

3 things a golf course superintendent juggles 高爾夫球場場務的3件要事

- **Turfgrass health** 草坪的健康
- **Playability** 擊球品質
- **Budget** 預算



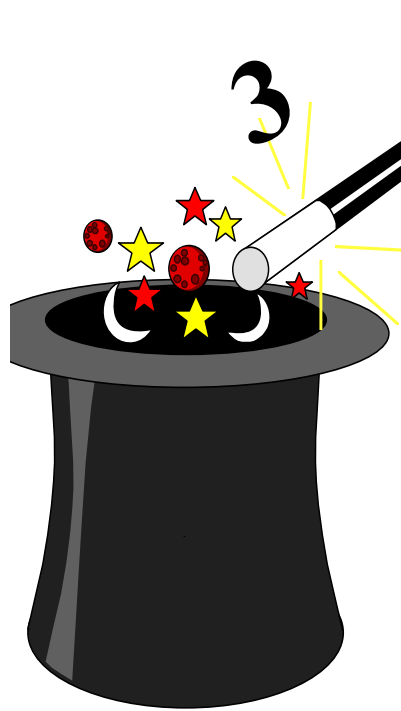
1990's rolling frequency research

1990年代關於滾壓頻率的研究

- **0, 1, & 2 times per week** 每周0,1,2次 (Penn State 賓州)
- **0 & 3 times per week** 每周0&3次 (Michigan State 密西根州)
- **0, 1, 4, & 7 times per week** 每周0,1,4&7次 (NC State 北卡)
 - **no decrease in turfgrass quality with three or less rollings per week** 每周3次或以下對草坪品質並沒有影響
 - **a decrease in turfgrass quality existed with rolling frequencies of 4 times or more per week after several consecutive weeks** 持續幾周每周4次以上對草坪品質會有負面影響
 - **no consistent increase in bulk density** 對密度無持續的影響
 - **no decrease in water infiltration** 沒有降低水的滲透率

3 is the Magic Frequency

3 是魔術的頻率



3 No increase in bulk density 不會改變密度

- **No decrease in turfgrass quality 不會影響草的品質**
- **Can noticeably increase green speeds 6 days per week 每周6天可感覺到增加果嶺速度**
- **Decreases dollar spot and localized dry spot 可以將低dollar spot 及控制dry spot**

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Impact of Light-Weight Rolling on Putting Green Performance 輕型果嶺滾壓對果嶺的影響

Christopher E. Hartwiger, Charles H. Peacock*, Joseph M. DiPaola and D. Keith Cassel

“Rolling treatments were applied using a GreenRollerJ (Cultural Turf Technologies, Arnold, PA) lightweight roller at frequencies of zero, one, four, or seven rollings per week A single rolling treatment consisted of **rolling across a plot in one direction and then back in the opposite direction.**”

“每周使用GreenRollerJ輕型滾壓機0,1,4或7次在果嶺上. 每次滾壓包括單向去及回。”

Graden roller Study 2006

- Initiated May 2006 on a bentgrass plot seeded in October 2005 (*very young and tender turf*) 2006年5月開始的試驗，測試在2005年10月份種植的本特 (*非常年輕且嫩軟的草*)
- 6 treatments (all mowed at 0.156in) 6組試驗組 (全部設定3.96mm)



Graden Roller Study 2006

Season Averages

Treatments(0.156 in割草高度為3.96mm)	Not rolled 不滾壓	Rolled 滾壓
Mowed daily never rolled (每日割草從不滾壓)	-----	-----
Mowed daily rolled every other (每日割草每隔一日滾壓)	+7"	+16"

The numbers in each column represent an average of approximately 20 green speeds measurements obtained during the summer of 2006 at Michigan State University. The 16-inch gain obtained on the day plots were rolled is a very positive increase. Additionally, a residual green speed of 7-inches is good, however, the daily change in speed of 11-inches might be a concern for some. 上列數值, 為2006年在密西根州立大學測試的20個果嶺的速度平均值. 增加16英吋的果嶺速度距離, 在提升測試果嶺速度與滾壓的關係上來說算是非常明顯的. 但是在不滾壓的日子裡果嶺速度提升7英吋. 問題產生: 在與每日果嶺速度的差異性就有11英吋.

