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**ST. JOHNS LANDFILL  
1997 VEGETATION MAINTENANCE PROGRAM**

**Task Three: Sheep Grazing Guidelines  
Final Draft**

**prepared for**

**Metro Department of Regional Environmental Management**

**prepared by**

**Mark Griswold Wilson  
Restoration Ecologist**

**February 1997**



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February 18, 1997

Dennis O'Neil  
Metro Regional Environmental Management

Dear Dennis,

Please find the final draft of Task 3: Sheep Grazing Guidelines attached. As I state in the text I envision this document to be a working draft subject to change based on this years experience with an intensive grazing management program.

I will be coordinating with Janelle to schedule an early March meeting at SJL with Metro staff, grazing and weed control specialists, and myself.

As you know, three vegetation management activities are planned for the 1997 field season at SJL:

1. An IVM plan for the control of invasive weeds of concern will be initiated.
2. The native grassland plots will be managed and the seed harvested.
3. Sheep grazing will be monitored and managed.

I will develop specific protocols for each of the above activities but implementation will require Metro staff assistance. I recommend that one full time Metro R.E.M. employee be assigned to vegetation management activities from March 1 through July 31, 1997.

  
Mark G. Wilson

cc: Janelle Davis, Emily Roth

## **SCOPE OF WORK**

### **ST. JOHNS LANDFILL VEGETATION MAINTENANCE PROGRAM - 1997**

#### **TASK 1:**

**Prepare an integrated vegetation management plan that specifies control measures for invasive weeds of concern at the St. Johns Landfill.**

Invasive, non-native weeds will be identified by line drawing and photographed in flower. Control measures, developed in compliance with Metro Executive Order No. 60: Developing an IPM Plan for Metro facilities, will be prepared. The IVM Plan will identify naturally occurring weed control measures such as biological diversity, plant competition and succession and specify how they may be integrated with various mechanical, cultural and chemical controls and habitat modification techniques.

Submittal dates: March 1, 1997 (text and line drawings)

June 1, 1997 (photos)

#### **TASK 2:**

**Develop a management plan for the native grassland plots in Subareas 1, 4, and 5A.**

The goals of the native grassland plan will be to maintain a high cover of natives within the plots and maximize native seed production. In order to meet those goals, specific field management guidelines will be developed for weed control, fertilization, and seed harvest and storage.

Submittal dates: February 21, 1997 (draft text)

February 28, 1997 (final)

#### **TASK 3:**

**Prepare a management plan for areas of the landfill deemed suitable for grazing by sheep.**

Sheep grazing guidelines will be developed in order to manage the native and non-native grasslands on the landfill and prevent overgrazing and erosion. Guideline objectives are as follows:

- A. Using the principals of intensive grazing management and field observation, determine the timing and duration of grazing events. Determine if timely sheep grazing can limit the seed production of non-native grasses and invasive weeds [see TASK 1 above].
- B. Determine the palatability of *Bromus carinatus* (California brome-grass) to sheep. Observe if timely sheep grazing can be used to reduce short term accumulations of *Bromus* biomass and increase seed production.
- C. Prepare a fencing/cross fencing plan in consultation with metro staff and the sheep herdsman.

Submittal dates: February 15, 1997 (draft field study text)

May 1, 1997 (completion of field studies)

## ST. JOHNS LANDFILL VEGETATION MAINTENANCE PROGRAM

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### **Task 3A: Field Study Text**

**Using the principals of intensive grazing management and field observation, determine the timing and duration of grazing events. Determine if timely sheep grazing can limit the seed production of non-native grasses and invasive weeds.**

#### **Background: Review of 1996 Grazing Practices**

Sheep grazing was initiated on the landfill during the 1996 growing season in order to assist with the management of the tall growing, largely non-native, grassland. In previous years, large areas of the landfill, particularly steep slopes with perpendicular gas lines, were unable to be mowed with tractor drawn equipment. This encouraged the spread of undesirable and noxious weeds and hindered the maintenance of gas lines and other landfill cover structures and equipment. The goals of the 1996 grazing program were to: lower the height (and reduce the flowering and seed set) of mixed grasses and weeds in all areas; and reduce the amount of staff labor and equipment time devoted to grassland mowing.

