VIRGINIA AGRICULTURAL EXPERIMENT STATION
EASTERN VIRGINIA AGRICULTURAL RESEARCH AND EXTENSION CENTER
VIRGINIA TECH

EASTERN VIRGINIA AREC NEWSLETTER

VOLUME V, ISSUE I

April 2024

Dr. Joseph Oakes,

Superintendent

Activities at the center are quickly picking up as we have entered April and moved into spring! Wheat at the center is splitting the boot and will be heading in a few days. With no forecast of frost for the next 2 weeks, we should be in the clear for a high yielding wheat crop. We invite everyone out to the Virginia Small Grain Field Day on May 16 to hear from our small grain specialist and breeding team. More info and registrations links are on page 2. We are also hosting a faba bean field tour on May 29. Details are on page 5.

This Issue:

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Save the Date!

Click here to register: https://bit.ly/SGFD2024

Research Spotlight

We began a study funded by the Virginia Small Grains Board this growing examining the impact of planting date and weather patterns on wheat development, freeze susceptibility, and yield. This research has two major objectives:

1. To examine the effect of planting date on tiller development, freeze susceptibility, and yield at several locations across Virginia.
2. To determine if the North Atlantic Oscillation weather pattern can be used in Virginia to predict growing degree days (GDD) as a tool for planting date.

Recent weather trends have suggested that we may be able to shift our wheat planting dates back 1 -2 weeks, while still achieving adequate fall tiller development and reducing the risk of a late spring freeze.

We currently have three on-farm locations where we are examining the planting dates from mid-October to late-November. Preliminary results have shown that wheat planted on both Oct. 19 and Oct 30, accumulate adequate GDD for proper fall tiller development.

Look for more details and recommendations in the coming months once the plots are harvested.

King William/King & Queen County ANR Agent Turner Minx and Essex County ANR Agent Robbie Longest stand in an on-farm planting date test in King William County, VA

Aerial Spectral Imagery to Determine Fertility Rate & Timing

We have recently concluded a six year study looking at using aerial imagery to determine tiller density and pinpoint the rate & timing of GS25 nitrogen applications.

Using the following equation:

