TECHNICAL NOTES

UNITED STATES DEPARTMENT OF AGRICULTURE — NATURAL RESOURCES CONSERVATION SERVICE
JULY 2009 — ALEXANDRIA, LOUISIANA

PLANT MATERIALS TECHNICAL NOTE NO. 11

UNDERSTANDING SEEDING RATES, RECOMMENDED PLANTING RATES, AND PURE LIVE SEED (PLS)

INTRODUCTION

The success of any conservation plantings depends on seed quality, planting techniques, and your understanding of knowing what to plant and how much seed is needed.

Any successful planting begins with identifying the purpose of the planting; selecting suitable species that meet the desired objectives of the resource concern; and determining how much seed needs to be purchased.

Having a basic understanding of seeding rates, recommended planting rates, and of pure live seed (PLS) will help you in deciding how much seed you'll need to purchase for your planting.

Making the wrong decisions when buying seed will cost you spent time and money, and the chance having a stand failure by not planting adequate amounts of seed.

SEEDING RATES, RECOMMENDED PLANTING RATES, AND PURE LIVE SEED (PLS)

Seeding Rate

Seeding is defined as the amount of seed of an individual species that's needed to achieve an adequate stand. This is expressed in pure live seed (PLS) pounds per acre and is based on planting a predetermined number of live seeds per square foot to achieve a specific plant density.

Having the proper plant density is important because it affects the overall health of the planting and the vigor of the plants. Excessively high plant densities cause plants to compete for available food and water, where as extremely low plant densities may provide the opportunity for weed invasion. Higher plant densities are good for situations where quick cover and protection is desired such as critical area plantings or one might want a lower plant density if you are targeting the development of habitat for wildlife such as the bobwhite quail.

For conservation purposes, seeding rates have been established to achieve the desired plant density of around 20-60 live seeds per square foot. These figures are fairly standard when figuring seeding rates except when you are dealing with very large or very small seed sizes (e.g. eastern gamagrass vs. bermudagrass). Under these situations you may be looking at plant densities as low as 2 seeds per square foot for eastern gamagrass compared to 240 seeds per square foot for bermudagrass. The reasoning behind these extremes can usually be contributed to mature plant size, plant type, and planting methods. Established seeding rates have been

An Equal Opportunity Provider and Employer

evaluated by state agricultural stations and the plant materials program and have proven to be the best rate to achieve an adequate stand.

Recommended Planting Rate
The recommended planting rate is also an expression of the number of pure live seed (PLS) pounds per acre needed to achieve an adequate stand. The recommended planting rate will mirror individual species seeding rates if only one species is planted. When a mixture of several plant species is planned the recommended planting rate of each species would reflect only a specific percent of the total mixture. Other plants within the mix will make up the remaining percent of the mixture (100% Total). When all of the selected plants are planted at their recommended planting rates than the desired plant density should be achieved.

Pure Live Seed (PLS)
PLS is a means of expressing seed quality. PLS is the percentage of seed (i.e. good viable seed) that has the potential to germinate within a measured one pound weight of any seed lot. Nearly all species recommended for conservation plantings by NRCS uses Pure Live Seed (PLS) expressed in pounds per acre as the basis for the calculation of seeding rates. One exception to this rule is the use of bulk planting rates for traditionally used agronomic crops (e.g. wheat, oats, annual ryegrass, etc.). PLS provides a basis for comparing the quality of seed lots of the same species that differ in purity and germination. The use of PLS guarantees that the same amount of viable seed per acre is planted even though different seed lots with varying quality may be used.

CALCULATING PURE LIVE SEED
The first thing that needs to be understood when dealing with seeding rates, recommended planting rates and seed mixtures is how to determine PLS. As defined above PLS is the percentage of good viable seed that has the potential to germinate. To calculate PLS you will need to know the % total germination and % purity of each seed lot that you plan on planting. See Example 1.

This information is included on the seed analysis tag or a copy of the seed analysis report that by law should have been supplied with each lot of seed purchased. If you don't have this information or you have purchased seed without an analysis tag or report than you are taking a chance on whether the seed you plant may be viable or not.

Some companies do the math and print the PLS % on the seed tag but it is not required by law.

Example 1 - How to calculate PLS.