Grazing management practices on the landfill during the 1996 season consisted of turning out approximately 1,000 sheep on the large grassland areas of Subareas 1, 3 and a portion of 2 and allowing them to pick and choose and eat what and when they wanted. As animals tend to eat plants and parts of plants they like best, leaving the rest to mature, set seed and multiply, many of the less palatable and unpalatable plants proliferated. Clover and ryegrass seemed to be most favored by the sheep, but they were eaten very inefficiently. Many areas of the landfill were undergrazed and large stands of aggressive

non-native grass species [such as *Phalaris* spp. (reed canary grass) and *Bromus* spp. (cheatgrass, etc.) and state listed noxious plants (such as *Cirsium* spp. (thistles) and *Cytisus scoparius* (Scot's Broom)], grew and multiplied. Erosion caused by sheep trailing and trampling was evident in areas immediately adjacent to the watering tanks, and in partly shaded sheep resting and bedding areas such as beside concrete vaults and methane gas lines, alongside roadways and under the power towers. To date, many of these eroded areas are still bare ground, supporting little or no vegetation.

Much Metro staff time was spent on tasks related to sheep watering. Water tanks required checking daily seven days a week for the duration of the grazing period. During hot weather refilling of the water tanks was necessary twice a day.

### **Proposed 1997 Grazing Management Objectives**

The proposed objectives for a 1997 sheep grazing program at SJL are as follows:

- provide high quality forage for a specified number of sheep during the 1997 grazing season.
- change from an unmanaged "open range" sheep grazing practice to a managed intensive grazing program using high stocking densities of sheep.
- avoid overgrazing of grasslands resulting in erosion and soil compaction (due to excessive trampling). Avoid inefficient undergrazing.
- keep ryegrass and non-native clovers in a vegetative state, preventing flowering and seed set.
- prevent the spread of non-native pest plants and State of Oregon listed noxious weeds [see attached plant list].

A discussion of each of these objectives follows:

#### **Provide a sufficient quantity of high quality forage**

In order to gain the interest of perspective sheep ranchers, the forage on the landfill should be of sufficient quantity and of reasonably high quality. During the 1996 grazing season, approximately 150 acres of landfill grasslands supported approximately 1,000 head of sheep. Because an even greater number of acres could be made available for grazing the same number of sheep during the 1997 season, there is no anticipated shortage of forage. As the majority of these 150 + acres of grasslands have a primary cover of highly palatable ryegrass, forage quality is also not a problem.

#### **Implement a managed intensive grazing program that avoids overgrazing and undergrazing and keeps ryegrass and non-native clovers in a vegetative state.**

A well managed intensive grazing program rations out the forage according to the needs of the livestock, protects the landscape from the effects of overgrazing, and achieves a high level of forage use. Key parts of an intensive grazing program involve a resting or recovery period for the pastures between grazing events, and regulating the length of time that animals are in a paddock [a fenced area within a larger field](Murphy 1995). Such a program applied to SJL would consist of dividing each subarea, using electric fence, into smaller paddocks. Each paddock would then be grazed for a short duration of time using



high stocking densities [high numbers of sheep per acre of pasture]. These short, but intense, grazing events would be followed by a specific plant recovery period during which time the sheep would be moved to another paddock. Following plant recovery, the sheep would be allowed to re-graze the beginning paddock and so on. A summary of an intensive grazing management program follows.

