

Desperate Planter's Wrist Maintenance Program

Tree planting is a great job that can earn you a lot of money. But to put a lot of trees in the ground you have to work your body hard.

The wrist is one of the weakest joints, and every year rookies and veterans alike succumb to the dreaded wrist tendonitis.

Planters can use the [Desperate Planter's Wrist Maintenance Pamphlet](#) to keep their wrists injury free!

First-Aid attendants can [view a more in depth version of the Desperate Planter's Wrist Maintenance Program](#). The ***highlighted text** on the first-aid attendant pamphlet corresponds with content below.

*Note that if you cannot see the highlighted text, try opening the pdf in Internet Explorer or saving a copy to your device and re-opening using Adobe.

Reflex Training

Reflex training is based on the small sensory neurons located in muscle, tendon and joint capsules, collectively known as proprioceptors. Although each of these three types of mechanoreceptors responds to different stimuli, together they work to provide muscles with information about when to contract and when to relax.

The Muscle Spindle is a specially adapted group of muscle fibers and nerves embedded in the body of a muscle. When a muscle is stretched this receptor can cause a very fast response – it makes the same muscle that is being stretched contract. Under normal conditions this reflex works to adjust the degree of muscle contraction to the load exerted.

For example if someone hands you a large beer stein full to the brim, the glass might drop a bit as you try to support the weight. The muscle spindle in your bicep fires as the muscle is stretched by the downward pull of the heavy glass. The response is to make your biceps contract even harder and lift the stein back up, all without you thinking about it, or even seeing it take place.

The Golgi Tendon Organ (GTO) is located in the tendons that connect muscle to bone. As the muscle contracts and shortens under load, tension develops in the relatively non-elastic tendon, which is monitored by the GTO. If the tension gets too high, the GTO reflex inhibits the muscle attached to the tendon. As the muscle relaxes (due to this inhibition or blockage of the contraction) it lengthens and relieves the tension on the tendon – hopefully before any damage can occur.

Joint receptors include several types of nerve endings including Pacinian Corpuscles (sensitive to rapid change) and Ruffini endings (slow to adapt and hence provide information on joint position rather than movement).

All of the sensory neurons tend to be small and easily damaged. Cold, fatigue, hypoglycemia, pain, vibration, previous injury and edema will all interfere with the transmission of information from muscles, tendons and joints, thereby decreasing the ability of your muscles to respond quickly to support the joint in a suddenly changing situation – like striking a rock or hard ground with your shovel, or tripping or stumbling over slash in the block.

Fortunately, the proprioceptive reflexes can be restored through agility training. Applying a sudden stretch or load to the joint while concentrating on good form helps your receptors speed up their response to a sudden (and potentially damaging) change when you are in the field.

The obvious outcome is to reduce acute injuries that occur with a sudden large load, like when you trip, but these reflexes also help reduce repetitive strain injuries like tendonitis, because the faster and more accurately they work, the less stress is placed on the connective tissue with each and every shovel strike. It doesn't take too much work to reset these reflexes, so incorporate a bit of agility work into your warm up and your joints will thank you for it!

Strength Training

Building some strength in the muscles that will be used heavily during planting prior to the start of the season is a very smart move. For one thing, it will help you focus on planting, and relieve you of the worry of whether or not you will be strong enough to get your quota of trees into the ground. For another, you will have more fun, sleep better and plant more trees if you aren't in pain.

Assuming that the first week of planting will build the required strength is a bad plan. With overuse (or a training stimulus) your body breaks down the weak and damaged tissue. If you supply the needed nutrients, energy and rest, the muscle, tendon and bone will rebuild, stronger and capable of doing more work without any damage occurring. But if you have to keep planting the whole time, there is no time for recovery and rebuilding; either you slow down on the planting, or your wrist breaks down.

The exercises given in the Desperate Planter's Guide to Avoiding Wrist Tendonitis are not the only ones that will strengthen your wrist. They are however, chosen carefully to be the most efficient at preparing you for the movements associated with planting trees. They are also designed to strengthen the tendons and ligaments as well as the muscles. Research shows that the eccentric or negative phase is much more effective at training ligaments and tendons than the concentric or shortening phase.

Wrist Flexors

There are three main muscles that flex the wrist. The flexor carpi radialis and flexor carpi ulnaris both arise from the medial epicondyle, where they share a large tendon of origin, the common flexor tendon. Inflammation of this tendon is called medial epicondylitis or golfer's elbow. The flexor carpi ulnaris also has a second head, which arises from the ulna.

