# Athletic Field Paint Effects on Turfgrass Photosynthesis

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**Objectives:** To determine the effects of athletic field paint on turfgrass growth processes including photosynthesis.

- Photosynthetically Active Range (PAR) is 400-700 nm.


| Color | Wavelength |
|---|---|
| violet | 380–450 nm |
| blue | 450–495 nm |
| green | 495–570 nm |
| yellow | 570–590 nm |
| orange | 590–620 nm |
| red | 620–750 nm |

## Photosynthesis Experiments

Athletic field paints are routinely applied to turf surfaces to demarcate sports fields. Although they do not typically cause acute injury, field managers routinely notice chronic declines in turfgrass health and quality from repeated applications. NC State has been evaluating the impacts of athletic field paint on spectral quality within the turfgrass canopy and associated photosynthesis. Experiments were designed to evaluate the effects of red and white athletic field paint (no dilution and 1:1 dilution with water) on net canopy photosynthesis (Pn) of perennial ryegrass. Paint treatments were applied weekly for six weeks with net canopy photosynthesis recorded 24 hours after each application using a portable gas exchange system. Additional experiments were conducted to evaluate reflection, absorption, and transmission of light based on paint color, dilution, and thickness. Narrow-band spectral data collected were 410, 430, 640, and 660 nm ±10 nm while broad-band data collected were 400-500, 600-700, and 400-700 nm. Over a six week period all paint treatments reduced Pn with treatment effects being dependent upon color ($P \leq 0.0001$) and dilution ($P \leq 0.0001$). Red non-diluted paint produced a 75% reduction in canopy photosynthesis over six weeks while white 1:1 diluted paint only produced a 19% reduction. Broadband data suggests this is likely due to reductions in PAR with red paint absorbing 51% of incident PAR while only transmitting and reflecting 6% and 43%, respectively. White paint transmitted 5% of PAR while reflecting 95%. Narrow-band responses varied by wavelength. Alterations in light spectral quality as a result of athletic field paint applications can significantly impact PAR available for turfgrass photosynthesis that may result in a decline in turfgrass quality.

Figure 1. Apparent photosynthetic rates of perennial ryegrass without paint and following application of red-undiluted paint, white undiluted paint, or these paint treatments diluted 1:1 with water.