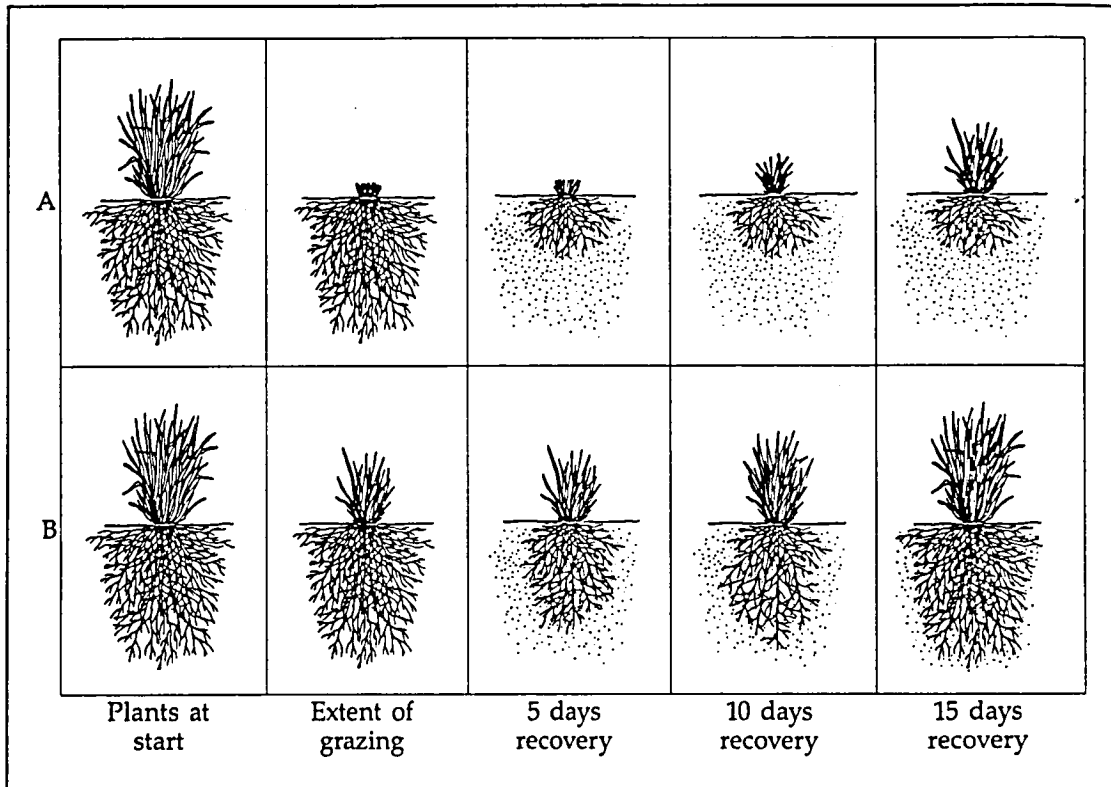
Number and Size of Paddocks In practice, the more paddocks, the better the distribution of grazing on the plants, the fewer severely grazed plants, and the greater proportion of plants are able to recover quickly from grazing (Savory 1988). Paddocks must be small enough so that all forage is grazed completely and uniformly within each occupation period. The size of each paddock is dependent on the quality of forage within; poorer quality pasture areas should be divided into larger paddocks and higher quality areas divided into smaller paddocks. A field survey of all SJL subareas proposed for grazing should be made to determine forage quality and quantity prior to the division of each subarea into smaller paddocks

#### Plant Recovery Periods

During the February to October growing season the unirrigated grasses at SJL grow at approximately three rates: mid-February to mid-March is an early period of slow growth; mid-March through the beginning of June is a middle period of rapid growth; and from the beginning of June through mid July is a final period of slow growth. Generally, during normal rainfall years at the SJL site, grass vegetative growth ceases and plants ripen seed by mid-July to early August. The suggested plant recovery period during periods of slow growth is approximately 30-40 days; during periods of fast growth the recovery period would be approximately 15-20 days. It is important to note, however, that an exact determination of recovery period should be based on daily observations of plant re-growth within each paddock. No single recovery period will suit all conditions at SJL because the daily growth rate of plants changes continuously during the growing season (in response to differing microclimates, slopes, landscape positions, soil fertility and moisture regimes, etc.) (Savory 1988). See **Figure 1** for a graphic comparison of a plant recovery periods after two different grazing regimes.

**FIGURE 1 -**

**Rate of immediate regrowth as affected by amount of leaf removed by grazing.**



**Figure 1** shows two grass plants that began growth as equals during the growing season. Early in the season an animal severely defoliates "A" removing some 90% of the leaf but takes only 40% of "B". The two plants then recover at very different rates: "A" is very slow to recover and re-grow. "B" starts re-growth immediately and quickly produces much more volume of leafy forage than "A". (adapted from Savory 1988)

**Grazing Time (Periods of Stay and Occupation)** Overgrazing is unrelated to the number of animals in a pasture and highly related to the time period (how long and when) during which plants are exposed to the animals (Murphy 1995). If animals remain in any one area for too long and graze re-growth, or if they return to an area before previously grazed plants have recovered, they overgraze plants. Overgrazing will decrease the percent cover of highly palatable grasses (like ryegrass) and result in an increased cover of less desirable, more aggressive grasses and noxious weeds. Prolonged overgrazing will increase the percent cover of bare ground resulting in increased erosion. Undergrazing, on the other hand, is the direct result of a low stocking density. A laxly grazed pasture changes quickly from a field of predominantly vegetative plants to one of mostly reproductive plants. Flowering and seeding plants have a higher fiber content and a lower nutritional value to sheep.

