18

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With Fertilizer

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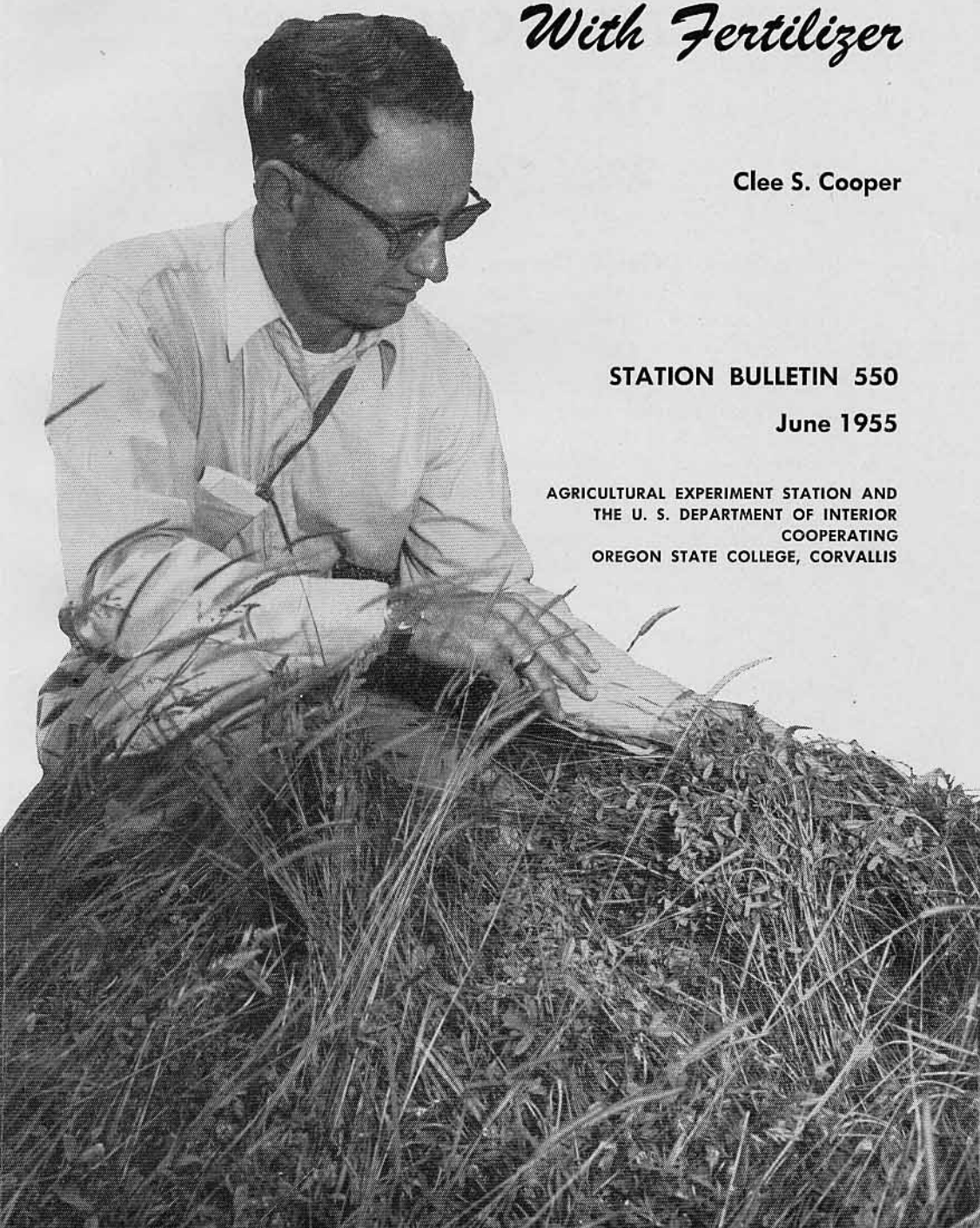

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MORE MOUNTAIN MEADOW HAY

With Fertilizer

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COMMERCIAL fertilizers can increase yield and improve quality of hay produced on much of the 500,000 acres of Oregon's wild flood meadowland. During the past 3 years, experiments have been conducted to study the influence of major fertilizer elements (nitrogen, phosphorus, and potassium) and minor fertilizer elements (copper, boron, manganese, and zinc) on the yield and quality of hay. Only nitrogen and phosphorus have influenced hay yields and only phosphorus hay quality. The following is a summary of results from some research trials conducted on wild flood meadows.

