

8. Broadleaf weed, moss, algae reduction

No research plots have ever been designed to examine the impact of lightweight rolling on broadleaf weeds, moss or algae encroachment, yet related research has documented that lightweight rolling decreases each of them. In an MSU study in 1996, putting greens rolled three times per week had fewer broadleaf weeds and less moss than greens that were not rolled.

Furthermore, in 2008, University of Arkansas Masters student Jay Richards reported that lightweight rolling decreased algae encroachment.

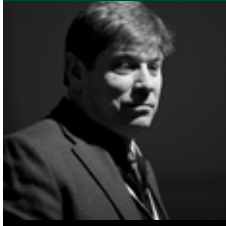
Exactly why regular lightweight rolling would decrease these pests is not known, but two different theories have the most merit.

The first is that regular rolling increases turfgrass density thus reducing the potential of the pests. The other theory is the pests (especially moss) simply cannot tolerate the traffic put upon it by continuous rolling.

7. Decreased localised dry spot

A lightweight rolling study per-

about the author



Thomas A. Nikolai, Ph.D., is an academic specialist at Michigan State University and is world renowned as being the "Doctor of Green Speed". He is also the author of the book, *The Superintendents Guide to Controlling Putting Green Speed*.

BELOW RIGHT (TOP): Seeded plots. The plot in the middle is rolled 3x per week to its left never rolled and to the right rolled 5X per day during establishment after seeding

BELOW RIGHT (BOTTOM): Plot on left has never been rolled the plot on the right is rolled 3X/week

BELOW LEFT: Figure 1

MAIN IMAGE LEFT: Courtesy of Mike Morris CGCS

formed at MSU from 1995 to 2000 revealed that greens rolled three times per week displayed significantly less localised dry spot than greens that were never rolled. Soil samples from the study showed that rolled plots retained more moisture and had more root mass than root zones that were not rolled.

Obviously, increased soil moisture content and root mass could lead to less localised dry spot on the turfgrass putting surface.

In the past several years it has become easier for researchers and golf course superintendents alike to measure volumetric soil moisture content because Time Domain Reflectometry (TDR) technology has been vastly improved. TDR measurements taken on lightweight rolling studies have consistently shown that lightweight rolling does increase soil volumetric moisture content.

6. Height of cut raised and green speed retained

Figure 1 (below left) shows green speed measurements from the very first mowing height/rolling study. Plots mowed at 0.5cm were rolled three times per week and were compared to plots that were not rolled