The determination of SJL site specific information such as: Number and Size of Paddocks, Plant Recovery Periods, and Grazing Time will be based on the principals of intensive grazing management and field observations by Metro staff, the sheep herdsman, and the consultant. The resultant grazing plan should be thought of as an adaptive management program.

#### **Prevent the spread of non-native pest plants and noxious weeds**

During the 1997 grazing season at SJL an Integrated Vegetation Management (IVM) Plan will be developed by the consultant (see the attached **1997 Vegetation Maintenance Scope of Work**). This plan will propose control measures for specific invasive species of concern in all landfill areas. The first step in this process will be to identify potential invasive species and determine the size of the infestations. As time allows, the consultant will be available to assist the Metro staff person assigned to vegetation management with invasive plant identification, mapping and control within the grazing areas.

#### **1997 Grazing Management Work Tasks**

In early March 1997, prior to the April 1 beginning of grazing, a grazing management meeting will be scheduled at SJL. Participants are to include: Metro staff, sheep herdsman, grazing and weed control specialists, and the consultant. A proposed agenda for that meeting is as follows:

- Review 1996 grazing program
- Discuss 1997 grazing management objectives
- Determine: SJL areas to be grazed, animal units/acre, paddock size.

Although site specific grazing objectives will be discussed at the March meeting, recommendations of daily work tasks can be identified now in order to provide Metro with an estimate of staffing requirements. The work tasks are as follows:

#### **March**

- Assist shepherd as needed with construction of native grass exclosures and paddock fencing.



### **April through July**

- Check sheep water. Move water tanks as required to avoid trailing and erosion.
- Monitor enclosure fencing and paddock fencing daily and repair as required.
- Monitor paddocks daily to determine: if paddock size needs readjustment, the need for herd rotation, pasture recovery time.
- Identify and map locations of invasive pest plants within the grazing area [see attached list of noxious species]. Note if sheep grazing is providing a measure of pest plant control by delaying or preventing flowering and/or seediest. Implement pest plant control measures as specified by the consultant and approved by Metro staff.

### **Summary**

If a managed intensive grazing program and an improved stock watering system is developed at SJL during the 1997 grazing season, fewer total acres will need to be grazed, the forage quality should improve, and additional erosion damage can be prevented. If the predominant cover of ryegrass is intensely grazed and/or mowed in a timely fashion grass seed production can be reduced. It should be noted, however, that a grazing management program is not likely to reduce labor costs.

### **Task 3B: Draft Field Study Text**

**Determine the palatability of *Bromus carinatus* (California brome-grass) to sheep. Determine if timely sheep grazing can be used to reduce short term accumulations of *Bromus* biomass (thatch), and increase seed production.**

### **Background**

In California, sheep are used seasonally by several native grass seed growers to graze out non-native plants, reduce thatch, and increase native seed production (Anderson 1997 and Meinke 1997). The California Nature Conservancy has also used sheep grazing to manage established native grasslands in their Carizo and Santa Rosa Plateau preserves (Amme 1995). In the Hedgerow Farms seed production fields, approximately 100 sheep are rotated through a series of four 30 acre paddocks over a period of 4-7 days in the early spring after the non-native grasses and weeds begin rapid growth but prior to the total green-up of the native grasses. Sheep grazing resumes in the early fall after warm rains have stimulated a sprouting of additional non-native grasses (Anderson 1997). In the Pacific Northwest, no known research has been undertaken to determine if timely sheep grazing can improve the quality and seed production of native grassland stands.

### ***Bromus carinatus* (California brome-grass) Test Plots at SJL**

In September 1994, approximately 5 total acres of Subareas 1 and 2 were no-till drilled with two species of native bunchgrasses. Equal mixtures of *Bromus carinatus* (California brome-grass) and *Festuca idahoensis* (Idaho fescue) were seeded at two different

densities on six testplots that had been prepared using several different techniques. By the end of the first growing season (in fall of 1995), it was apparent that all seedings of the fescue had failed to establish.