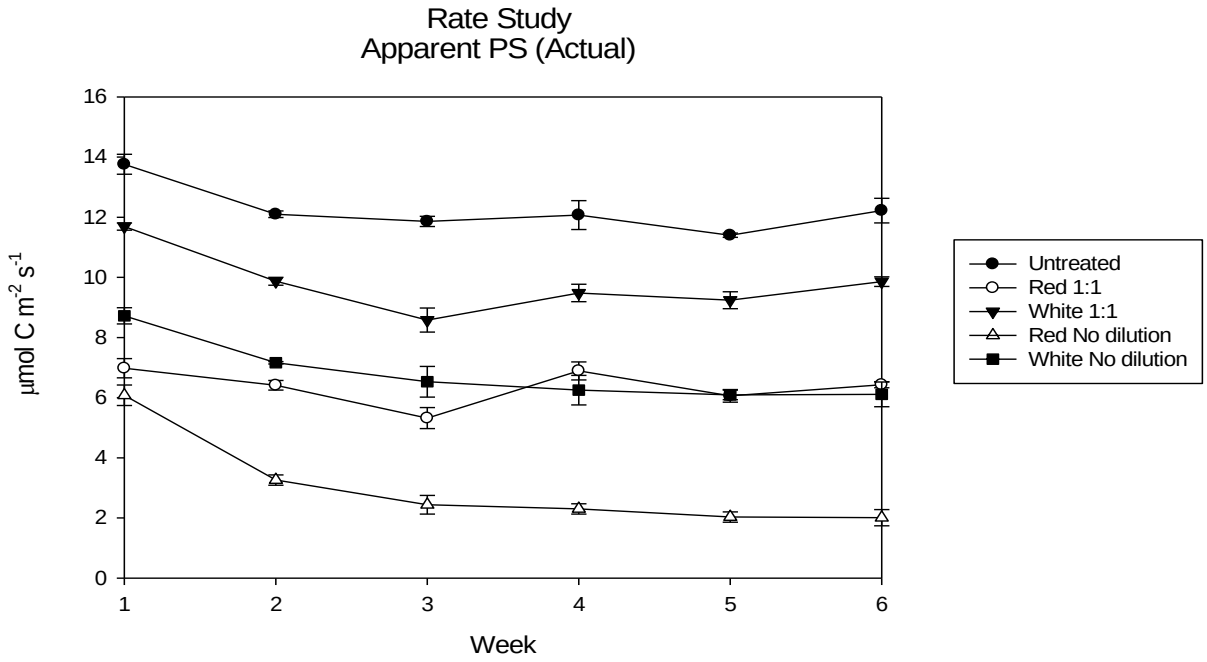



Figure 2. Normalized photosynthetic rates of perennial ryegrass following 1, 2, 3, or 4 applications of red non-diluted paint.

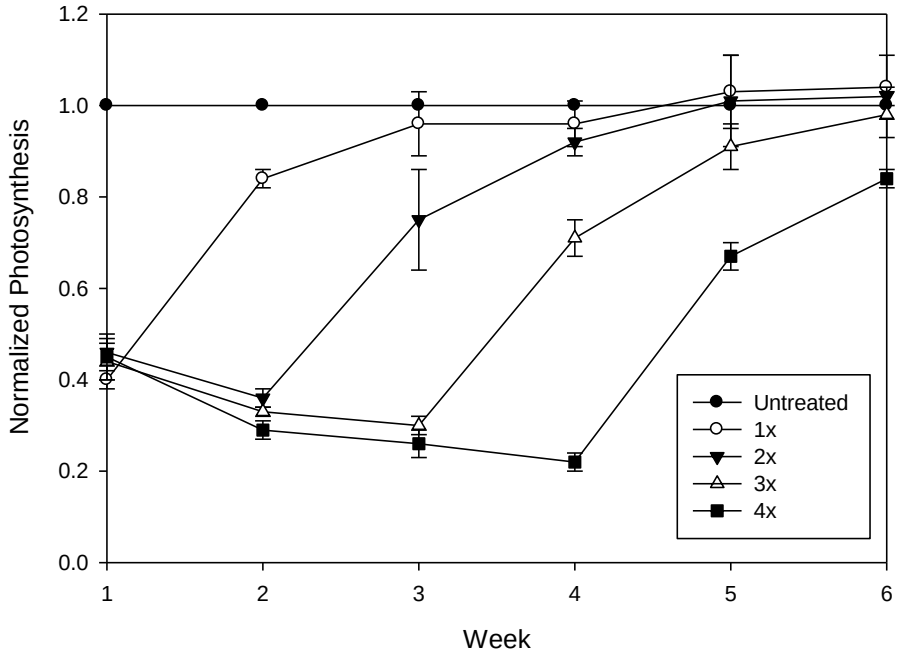
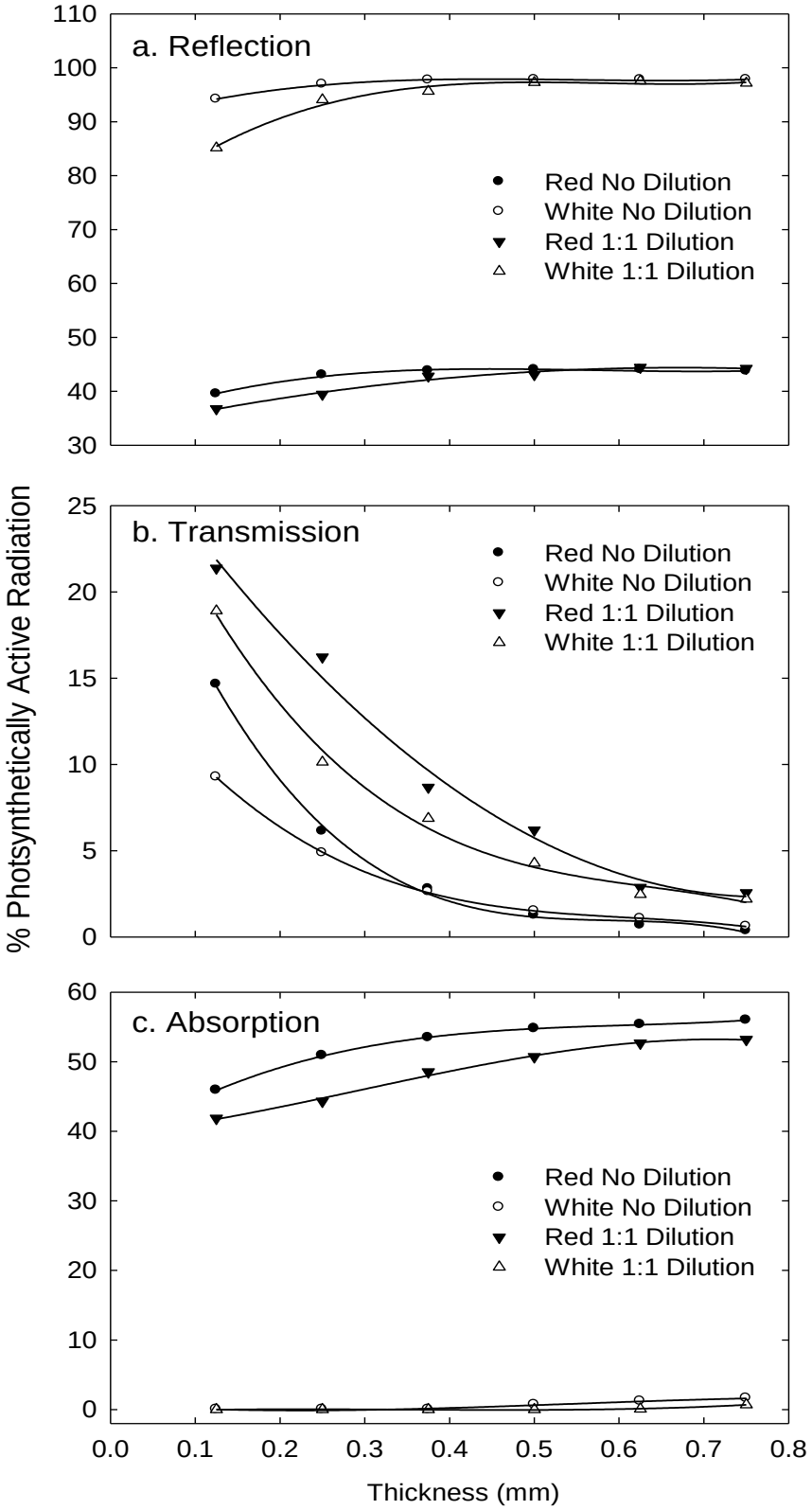


