soil Survey Status", "Glossary", "Preferences", "Link", "Logout", and "Help".

Below the navigation menu is a row of five yellow buttons: "Area of Interest (AOI)", "Soil Map", "Soil Data Explorer", "Download Soils Data", and "Shopping Cart (Free)".

The main content area is divided into two panels. The left panel, titled "Area of Interest Interactive Map", contains a search bar, an "Area of Interest" section with "Open All" and "Close All" buttons, an "AOI Properties" section with a "Clear AOI" button, and an "AOI Information" section. The "AOI Information" section displays the following details:

- Name: [Empty text box]
- Map Unit Symbols: Use Soil Survey Area Map Unit Symbols, Use National Map Unit Symbols
- Area (acres): 75.2
- Soil Data Available from Web Soil Survey: Douglas County Area, Oregon (OR649)
- Data Availability: Tabular and Spatial, complete
- Tabular Data: Version 8, Dec 6, 2013

The right panel, titled "Area of Interest Interactive Map", features a legend, a toolbar with various map navigation tools, a "View Extent" dropdown menu set to "Contiguous U.S.", and a "Scale" dropdown menu set to "(not to scale)". The main map area shows an aerial view of a landscape with a cyan-colored polygon highlighting a specific area of interest. The map includes labels for "Azalea Glen Rd" and "Douglas".

The bottom of the screenshot shows the Windows taskbar with various application icons and the system clock displaying "9:10 PM".

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 tilled and fertilizer use.



Pastures

Western Oregon and Western Washington

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

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 Seedlings

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. N Lime application rates for grass or white clovergrass pastures.

If the SMP buffer Apply this amount test for lime is: of lime (t/a):

under 5.5 4D5

5.5D5.8 3D4

5.8D6.1 2D3

6.1D6.5 1D2

over 6.5 0D1

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 seedlings and pastures on coastal county bottomland soils. For new subclover seedlings 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,

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)

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 seedlings, broadcast K and work it into the seedbed anytime before seeding. See Table 3 for fertilization rates based on a soil test.

OSU Fertilizer guides



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

$$(2,673,550 \text{ gal.} \times 8.34/2000) \times (1.93/100) = \mathbf{215.17} \text{ dry tons of biosolids}$$

(% X 20= lb/ton)

- TKN-N 10.7% $10.7 \times 20 = \mathbf{214}$ lb/ton
 - To convert % to ppm take % x 10,000 = ppm; ppm X 0.002= lb/ton
- NH4-N 5.45% $(5.45 \times 10,000) \times 0.002 = \mathbf{109.3}$ lb/ton
- NO3-N 0.015% $0.015 \times 20 = \mathbf{0.3}$ lb/ton
- Organic –N (TKN-NH4) $10.7 - 5.45 = 5.25$;
 $5.25 \times 20 = \mathbf{105.0}$ lb/ton
- P 0.78% $0.78 \times 20 = \mathbf{15.6}$ lb/ton
- K 0.0015 $0.0015 \times 20 = \mathbf{0.3}$ 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
$$\text{ALR} = 230/91 = \mathbf{2.5 \text{ tons per acre}}$$

Metal Loading Calculation

trace metal calculation

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

$(3.0 \text{ mg As}/1,000,000 \text{ mg TS}) \times (215 \text{ ton} \times 2000 \text{ lb./ton of dry solids}) = 1.29 \text{ lb. As/yr.}$

3 ppm As \times 0.002 = 0.006 lb/ ton

215 ton \times 2000 lb/ton = 502000 lb


and say we land apply on 52 acres

$(3.0 \text{ mg As}/ 1000000 \text{ mg TS}) \times (502000 \text{ lb. TS}) / 52 \text{ ac} = 0.029 \text{ lb. As/ac-yr.}$

(EPA Table 2 cumulative loading limit for As is 41 total lb. As/ac

$41 \text{ lb As/ac} / 0.029 \text{ lb. As/ac-yr.}) = 1413 \text{ yr. site life for As}$

$(0.029 \text{ lb. As/ac-yr.}) \times 1.12 \text{ conversion factor} = 0.032 \text{ kg/ha-yr.}$



USDA United States Department of Agriculture
Natural Resources Conservation Service

Web Soil Survey

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You are here: Web Soil Survey Home

Search


Enter Keywords

All NRCS Sites


Browse by Subject

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- Official Soil Series Descriptions (OSD)
- Soil Series Extent Mapping Tool
- Geospatial Data Gateway
- eFOTG
- National Soil Characterization Data
- Soil Geochemistry Spatial Database
- Soil Quality
- Soil Geography

The simple yet powerful way to access and use soil data.



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- Web Soil Survey Release History
-  Sign up for e-mail updates via GovDelivery

I Want Help With...



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