$$Tiller\ count = 0.00071 NDVIa + 0.2623^{1}$$

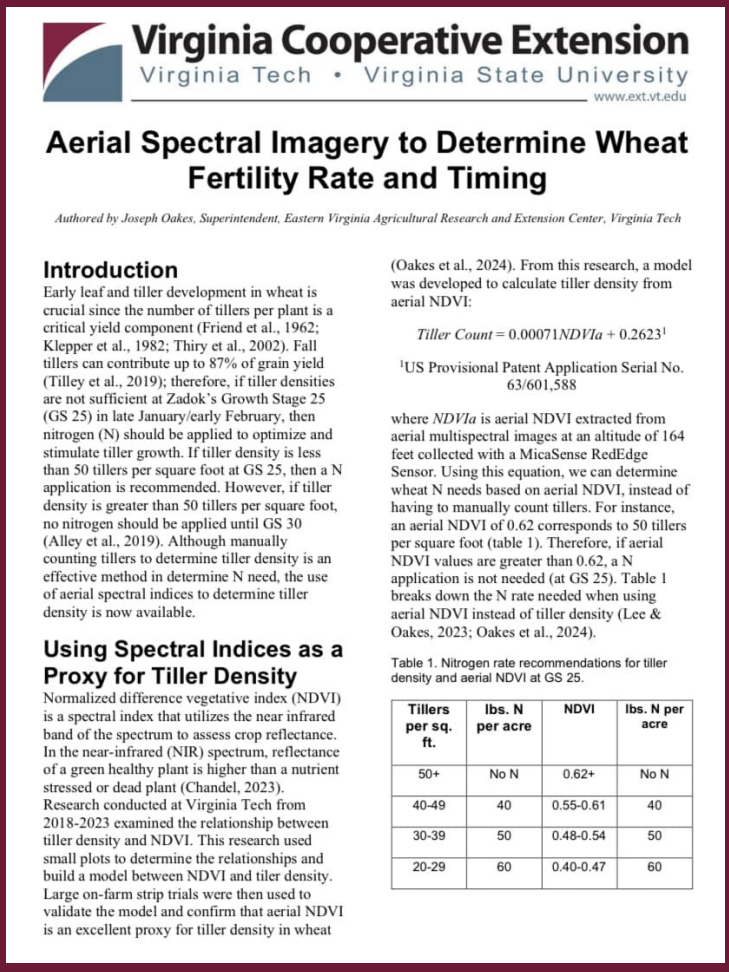
[1]US Provisional Patent 63/601,588

where *NDVIa* is aerial NDVI extracted from multispectral images, we are able to accurately calculate tiller density from aerial NDVI.

The following chart provides recommendations for nitrogen applications based on aerial NDVI.

Table 1. Nitrogen rate recommendations for tiller density and aerial NDVI at GS 25.

Tillers per sq. ft.	lbs. N per acre	NDVI	lbs. N per acre
50+	No N	0.62+	No N
40-49	40	0.55-0.61	40
30-39	50	0.48-0.54	50
20-29	60	0.40-0.47	60



Virginia Cooperative Extension
Virginia Tech • Virginia State University
www.ext.vt.edu

Aerial Spectral Imagery to Determine Wheat Fertility Rate and Timing

Authored by Joseph Oakes, Superintendent, Eastern Virginia Agricultural Research and Extension Center, Virginia Tech

Introduction

Early leaf and tiller development in wheat is crucial since the number of tillers per plant is a critical yield component (Friend et al., 1962; Klepper et al., 1982; Thiry et al., 2002). Fall tillers can contribute up to 87% of grain yield (Tilley et al., 2019); therefore, if tiller densities are not sufficient at Zadok's Growth Stage 25 (GS 25) in late January/early February, then nitrogen (N) should be applied to optimize and stimulate tiller growth. If tiller density is less than 50 tillers per square foot at GS 25, then a N application is recommended. However, if tiller density is greater than 50 tillers per square foot, no nitrogen should be applied until GS 30 (Alley et al., 2019). Although manually counting tillers to determine tiller density is an effective method in determine N need, the use of aerial spectral indices to determine tiller density is now available.

Using Spectral Indices as a Proxy for Tiller Density

Normalized difference vegetative index (NDVI) is a spectral index that utilizes the near infrared band of the spectrum to assess crop reflectance. In the near-infrared (NIR) spectrum, reflectance of a green healthy plant is higher than a nutrient stressed or dead plant (Chandel, 2023). Research conducted at Virginia Tech from 2018-2023 examined the relationship between tiller density and NDVI. This research used small plots to determine the relationships and build a model between NDVI and tiler density. Large on-farm strip trials were then used to validate the model and confirm that aerial NDVI is an excellent proxy for tiller density in wheat (Oakes et al., 2024). From this research, a model was developed to calculate tiller density from aerial NDVI:

$$Tiller\ Count = 0.00071 NDVIa + 0.2623^{1}$$

[1]US Provisional Patent Application Serial No. 63/601,588

where *NDVIa* is aerial NDVI extracted from aerial multispectral images at an altitude of 164 feet collected with a MicaSense RedEdge Sensor. Using this equation, we can determine wheat N needs based on aerial NDVI, instead of having to manually count tillers. For instance, an aerial NDVI of 0.62 corresponds to 50 tillers per square foot (table 1). Therefore, if aerial NDVI values are greater than 0.62, a N application is not needed (at GS 25). Table 1 breaks down the N rate needed when using aerial NDVI instead of tiller density (Lee & Oakes, 2023; Oakes et al., 2024).

Table 1. Nitrogen rate recommendations for tiller density and aerial NDVI at GS 25.