Nitrogen

Apply 60 to 80 pounds annually

This means 180 to 240 pounds of ammonium nitrate or 300 to 400 pounds of ammonium sulphate per acre. The average increase in yield from an application of 60 pounds of nitrogen has been three-fourths of a ton per acre. Rates of application as high as 200 pounds of actual nitrogen per acre continue to increase production (Figure 1), but, in general, 60 to 80 pounds of nitrogen per acre have given the most return for money expended. Note in Figure 1 that with each additional 50 pounds of nitrogen the corresponding yield increase becomes smaller.

Apply in late fall or early spring

Either late fall or early spring applications are satisfactory. Since no difference has been noted between yields from either application date, the choice of when to apply is a matter of personal convenience. We prefer late fall because early spring floods may limit the time available for application.

[1]The Squaw Butte-Harney Range and Livestock Experiment Station is jointly owned and operated by the Bureau of Land Management, Department of the Interior, and Oregon Agricultural Experiment Station, Oregon State College, Corvallis, Oregon.

Put fertilizer on good meadow types

Nitrogen trials have been conducted on 35 different meadows in southeastern Oregon. These meadows were classified into three main types:

1. **Nevada bluegrass**—Areas containing almost pure stands of Nevada bluegrass. These areas are characterized by short periods of early spring flooding. **Apply 60 to 80 pounds of nitrogen per acre.**

2. **Rush-sedge-grass**—Areas containing a mixture of rushes, sedges, and grasses with some native clovers. These areas flood 6 to 12 weeks from 1 to 6 inches deep.

   Apply 60 to 80 pounds of nitrogen per acre here.

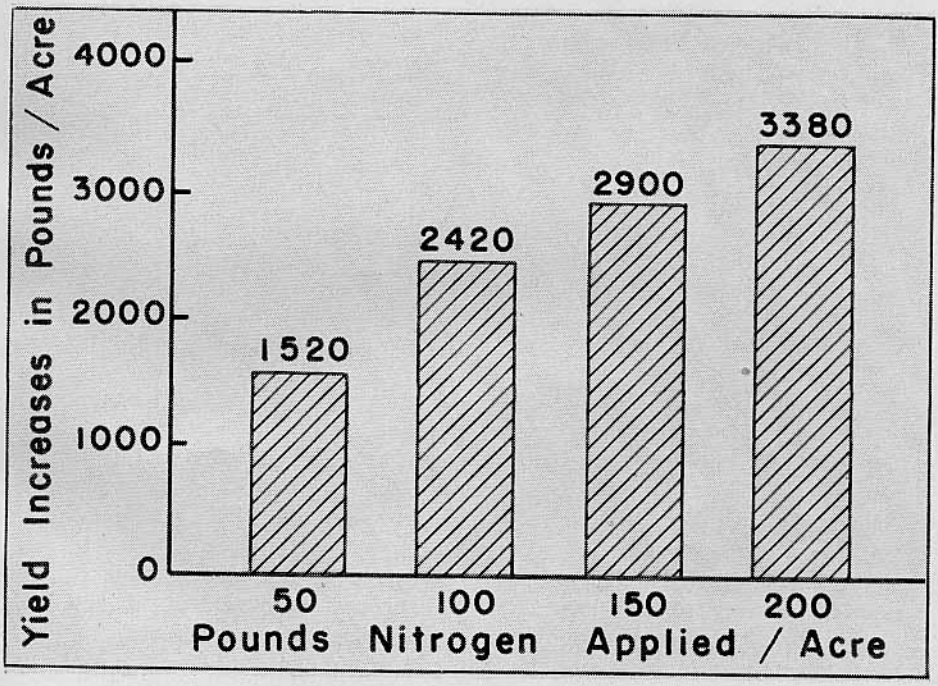
   Don't fertilize strongly alkaline areas.