Kind	SWITCHGRASS	
Variety	LNPI Selection	
Lot Number	SRE-02-08	
Date Tested		11/29/2008
Net Weight		50 LB.
Pure Seed		98.75%
Inert Matter		1.00%
Other Crop		0.00%
Weed Seed		0.00%
Germination		88.00%
Dormant Seed		5.00%
Total Germ & Dormant Seed		93.00%
Origin	Terrebonne Parish, LA	
Noxious Weed/LB	NONE	
Name	USDA-NRCS Golden Meadow Plant Materials Center	
Address	438 Airport Road, Galliano, LA 70354	

The basic formula to calculate PLS is:
Percent (%) Purity x Percent (%) Total Germination /100 = % PLS

The seed tag above indicates this lot has 98.75% purity and a total germination of 93% (germination 88% and dormant seed 5%)

The calculation to figure PLS for this lot would be: 98.75 x 93/100 = 91.83% PLS

What this tells you is that out of every bulk pound of seed from this lot of switchgrass; only 91.83% of each pound would be good viable seed. In other words, if you purchased a bag of this seed and it weighed 50 pounds, you would only be purchasing 45.9 pounds of good viable seed. The remainder would be inert matter and other seed that failed to germinate. Understanding PLS helps us determine seed lot quality and can be used to compare seed lot cost. See Example 2 and 3.

We're often confronted with this question when shopping for seed. What is the best buy? If all your price quotes are given in dollars per PLS pound than your answer is simple. The one that is the cheapest is the best buy. What you'll run into many times is that you will see a price listed for a pound of seed and the price quoted is a bulk pound price. This practice is not wrong in any way, but if you are not aware of what you are looking at than the impression you get is that you've found a bargain seed lot and it's going to save you a lot of money.

Example 2 - Comparing Bulk price vs. PLS price
Which is the best buy? Purchasing a switchgrass lot with a bulk seed cost at $19.95 per pound or buying it by PLS at $20.00 per pound? The switchgrass seed lot in the example above has a PLS of 91.83 %. To figure the PLS cost per pound use the following example;

PLS Cost Per Pound = bulk price/% PLS

= $19.95 / 91.83 %

= $21.72

Using the above formula we see that purchasing seed at $20.00 per pound PLS is actually less expensive than purchasing seed at $19.95 per bulk pound which would calculate out to $21.72 per pound PLS.

Example 3: Comparing two different lots.
Once you have mastered how to determine PLS for any given seed lot you'll be able to compare the cost of two different seed lots and see which one is the best buy. Look at the results below of seed offered for sale from Company A and Company B

	Formula	Company A	Company B
Species		Little Bluestem	Little Bluestem
Price (Bulk per lb)		$ 8.00	$ 8.25
% Purity		85.20 %	86.30 %
% Total Germination		79 %	84 %
% PLS	**(%) Purity x Percent (%) Total Germination /100**	67.30 %	72.49 %
Price per PLS lb	**bulk price/% PLS**	$ 11.89	$ 11.38

From these calculations we can easily see that the posted price ($ per bulk pound) is again not always the best buy. Company A's seed that sells for $ 8.00 a bulk pound would end up costing $11.89 for each PLS pound as compared to Company B which sells it's seed for $ 8.25 per bulk pound which would end up being the cheapest at $11.38 for each PLS pound.

These examples prove that the cheapest seed is not always the best buy or the most economical. By comparing the purity and germination, and calculating PLS for any given seed lots you can see clearly which lots are the most economical and have the best chance to establish a successful planting.

Morris J Houck
Plant Materials Specialist

REFERENCES

Louisiana Department of Agriculture & Forestry, Seed Programs, 2008, Louisiana Seed Certification Standards, Baton Rouge, LA.

Louisiana Department of Agriculture & Forestry, Seed Programs, 2008, Louisiana Seed Laws, Baton Rouge, LA.

USDA Natural Resources Conservation Service, 2007, National Plant Materials Manual, Fourth Edition, Beltsville, MD.

Reading Seed Packaging Labels and Calculating Seed Mixtures, 2002, USDA NRCS Plant Materials Technical Note No. 4, Boise, ID.

Association of Official Seed Certifying Agencies, 2003, The Native Plant Connection, Boise, ID.

Association of Official Seed Analysis, 2008, Rules for Testing Seed Manual, Stillwater, OK.