To date, two Subarea 1 testplots: the Solarization plot and the Herbicide/No till plot exhibit the highest percent cover of the brome-grass. The other Subarea 1 testplots: Till Only, Acid pH (Sulfur), and the Herbicide/Till plots all have mixed covers of brome, and non-native grasses and forbs. The Native Seeding with No Site Preparation plot in Subarea 2 failed. During the 1996 grazing season, an exclosure fence was placed around the Solarization plot and the Herbicide/No till plot to prevent grazing. Both plots bore heavy seed crops in the fall of 1996; but the seed was not harvested. In the late summer of 1996 the two exclosed plots were flail mowed.

#### **Sheep Grazing of *Bromus*: A Proposed Study**

In order to determine if timely sheep grazing can reduce thatch and enhance seed production in all Subarea 1 testplots of *Bromus carinatus* (California brome-grass) a field study is proposed for the 1997 and 1998 grazing seasons. A summary of proposed study tasks follows:

**1997**

##### **February-March (prior to beginning of grazing season)**

- Evaluate the quality of *Bromus* cover in all Subarea 1 testplots. Determine which plots have a *Bromus* cover >50% and erect exclosure fencing. Allow sheep to free graze plots with *Bromus* cover <50%.

##### **March-May**

- Monitor all testplots. Using a tractor drawn sickle bar, high mow testplots with significant cover of non-native grasses no lower than 6". Repeat as necessary.
- Flail mow one tractor width around all exclosed plots. Repeat as necessary.
- Check electric wire and posts in exclosed plots daily. Repair as necessary.

### **May-June**

- Monitor to determine flowering date of *Bromus* (Seed harvest date is usually within 3 weeks after flowering) Harvest seed by hand. [The consultant will be available for staff training]

### **July**

- After completion of seed harvest, select a minimum of two testplots of comparable size and stand quality. Pick an equal number of plots to remain ungrazed and grazed. Open one side of the enclosure fence around the graze plot(s) and allow a select number of sheep to free feed and trample *Bromus* thatch for an amount of time (to be determined in the field). Remove sheep from enclosure. Secure fencing.

**1998**

### **February-March**

- Monitor 1997 exclosed plots. Compare grazed to ungrazed. Evaluate program.
- Before the spring green-up of *Bromus*, select a minimum of two testplots of comparable size and stand quality. Pick an equal number of plots to remain ungrazed and grazed. Open one side of the enclosure fence around the graze plot(s) and allow a select number of sheep to free feed on *Bromus* and non-native grasses for an amount of time (to be determined in the field). Remove sheep from enclosure. Secure fencing.

### **May-June**

- Monitor to determine flowering date of *Bromus* (Seed harvest date is usually within 3 weeks after flowering) Hand collect all seed from an equal number of randomly selected quadrats in each testplot. Weigh dry seed and compare weights collected from each quadrat. Harvest all remaining seed by hand.

### **July**

- After harvest. Repeat sheep trampling as in 1997.
- Prepare report of findings

## **Task 3C: Draft Field Map**

### **Prepare a fencing/cross fencing plan.**

A fencing/cross fencing map will be prepared by or before March 15, 1997 after completion of the March grazing meeting with: Metro staff, sheep rancher, weed control and intensive grazing specialists, and the consultant.

# Noxious Weeds in Oregon and Washington

Table 1. "A" Designated Weeds as Determined by ODA.

Common Name	Scientific Name
Bearded creeper (Common crupina)	<i>Crupina vulgaris</i>
Camelthorn	<i>Alhag camelorum</i>
Creeping yellow cress	<i>Rorippa sylvestris</i>
Hydrilla	<i>Hydrilla verticillata</i>
Iberian starthistle	<i>Centaurea iberica</i>
Maltgrass	<i>Nardus stricta</i>
Purple starthistle	<i>Centaurea calcitrapa</i>
Silverleaf nightshade	<i>Solanum eleagnifolium</i>
Smooth cordgrass	<i>Spartina alterniflora</i>
Smooth distaff thistle	<i>Carthamus baeticus</i>
Squarrose knapweed	<i>Centaurea virgata</i>
Whitestem distaff thistle	<i>Carthamus leucocaulos</i>
Woolly distaff thistle	<i>Carthamus lanatus</i>