   Don't fertilize deep swales which are submerged to a depth of more than 6 inches.

3. **Rush**—Areas which are almost pure baltic rush (wire grass) which flood to a depth of 6 inches or more for long periods. **Don't fertilize here.**

Of all types tested, the rush-sedge-grass appears to have the greatest yield potential although yields are quite variable from area to area (Table 1).

FIGURE 1. Nitrogen Boosts Hay Yields



Broadcast on surface soil

Application is limited to surface broadcasting since tough meadow sod prevents the use of machines that place fertilizer in the soil.

Does nitrogen pay?

Yield increases from 28 locations in 1953 and 1954 have shown that while the average increase from an application of 60 pounds of nitrogen is 1600 pounds per acre, considerable variation may be expected from area to area. In Table 2, the net profit in dollars per acre is given for varying yield increases at varying hay prices. Operators making an initial application of nitrogen where the expected yield increase is unknown should use the 1600-pound-per-acre increase for computing expected returns.

Many ranchers may not find it desirable to fertilize with nitrogen year-in and year-out, particularly those who normally have enough hay and do not wish to sell hay on the open market. When hard winters, poor hay years, or a combination of the two cause dwindling hay supplies however, nitrogen fertilizer can rebuild hay reserves.

TABLE 1. Nitrogen increased hay yields at 21 locations on rush-sedge-grass type meadows

Location number	Pounds of nitrogen applied per acre		
	0	60	120
	Tons/acre yield	Tons/acre yield	Tons/acre yield
1	2.19	3.01	3.64
2	2.62	3.43	3.92
3	2.38	3.16	3.03
4	1.39	2.48	2.89
5	2.00	2.42	3.26
6	1.40	2.32	2.34
7	1.79	2.62	2.72
8	.46	1.04	1.74
9	1.93	2.84	3.18
10	1.44	2.12	2.42
11	1.50	2.09	2.82
12	1.99	2.89	3.53
13	.47	.80	.95
14	.90	1.74	2.27
15	1.70	2.70	3.66
16	1.41	2.48	3.35
17	3.21	4.31	3.84
18	1.06	1.20	1.93
19	.25	.62	.77
20	2.71	3.51	3.79
21	1.29	1.95	2.12
Average	1.62	2.37	2.77

Each value is the average yield of that treatment at two rates of phosphorus application, 0 and 80 lbs. of P_2O_5 per acre.

Phosphorus

In combination with certain management practices, phosphorus can increase both the quantity and quality of hay produced on some wild hay meadows. Phosphorus causes a phenomenal increase in the growth of annual whitetip clover, *Trifolium variegatum,* which is commonly found growing on eastern Oregon meadowlands. Without fertilization this clover seldom exceeds 8 inches in height. When phosphorus is applied, it may attain a height of 30 inches. Initially this growth increase may not contribute much to yield since clover plants may be very sparse. You will need to provide for increasing the number of clover plants, and you can do this by delaying the cutting date slightly to allow the clover to drop seed.

Through this combination of fertilizer and management, it has been possible to change the forage composition from one containing less than 1

per cent clover by weight to one containing as much as 50 per cent clover by weight. Meadows thus changed in forage composition have yielded 3 tons per acre, compared to 1 ton per acre on unfertilized meadows. The crude protein content of hay increased from $6\frac{1}{2}$ to $12\frac{1}{2}$ per cent.

Select clover sites for fertilization

At present we recommend phosphorus applications only on areas where white-tip clover is known to be present. The best time to check meadows for the presence of clover is just before hay harvest.

Apply 40 to 60 pounds annually

This will be enough to stimulate the growth of clover present. As the clover percentage in the forage increases, it may become practical to use larger applications.