Figure 3. Reflection (a), transmission (b), and absorption (c) of red non-diluted, red 1:1 diluted, white non-diluted, and white 1:1 diluted paint when applied to transparent film at six wet thicknesses (0.125, 0.25, 0.375, 0.5, 0.625, and 0.75 mm).



# Comparison of Athletic Field Paint Application Methods

Grady Miller – 11 August 2010 Turf Field Day Presentation

There are two primary paint formulations used in application of paints (lines or logos) to athletic fields: aerosol and bulk paint. The aerosol paint may be applied as a line using a "striper" and the bulk paint using roller, paint brush, or pressurized sprayer. The pressurized sprayer is most commonly used with either low pressure (from $CO_2$ tanks or compressed air) or high pressure (often called an airless sprayer). The benefits of aerosol paint compared to bulk paint are convenience and less need of cleanup after use. The downside is all the spent cans that are discarded and end up in a landfill and high paint cost. Other than clean-up, the downside to bulk paint is the significant cost of the application machine. A new product on the market (Starliner) provides a new alternative to each of these methods. It uses paint from a sealed cardboard box and the relatively inexpensive application machine uses an electric motor to pressurize the system to deliver the paint. A relative cost comparison of the three different application methods is below:

| **Paint type** | **Linear ft.** | **Cost** | | | | | **Associated equipment** |
|---|---|---|---|---|---|---|---|
| | | $/unit | 1000 linear ft. | Soccer small | Soccer large | H. S. football | |
| Aerosol (18 oz.) | 180/can | $4.46 | $ 25 | $ 45 | $ 50 | $ 115 | $ 100 |
| Starliner electric | 1250/box | $39.75 | $ 32 | $ 57 | $ 65 | $ 148 | $ 380 |
| | 2000/box | | $ 20 | $ 36 | $ 40 | $ 92 | |
| Airless sprayer | 1900/gal. | $14.50 | $ 8 | $ 14 | $15 | $ 20 | $ 1600- 3200 |

Note:
Starliner has 2 speed options. This will change painted area per box of paint.
All products can be bought in bulk to reduce price.