Common Name	Scientific Name
Scotch thistle	<i>Onopordum acanthium</i>
Slender-flowered thistle	<i>Carduus tenuiflorus</i>
South American waterweed (Elodea)	<i>Elodea densa</i>
Spikeweed	<i>Hemizonia pungens</i>
Spiny cocklebur	<i>Xanthium spinosum</i>
Spotted knapweed	<i>Centaurea maculosa</i>
St. Johnswort (Klamath weed)	<i>Hypericum perforatum</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Western horsetail	<i>Equisetum arvense</i>
White top (Hoary cress)	<i>Cardaria spp.</i>
Wild proso millet	<i>Panicum miliaceum</i>
Yellow nutsedge	<i>Cyperus esculentus</i>
Yellow starthistle	<i>Centaurea solstitialis</i>
Yellow toadflax	<i>Linaria vulgaris</i>

Table 2. "B" Designated Weeds as Determined by ODA.

Common Name	Scientific Name
Austrian pea-weed (Swainsonpea)	<i>Sphaerophysa salsula</i>
Buffalo burr	<i>Solanum rostratum</i>
Bull thistle	<i>Cirsium vulgare</i>
Canada thistle	<i>Cirsium arvense</i>
Dalmatian toadflax	<i>Linaria dalmatica</i>
Diffuse knapweed	<i>Centaurea diffusa</i>
Dodder	<i>Cuscuta spp.</i>
Dyer's woad	<i>Isatis tinctoria</i>
Eurasian watermilfoil	<i>Myriophyllum spicatum</i>
Field bindweed	<i>Convolvulus arvensis</i>
French broom	<i>Cytisus monspessulanus</i>
Giant horsetail	<i>Equisetum telmateia</i>
Gorse	<i>Ulex europaeus</i>
Halogeton	<i>Haloteton glomeratus</i>
Italian thistle	<i>Carduus pycnocephalus</i>
Japanese knotweed (Fleece flower)	<i>Polygonum cuspidatum</i>
Johnsongrass	<i>Sorghum halepense</i>
Jointed goatgrass	<i>Aegilops cylindrica</i>
Kochia	<i>Kochia scoparia</i>
Leafy spurge	<i>Euphorbia esula</i>
Meadow knapweed	<i>Centaurea jacea x nigra</i>
Mediterranean sage	<i>Salvia aethiopsis</i>
Medusahead rye	<i>Taeniatherum caputmedusa</i>
Milk thistle	<i>Silybum marianum</i>
Musk thistle	<i>Carduus nutans</i>
Perennial pepperweed	<i>Lepidium latifolium</i>
Poison hemlock	<i>Conium maculatum</i>
Puncturevine	<i>Tribulus terrestris</i>
Purple loosestrife	<i>Lythrum salicaria</i>
Quackgrass	<i>Agropyron repens</i>
Ragweed	<i>Ambrosia artemisiifolia</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Russian knapweed	<i>Acroptilon repens</i>
Scotch broom	<i>Cytisus scoparius</i>

Table 3. "T" or Target List, Determined by ODA.

The Oregon Department of Agriculture annually develops a target list of weed species that will be the focus of control by the Weed Control Program, sanctioned by the Oregon State Weed Board. Because of the economic threat to the state of Oregon, action against these weeds will receive priority.

Common Name	Scientific Name
Bearded creeper (Common Crupina)	<i>Crupina vulgaris</i>
Gorse	<i>Ulex europaeus</i>
Leafy spurge	<i>Euphorbia esula</i>
Rush skeletonweed	<i>Chondrilla juncea</i>
Squarrose knapweed	<i>Centaurea virgata</i>
Tansy ragwort	<i>Senecio jacobaea</i>
Woolly distaff thistle	<i>Carthamus lanatus</i>
Yellow starthistle	<i>Centaurea solstitial</i>

## REFERENCES

- Amme, David. The nuts and bolts of putting together a grazing lease for the benefit of native grasslands. A presentation at the 1995 California Native Grass Association annual meeting, Sacramento, California.
- Anderson, John. Principal: Hedgerow Farms Native Grass Seed Nursery, Winters, California. Personal Communication. January 1997.
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- Murphy, Bill. Pasture Management to Sustain Agriculture. In: Agroecology: The Science of Sustainable Agriculture. Westview Press. 1995.
- Savory, Allen. Holistic Resource Management. Part VI: The Guidelines. Island Press, Covelo, California. 1988.