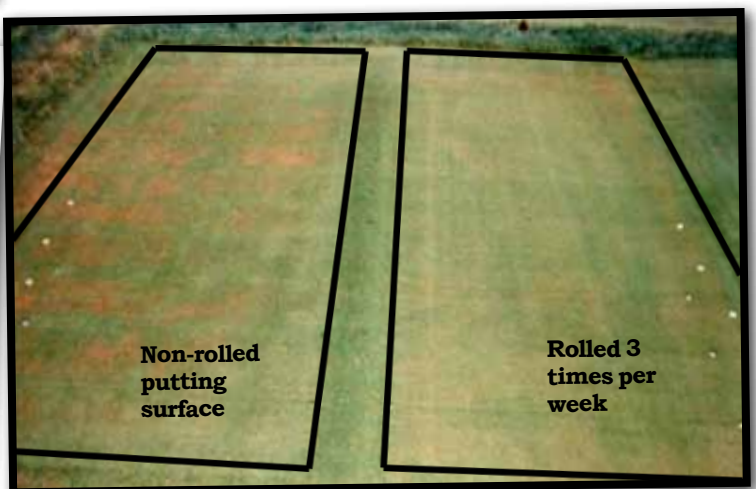
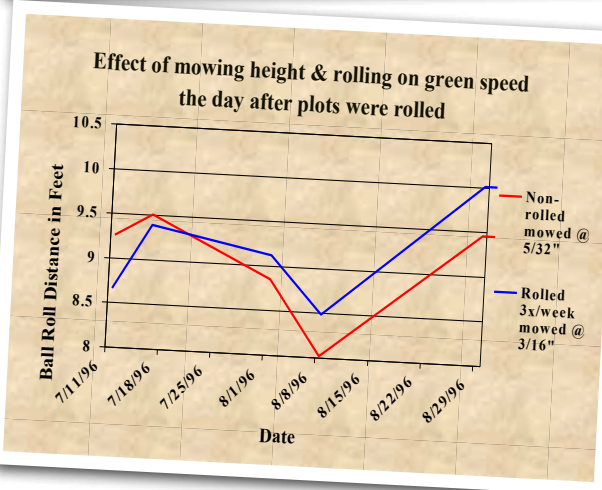
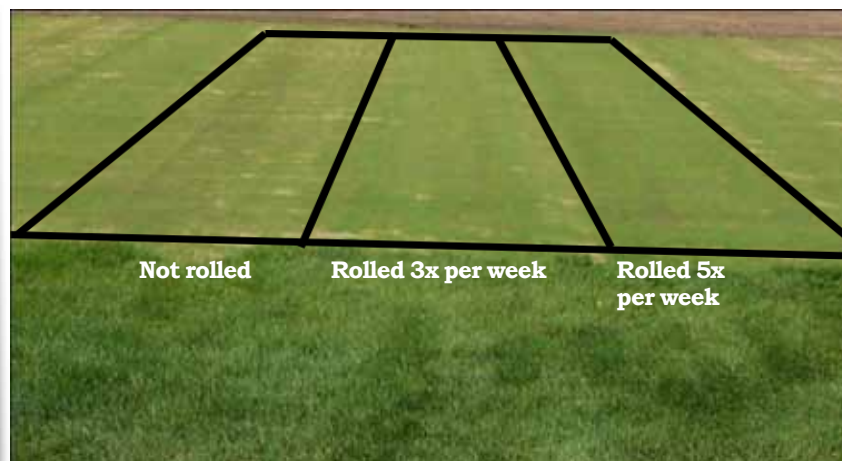
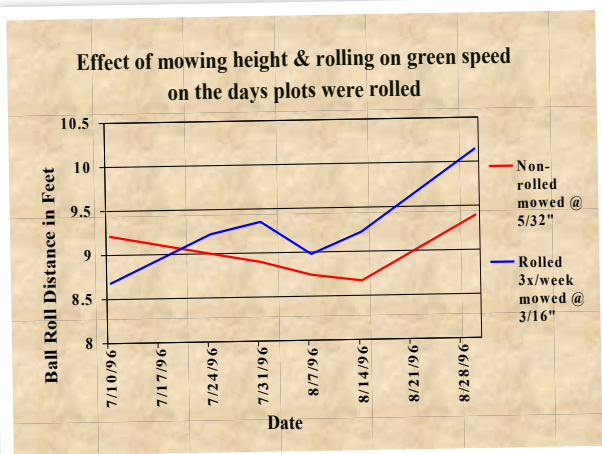
and were mowed at 0.4cm.

At the beginning, plots maintained at the higher height of cut had slower green speeds compared to plots mowed at the lower height of cut. However, after a week and a half of rolling, plots maintained at the higher height of cut achieved green speeds as fast as (and in some cases faster than) plots mowed at the lower height.

Interestingly, rolling resulted in enough residual green speed that the higher height of cut maintained the green speed of plots at the lower height of cut the day after rolling. Since that original study, several other studies have been performed that validate those findings. Furthermore, Rutgers University has documented that rolling and increasing the height of cut decreases anthracnose, and MSU has reported decreases in brown patch.

5. Decreased cutworm activity - maybe!*

OK. This might be a stretch, but bear with me and, if nothing else, you'll learn I am an honest individual. At the Hancock Turfgrass Research Center at Michigan State, we usually do not get enough black



cutworms to warrant an insecticide spray.

However, over a period of years I had observed cutworms, along with their unmistakable chewing damage, on my plots, and both of these coincided with increased bird feeding. Therefore, I hypothesised that the birds were going after the cutworms.

The three years this happened I counted bird-beak holes in the turfgrass before mowing/rolling. Plots rolled three times per week had significantly fewer bird-beak holes (and therefore fewer cutworms). Interestingly enough, the decrease in bird beak holes was 55%-60% in each of the years, which seems pretty consistent.