Delay cutting

Delay harvest until the lower seed heads begin to shatter. At this stage about half of the seed heads will have matured seed. In the process of raking, most of this seed will be threshed and scattered over the meadows. Further delay in cutting will result in a sharp loss in hay quality.

PHOSPHOROUS AND HARVEST management increase yields and improve hay quality through increased clover production. Foreground: Untreated area. Background: An area being converted to white-tip clover.

About the Clover

White-tip clover is an annual commonly found growing on the rush-sedge-grass type meadows in eastern Oregon. It is able to grow standing in water for periods up to 12 weeks, although it does not do well where water is more than 3 inches deep.

The plant produces a single stem which may grow to a height of 30 inches when fertilized, but seldom exceeds 8 inches without fertilization. The seed head is small with a diameter of less than one-half inch. Flowers are purple with white tips. When ripe, seed-heads turn brown and look like burs. Because of this latter characteristic it is sometimes called bur clover, but should not be confused with the true bur clover *Medicago hispida.*

The root system of white-tip clover is very shallow, seldom penetrating deeper than 4 inches. Nodules on roots are numerous and unusually large nodules have been observed. Since the clover is an annual, the roots die each year and become available for decomposition and the release of fixed nitrogen.

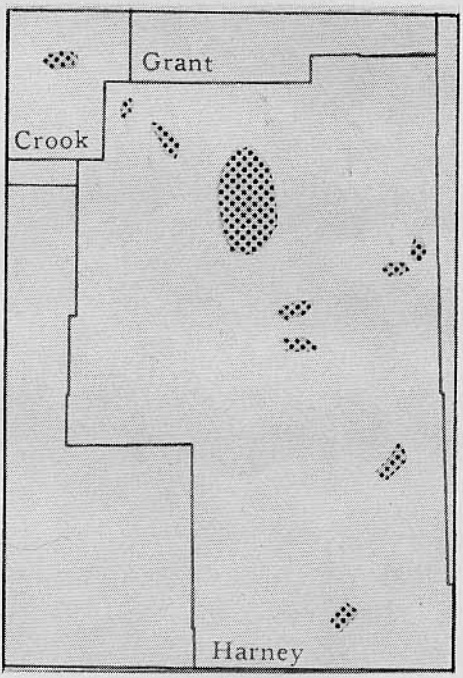
The species is a good seeder. Seed yields of 100 pounds per acre have been obtained and it was estimated that over half the seed was lost in the harvesting process. Upon ripening, the seed pods open and the seed is readily shattered—a characteristic which creates problems in white-tip clover seed harvest management.

White-tip clover is high in crude protein. Composite samples of pure clover taken on June 23, July 16, and July 30, 1953 contained 26, 21, and 13 per cent crude protein respectively.

Cattle eat white-tip clover hay with relish and prefer grazing the aftermath on fertilized clover areas.

One disease, a rust which has been identified as *Uromyces trifolii,* is known to attack white-tip clover plants. Control of the disease and the extent to which it may affect growth is unknown.

FIGURE 2. Trial Locations



FERTILIZER TRIALS have been and are being conducted on a number of eastern Oregon ranches. Soil type and other location differences which may affect meadow response to fertilizers can then be evaluated in making recommendations.

TABLE 2. Net profit* from yield increases due to 60 pounds of nitrogen per acre at various hay values

Value of hay in dollars per ton	Yield increases (pounds per acre)				
	2000	1800	1600	1400	1200
14	$ 1.80	$ .55	$ –.70	$–1.95	$–3.20
16	3.80	2.35	.90	– .55	–2.00
18	5.80	4.15	2.50	.85	– .80
20	7.80	5.95	4.10	2.25	.40
22	9.80	7.75	5.70	3.65	1.60
24	11.80	9.55	7.30	5.05	2.80
26	13.80	11.35	8.90	6.45	4.00
28	15.80	13.15	10.50	7.85	5.20
30	17.80	14.95	12.10	9.25	6.40

*Net profit was computed by subtracting the following costs from the value of the yield increase:
Nitrogen at 17¢ per pound.
Cost of application at 50¢ an acre.
Cost of stacking additional hay at $1.50 per ton.

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