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Mowed daily rolled every other (每日割草每隔一日滾壓)	+7"	+16"
Mow and roll daily (每日割草每日滾壓)	+22"	+21"

This is very nice data for green speed consistency day to day and it is certainly worthy to mention that these plots had no reduction in turfgrass quality and there was no decrease in water infiltration. Obviously, mowing and rolling everyday would be cost prohibitive for many golf courses. 這個數值在於每日個果嶺速度上表現相當平均.在這個試驗的草坪上並沒有品質上的異常也沒有降低水的滲透率. 但是每日割草及滾壓對很多高爾夫球場來說, 將會提高養護成本.

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Mow and roll daily (每日割草每日滾壓)	+22"	+21"
Roll daily mow every other (每日滾壓每隔一日割草)	+19"	+19"

Very interesting comparison isn't it? Given that it cost more money to mow than to roll, that rolling causes less damage to the turf than mowing, and that rolling daily and mowing every other day has the most consistent green speeds the only question is why wouldn't you roll daily and mow every other? 這是一個有趣的數值.每日滾壓每隔一日割草的這個試驗結果,數值極為平均.如考慮割草成本比滾壓成本高,且滾壓對草的傷害比割草對草的傷害還少.這個方式能否運用於高爾夫球場的養護中?

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Alternate mow and roll (一日割草一日滾壓)	+4"	+11"

What a great program to save money or free-up man-hours, produce healthy turf, and keep the members happy ! In a study performed at the University of Tennessee they found if private golf courses did this for a year they could save \$30,000.00. If a public course did this for several months a year the roller would pay for itself. 是一個節省的方式(省錢,省時,省工)且可以維持健康的草坪,且達到會員的要求. 在田納西州大學的研究下以這種方式操作果嶺保養一年可以省下3萬元美金. 如公共球場依這方式保養幾個月後將省下一台滾壓機的費用.

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Alternate mow and roll (一日割草一日滾壓)	+4"	+11"
Roll every other day double cut on days not rolled 每隔一天滾壓不滾壓的日子雙向割草	+12"	+20"

Not the results I anticipated and undoubtedly a program not worth doing (oh, it also produced the lowest quality turf). 這不是預期的結果. 且這是一個比較不值得運用的方法 (這個方式對比較傷草坪)

Lightweight roller research conclusions

輕型滾壓測試研究結論

• **Mowing every day and rolling every other** increases green speed an average of 16-inches with the Graden and has also been shown to decrease dollar spot and localized dry spot.

• **每天割草及每隔天滾壓**提高16英吋的果嶺速度且減少幣班病 (dollar spot)及局部乾燥斑點(localized dry spot).

Lightweight roller research conclusions

輕型滾壓測試研究結論

• **Mowing every day and rolling every other** increases green speed up to 16-inches with the Graden and has also been shown to decrease dollar spot and localized dry spot. 每天割草及每隔天滾壓提高16英吋的果嶺速度且減少幣班病 (dollar spot)及局部乾燥斑點 (localized dry spot).

• **Daily alternating rolling with mowing**

result in increased turfgrass quality, equal or improved playing conditions, and increased labor productivity and/or economic savings

• 一日割草一日滾壓提升草坪品質, 推桿品質的一致性. 及可看見的人力節省與經濟節省.

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• **Daily alternating rolling with mowing** result in increased turfgrass quality, equal or improved playing conditions, and increased labor productivity and/or economic savings. 一日割草一日滾壓提升草坪品質, 推桿品質的一致性. 及可看見的人力節省與經濟節省.

• **Rolling every day with the Graden and mowing every other** results in the most uniform playing conditions (an increase in green speed of 19-inches on days plots were mowed and NOT mowed) throughout the day and from day to day and better turf quality than mowing every day and rolling every other.

• **每日滾壓每隔一日割草**提升果嶺速度及推桿品質一致性(每天的速度都一樣提升19英吋不論有沒有割草).