The third flexor, the palmaris longus is a smaller muscle also arising from the medial epicondyle but inserting into a dense layer of fascia, the palmar aponeurosis and the flexor retinaculum. The flexor retinaculum is important because it forms the resisting tunnel through which the tendons of the hand and the median nerve must pass. Inflammation of the tendon sheath of any of these muscles can result in swelling, pressure on the median nerve and result in carpal tunnel syndrome.

The flexor carpi radialis passes through a deep ligamentous tunnel, inserting at the base of the second and third metacarpals. In addition to flexion, it also causes radial deviation. The flexor carpi ulnaris inserts on the pisiform bone; a small wrist bone on the ulnar border of the carpal tunnel. From the pisiform, the pull of flexor carpi ulnaris is transmitted eventually to the base of the fifth metacarpal. It causes wrist flexion and **ulnar deviation**. Both **radial and ulnar deviation** are also known as abduction and these movements are assisted not only by the respective flexors, but also by their extensors.

Extensors

Several extensors arise at a common origin on the lateral epicondyle via the Common extensor tendon including the Extensor carpi radialis brevis and the Extensor carpi ulnaris. Inflammation of this tendon sheath causes lateral epicondylitis or tennis elbow. A third extensor, the Extensor carpi radialis longus originates at the lateral epicondylar ridge, just below the brachioradialis.

As the extensor tendons cross the back of the wrist they pass under the extensor retinaculum together with the tendons of the muscles of the thumb, the extensor pollicis brevis and the abductor pollicis longus. The retinaculum acts as a guide for the tendons, trapping them between a layer of non-elastic connective tissue and the underlying bones.

Repetitive gripping and extension of the wrist can cause the tendon sheath to rub against these structures. The subsequent irritation and swelling create even more pressure on the tendons and the result is wrist tendonitis. This is the most common type of tendonitis seen in planters.

The Extensor carpi radialis longus and brevis are inserted on the bases of the second and third metacarpals, extensor ulnaris on the base of the fifth metacarpal. When the wrist extensors act together, they extend the wrist.

Although the powerful gripping muscles are located on the front of the wrist, their tendons are only tensioned when the extensors contract. In order to generate a powerful grip the extensors must be activated.

When the radial or ulnar extensors contract separately, they help to produce radial or ulnar abduction of the wrist. They do this in conjunction with the corresponding wrist flexor muscle, either radial or ulnar.

Hydration

There has been a lot of publicity on hydration in the last few years. In truth, getting hydration right is a real performance enhancer. Headaches, fatigue and health risks follow drinking too little, but this is also true of drinking too much.

The recommended rate of fluid intake is about 250 ml, or one cup per hour. If you sweat a lot you will need more than this. If you are not active or are working at a sub-aerobic pace (respiration only mildly elevated, not breathing deeply) then you may need a little less.

But be aware that in some climates you may not realize just how much water you are losing. Cold dry air at altitude for example, can cause significant loss of water through respiration. Hot dry air will evaporate the water so quickly that you may not be conscious of sweating. In the planting study it was not uncommon for planters to be in a water deficit of more than a liter.

Another time that it's important to watch out for dehydration is when you have drunk more than two cups of coffee or more than one ounce of alcohol, since both these substances are diuretics and make you lose water. Consuming the equivalent of 4 drinks will dehydrate you by about a liter, and the diuretic effect lasts long after you feel sober.

In studies with college students it took up to a full week to restore hydration levels after a binge drinking episode, and the risk of injury was increased for the entire duration of the dehydrated period. Eye to hand coordination, mental acuity, and reflex responses were all impaired for days afterwards. Binge drinking also has pronounced effects on muscle. It impairs energy production and interferes with muscle recovery. Doesn't sound like a very good plan if you want to plant a lot of trees!

So whenever you have a few too many, make sure to consciously rehydrate before you go to sleep and again the following morning, as well as for the next few days. It not only helps with planting, it will help mitigate the symptoms of a hangover.

So what are you supposed to do? First off, make water (in addition to coffee) part of your breakfast. Get into the habit of always having a water bottle with you. Sip water in the truck on the way to and the way back from the block. Get some 4 L containers like empty milk jugs, or a big 10L water container to keep at your cache and make sure to fill them in the evening so they are ready to go in the morning rush. Keep a 500 ml water bottle or hydration pack in your back bag, and have a drink every time you get to the end of the row.

The water will stay in your body much better (rather than be cleared by your kidneys) if you take it in as small amounts instead of guzzling a full liter all at once. And if you are worried about taking the time for a drink slowing down your planting – in the study planters who were hydrated were able to sustain a higher rate of planting for longer. Even though they stopped and took a drink regularly they still planted more trees than those that were dehydrated.