I now feel comfortable stating that I think rolling decreases cutworm activity, but in all truth I did not count cutworms, so I cannot say it with 100% confidence. I'll leave that up to you until a turfgrass entomologist performs a more conclusive study.

**Further research is required into how this relates to the UK & European model, however rolling is a recognised method of disposing of chafer grubs.*

4. Improved topdressing incorporation

In 2006 MSU performed a lightweight roller/sand incorporation study on creeping bentgrass putting green plots. Treatments included control plots that were never topdressed with sand, topdressed plots with the sand brushed in when dry, and plots that were brushed and then received a single pass with the True-Surface vibratory roller.

The day after topdressing, the plots were mowed with a walk-behind mower with buckets intact. Approximately 40% less topdressing sand was collected in the buckets when plots were rolled after brushing (Figure 2).

These plots also had a faster green speed several days after topdressing and decreased organic matter content at the end of the season. To my knowledge, no university research study has tested whether non-vibratory rollers increase sand incorporation after topdressing.

3. Decreased dollar spot

In 1995 I noticed that research greens rolled three times per week had less dollar spot than greens that were not rolled. None of the data was statistically significant, and I was certain I would never

make a similar observation. The following year, the rolled plots on my research greens had significantly less disease each time a dollar spot outbreak occurred. To say I was surprised would be an understatement. Since then I have made similar observations year after year in my lightweight rolling studies.

Additionally, in 2011 Paul Giordano, a Michigan State graduate, reported that increasing the frequency of rolling significantly decreased the incidence of dollar spot. The obvious question is, "Why does rolling decrease dollar spot?" The answer is lengthy and a bit elusive, and heck, this is just a top ten list. The important fact is that regular use of lightweight rolling does decrease dollar spot.

2. It's the economy (rolling/mowing frequency programs)

I published the results of my dollar spot observations in a scientific journal in 2001, and understandably many of my peers seemed sceptical.

In 2002, I gave a presentation on the subject at the GCSAA Education Conference in Orlando and several roller companies were so delighted that they have continued to fund my lightweight rolling research to date. Support from those companies (and the Michigan Turfgrass Foundation) has allowed us to study the effects of various rolling/mowing frequency programs over the years including the three listed below.

Alternating daily mowing and rolling.

In 2004 Michigan State initiated the first mowing/rolling frequency study by comparing mowing every day with alternating mowing and rolling on a daily basis.

On research greens, alternating mowing and rolling improves turfgrass wear tolerance and produces green speed measurements equivalent to mowing daily. If you are thinking this might result in an economic saving, you are correct.

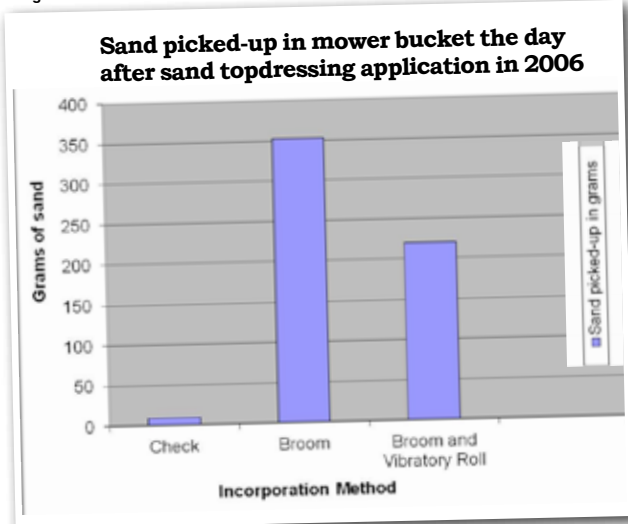
University of Tennessee graduate Dan Strunk performed a cost-analysis study comparing daily mowing to alternating mowing and rolling on a daily basis and concluded that alternating mowing and rolling could save the average golf course in Tennessee approximately \$13,000 annually.

This can be a very nice economic option especially when heat stress is high on cool-season grasses or cold stress is high on warm-season grasses.



Courtesy of Mike Morris CGCS

Fig 2





“Lightweight rolling produces smoother putting surfaces, which result in truer ball roll and faster green speeds”

mowing every other day. When I initiated a study to exam this method a lot of individuals scoffed.