Tillers per sq. ft.	lbs. N per acre	NDVI	lbs. N per acre
50+	No N	0.62+	No N
40-49	40	0.55-0.61	40
30-39	50	0.48-0.54	50
20-29	60	0.40-0.47	60

Click here to read the entire publication breaking down how to use aerial spectral imagery to determine tiller density and pinpoint the rate and timing of nitrogen applications:

Aerial Spectral Imagery to Determine Wheat Fertility Rate and Timing (vt.edu)

Upcoming Events

VIRGINIA AGRICULTURAL EXPERIMENT STATION
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- Virginia Small Grains Field Day—May 16
  8:00 am—12:00 pm; Lunch provided
  Register here: https://bit.ly/SGFD2024

- Faba Bean Field Tour—May 29
  10:30 am—12:00 pm; Lunch provided
  Register here: https://bit.ly/3Jh2W7o

- Virginia Soybean Field Day— Sept. 12
  More info to come soon!

Join Our Team!

Come join our team for the Summer as a paid intern!

JOIN OUR TEAM FOR THE SUMMER!

We are seeking a college student to work May-August 2024.

For more info contact:
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Recent Publications

Publications:

- **Oakes J,** Balota M, Cazenave A-B, Thomason W. Using Aerial Spectral Indices to Determine Fertility Rate and Timing in Winter Wheat. *Agriculture*. 2024; 14(1):95. https://doi.org/10.3390/agriculture14010095
- **Joseph Oakes.** Aerial Spectral Imagery to Determine Wheat Fertility Rate and Timing. 2024. https://www.pubs.ext.vt.edu/content/dam/pubs_ext_vt_edu/spes/spes-582/SPES-582.pdf

CALS Research Needs Assessment

The College of Agriculture and Life Sciences at Virginia Tech has launched a research needs assessment survey, aimed at steering the future direction of agricultural research initiatives. The survey is open to faculty, students, industry partners, and stakeholders and seeks to identify the most pressing needs in the agricultural sector., including crop science, agricultural technology, and sustainable farming practices. Mary Burrows, director of the Virginia Agricultural Experiment Station emphasized this endeavor. "This survey will help us align our resources with the most urgent and impactful areas of agricultural research.

Please click here to complete the survey: College of Agriculture and Life Sciences begins research needs assessment survey | Virginia Tech News | Virginia Tech (vt.edu)

Around the Center

VIRGINIA AGRICULTURAL EXPERIMENT STATION
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Good discussion & feedback with our advisory board in February!

Trenching cable to install WiFi in the seed lab

Spraying back wheat plots to harvest length

Planting faba beans as part of a USDA funded project

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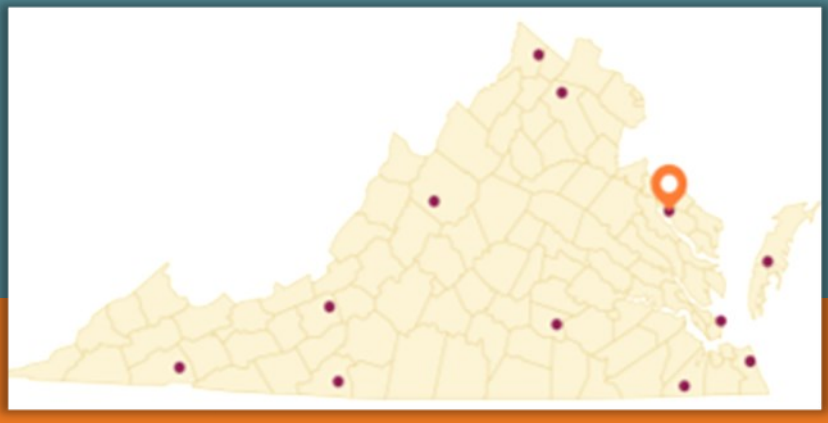
Eastern Virginia AREC's mission is to serve Virginia's grain and soybean industries through research and educational programs leading to improved varieties and crop management practices. Our research objectives are to support the Virginia Tech soybean and small grain breeding programs, and to conduct agronomic research that contributes to economically and environmentally

A COLLABORATIVE NETWORK

The ARECs are a network of 11 centers strategically located throughout the state that emphasize the close working relationships between Virginia Agricultural Experiment Station, Virginia Cooperative Extension, and the industries they work with. The mission of the system is to engage in innovative, leading-edge research, to discover new scientific knowledge, and create and disseminate science-based applications that ensure the wise use of agricultural, natural, and



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