However, of all the mowing/rolling frequencies I have researched, this one results in the most consistent green speeds from day to day, very good wear tolerance compared to mowing alone, and better dollar spot control than mowing every day and rolling every other day.

Obviously, this program can result in some economic savings as well.

With all the programs listed above I have never observed an increase in compaction, however, all my research plots have been on frequent sand-topdressing programs (every two to three weeks).

An additional caution: when I rolled plots every day of the week, I always used the lightest rollers available on the market (that is, TruTurf, DMI Speed Roller and True Surface vibratory rollers) because they have been continuous supporters of my research.

I don't want to imply that rolling seven days per week with a roller heavier than 550 pounds would cause compaction and therefore weaker turf, I am just cautioning that we do not know whether heavier rollers used daily would result in compaction or not.

Although I am a big advocate of lightweight rolling and encourage every superintendent to roll greens, I am an even a bigger advocate of proceeding with caution when making any changes to a putting surface management.

1. Increased customer satisfaction

Golfer survey after golfer survey indicates that the condition of the putting surface is the number one thing golfers care about.

Lightweight rolling produces smoother putting surfaces, which result in truer ball roll and faster green speeds.

No other cultural or mechanical practice can increase customer satisfaction as much as frequent use of a lightweight roller.

Finally, no other mechanical practice allows the superintendent the possibility to adjust the green speed to make his clientele happy.

To quote Walter S. Harbin from 1922: “I cannot conceive how a perfect putting surface can be developed or maintained without rolling.” I think Mr Harbin would be happy with the current use of the practice today.

BELOW: The plot on the left has never been rolled and has a lot of disease (dollar spot) the plot on the right is rolled 3 times per week.



Mow and roll every day.

We certainly are not considering saving money with this option, however, results indicate that both mowing and rolling every day produces consistent green speeds from day to day, possibly allows raised mowing heights for better turfgrass health and wear tolerance, and results in significantly more dollar spot control than mowing every day and rolling every other day.

Roll every day and mow every other.

That's right, rolling every day and

Managing with less in the land of the Kiwi

“Cape Kidnappers, one of the most spectacular golf courses in the world, is very conscious of best environmental practice and managing with less, and Course Manager Brad Sim recently won the GCSAA’s International Environment Leaders in Golf Award”

Greenkeepers based in New Zealand are facing as many tough challenges as their UK colleagues. Here Malcolm Peake gives an insight into how they're addressing problems and achieving outstanding results with their creative style of management

The glorious Cape Kidnappers
courtesy of David Cannon

Golf clubs in New Zealand are finding it difficult to survive meaning superintendents and committees have to think outside the box. There are over 400 golf courses in the country, and some of the smallest clubs cannot even afford green staff, so members are pulling together to maintain the course.

Wairoa Golf Club

Wairoa Golf Club is an 18 hole 5700 yard course and has 70 members who pay a \$410 subscription - about £200. It's a great little course, and right at the heart of the community with a mix of Maori and Pakeha (not of Maori decent) members.

A team of five members mow the course, and one has taken a New Zealand Sports Turf Institute (NZSTI) course to qualify for spraying and proficiency in basic course management. This mainly farming community are experts at handling machinery, and luckily the old Jim Arthur adage "ask a farmer what to do, then do the opposite" does not apply.

The club works closely with their NZSTI agronomist, who is aware of their limited financial resources and pitches his report accordingly. Watering and fertilising are kept to a minimum with the agronomist advising the common sense approach based on the colour of the green.

The greens are mown at 5mm and have some good areas of browntop bent, but also poa, couch, an indigenous variety of paspalum, and fescue.

Around twenty years ago the club planted copses of pinus radiata in strategic areas around the course but also as an investment for the future, the pines are now mature and a local forester has valued the trees at \$55,000 (£26,000) if they are felled. The club plans to replant native trees if some can be found of a future marketable value, and this will continue the legacy for future generations.

The club have also applied for funding for innovative conservation projects, with a view to enhancing existing wetland areas, ponds and streams and generally improving the whole habitat for native and endangered species – a really inspirational project.

Hopefully this can be achieved with the help of two local naturalists, and working with the local community and schools. Wairoa hopes to prove that golf courses are

not just for playing golf but can play an important role in protecting and enhancing New Zealand's native wildlife.

Another creative idea to generate extra income and encourage new members is a twilight nine-hole Texas Scramble, local companies are invited to enter teams of staff and customers. The evenings have become a great success, bringing in extra income, new members, and community involvement. One guest did turn up to play in wellingtons, shorts and a vest which even by Kiwi standards was a little too relaxed, but he was made welcome, and returned more appropriately dressed on the next occasion!

Paraparaumu Beach Golf Club

The next port of call was Paraparaumu Beach Golf Club. This is one of the greatest courses in the southern hemisphere - an undulating links which has held 12 New Zealand Opens. The great Peter Thomson said about the course "I loved it instantly. We had nothing like it in Australia – a monument to the game and a gift to the future. And the winds will ever blow to test the golfers' will and integrity." The course was designed in 1949 by Alex Ross who worked with Alister MacKenzie.

The club with the support of the NZSTI is restoring the course to a true links. The greens are now about 50/50 browntop bent and poa annua, are cut in summer at 3.5mm and are very firm and quick, and the fairways - a mix of fescue/bent/poa – run fast. Paraparaumu is reducing its course overheads and is being managed environmentally responsibly. The turf was not a uniform green, but was the perfect surface on which to play golf.

Manawatu Golf Club

The following day I visited Manawatu Golf Club. The club claims the title of the country's oldest golf course – it was founded in 1895 and boasts 1,300 members. Over the years the tree-lined fairways had grown out of proportion to the site and many inappropriate species had been planted.

The advisers have developed a long-term plan for felling a selection of trees to improve air and light circulation for the benefit of the turf. The course is a challenging layout with firm fast greens, which contrast in style with lush soft fairways and approaches, making for a target style of golf. A putting green has been developed with one half





ABOVE: Paraparaumu, 5th hole; LEFT: Paraparaumu Club President Ken Chariton mowing a green and BELOW: Discussing the greens at Cape Kidnappers



about the author



Malcolm Peake was Chairman of Green then Course Consultant at Temple GC in Berkshire. He has visited many golf courses around the world and has also worked on the R&A Golf Course Advisory Panel. He's also written "Confessions of a Chairman of Green" and "A Natural Course for Golf".

Malcolm would like to thank all the team at the NZSTI particularly Megan Cushman and the superintendents at the courses he visited for the information and hospitality.

lasered perfectly flat as requested by professional golfers.

I then visited the nearby headquarters of the NZSTI. Firstly we were shown a putting green used by staff. One side was USGA spec the other local sand for a long-term comparison, and then to the research plots where herbicides, recycled glass construction and summer grass were being studied. This was mainly to help clubs be more environmentally responsible - and also save money.

Cape Kidnappers

Our final visit was to Cape Kidnappers - a Tom Doak design of nearly 7200 yards, a par 71 off the back tees, and one of the most spectacular golf courses in the world. This top end resort course is very conscious of best environmental practice and managing with less, and Course Manager Brad Sim recently won the GCSAA's International Environment Leaders in Golf Award.

Cape Kidnappers preserves and enhances wildlife habitats, and a predator-proof fence around the 2500ha site - protected by two staff pest controllers - provides a safe habitat for native and endangered wildlife.

They have undertaken a plant survey to acquire a better understanding of native species and work with local schools to give children a better idea of how important it is to help improve wildlife habitat.

The students have helped build nest boxes and plant native trees and shrubs on site. Around 70 rare Kiwi have been introduced, and aviaries have been built to house the rare Takahe, a coot like bird, and the Kakapo, a prehistoric like parrot. In the winter dairy cattle graze the meadow roughs and over a three-month cycle reduce the ground cover. Even the waste paper is recycled into notepads and timber from the forests are used for firewood.

Superintendents in New Zealand enjoy a good degree of autonomy in their role with operational decisions largely made by the superintendent in consultation with the chair of green, referring to the club agronomist and golf course architect when necessary. Green committees are normally only involved in setting goals and a long-term strategies to guide the course management team. The chair of green is often a long-term position, the thinking being that if someone is knowledgeable and competent, why not retain them?



MAIN PIC: AeraVator UA60 with standard vibrating tines overseeding a fairway

INSET BELOW 4AERO80 – UA60 AeraVator with vibrating tines & seed box

BOTTOM: Multi-line – The AeraVator multi-tine shaft produces 600 holes per sq metre

An introduction to aeration

Aeration is simply one of the most important maintenance tasks carried out on turf. Here Andy Wight fights its corner with ten reasons why he feels it's so critical

Why is aeration so vital?

Having taught this subject for many years I consider there to be 10 basic reasons/advantages of aeration of sports turf:

1. It allows air into the soil - turf grasses need oxygen for respiration. Plant roots take up oxygen and give off carbon dioxide. Soil must be able to “breathe” in enough oxygen for roots to function properly.

2. To improve the drainage of the turf surface and underlying material, thus improving the

playing surface and reducing the potential for soil compaction and turf surface damage.

3. To reduce the occurrence of some fungal turf diseases such as fusarium patch and anthracnose which find it easier to spread from plant to plant in moist conditions caused by poor surface drainage.

4. To remove compaction from the soil. Compaction reduces drainage, root growth and resistance to drought as well as creating a hard playing surface. Compaction is caused by compression of the soil particles (by the movement of players and machines across the turf



about the author



Andy Wight is head of work based learning for land-based industries at Oaklands College where he has delivered greenkeeper training for over 20 years. He has worked closely with the GTC on greenkeeping qualifications and helped write the national learning notes for greenkeepers at level 2.





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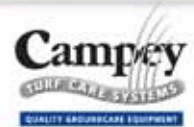
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surface). The reduction of compaction can be best achieved by the use of hollow tines which remove a core of soil or extraction by the effective Deep Drill aerator. Alternatively compaction can be relieved by the use of equipment which heaves the soil, such as vertidrainers.

5. To encourage root growth - if done at the correct time of the year. The slicing of the grass roots stimulates the plant to produce new root material increasing its mass and depth. The holes left by aeration also offer an easy route for the turf grass roots to progress downwards into the soil.

6. To stimulate aerobic soil bacteria which are vital to soil health. By virtue of increased oxygen levels in the soil, bacteria in the soil break down fertilisers for plant growth as well as breaking down organic matter (thatch). It is also thought by many that soil bacteria can be beneficial in controlling some damaging fungi in the soil.

7. To aid the penetration of irrigation water. This is particularly important when compact dry soils occur on a sloped area where

run off of irrigation water is a problem. This is often done by the use of sarrel spikers.

8. To help in the control or reduction of thatch in the turf. The use of hollow tines is well suited to this role as a plug of thatch is physically removed during the aeration process.

9. To help in the process of rootzone improvement. After aeration topdressing can be applied to the turf surface and can then be worked into the aeration holes to help improve drainage. Fertilisers and chemicals (such as wetting agents in granular form) can also be worked into the rootzone in the same way. In addition seed can be worked into aeration holes at the same time as topdressings where they can germinate (this is best done with equipment such as a sarrel roller so the seed is not worked in too deep to germinate effectively). In recent years the advent of "Drill n Fill" machines have enabled greenkeepers to drill to a depth of 31cm and backfill these holes with free draining materials such as sand and/or an amendment that brings soil improvement to new levels

10. To help maintain all round soil and turf grass health, thus reducing turf grass problems such as fungal diseases and certain weeds and moss which thrive in the presence of high moisture levels.

I have noted there is a tendency for some greenkeepers to aerate less than they used to and I am often told it's due to complaints from the membership. However the thing about not aerating is the effects are not obvious straight away. Everyone notices if you don't cut the greens or water them but lack of aeration takes a while to bite and it's several years before things start to get out of control. Of course, it's then harder to recover and you have to explain why you suddenly have to carry out lots of aeration. You can also bet it will be the same people who complained about the aeration who will now be asking why you have not been doing it and why you let the greens get into such a mess!

So next time a golfer stops and asks why you seem to be ruining their putting surface you can reply "It depends how long you've got - I can give you ten good reasons if you have the time?"



ABOVE AND BELOW: EcoSol Drill and fill machines

RIGHT PAGE: Koro RCD MKII (81), Campey Turf Care