Thirst isn't a great indicator of hydration level. By the time you are thirsty you are already down about a liter, and as soon as you start to drink the flow of water across the back of your tongue shuts off the thirst response. One of the reasons sport drinks are more effective hydrators than plain water is because the salt and sugar keep you drinking, but they also help with water absorption in the gut as well balancing the particulates to keep your kidneys from clearing the water.

If you do use juice or sport drinks be sure to rinse out your hydration pack and water containers very well. In the summer heat they will breed mold quickly.

Eccentric & Concentric Contractions

Eccentric exercises are based on movements where your muscle resists gravity to lengthen under load. They include movements like walking downhill and lowering a weight. Because of the way nerves and muscles communicate, eccentric work causes fewer muscle cells (also known as fibers) to contract so the amount of force on each fiber is higher than in concentric work.

When the load exceeds the strength of a fiber, small tears occur. It's the response of your immune system to these tears that causes delayed onset muscle soreness. The white blood cells digest away damaged tissue making you even more sore on the second day. Contrary to popular myth this soreness is NOT due to lactic acid crystals! As the tears are repaired muscle becomes much stronger, so eccentric or negative work causes large gains in strength quickly – but it also makes you very sore for a couple of days.

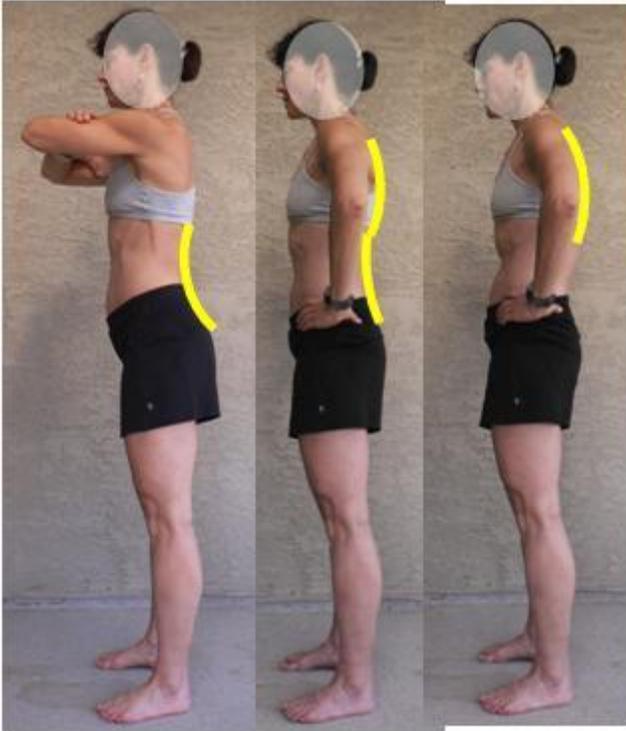
Eccentric work also causes the connective tissue that surrounds each muscle cell, as well as the connective tissue in the adjacent tendon and ligament to be strengthened. This is why it's important to include eccentric work when training to avoid tendonitis!

Concentric work is when muscle shortens under load, as in the lifting phase of weight training.

Neutral Posture

The normal curvature of the spine is to bow outwards slightly (convex) in the upper back (thoracic spine) and inwards slightly (concave) in the lower back (lumbar spine). The correct posture is shown in the images at the top of the next page.

Women tend to tilt their pelvis' back (butt out) and guys tend to tilt forward (the slouch). The easiest way to correct your posture is to imagine a string tied to the top of your head being pulled upward. The movement should unload your spine.



All of the large muscles of the leg and hip are more powerful and stable if your pelvis is in neutral position, so re-establishing good posture not only protects your back, it also helps prevent groin, knee and ankle injuries. Similarly, the muscles of shoulder and arm are designed to work together with your thorax in neutral position.

The planter in the images below is in a strong position in the left hand photo but as he gets tired he lets his posture go and instead of using his core to support his body he hunches his shoulders and rounds his back in the second photo.



Stretching

Stretching is one of those topics that always seems to come up. Proponents of Yoga and Pilates swear it is the cure for all that ails, but none of the scientific studies actually show conclusively that stretching reduces injuries. In fact, sometimes the results show exactly the reverse! Part of the problem is that there is more than one kind of stretching even though the same word is used to describe them all.

The Morning “Stretch”

Stiffness upon rising or after sitting is best worked out by gently moving the limb through the range of motion without any force. Start small and gradually increase the range of motion until you reach the full movement, but don't force the limb beyond what feels comfortable. Be gentle and dynamic, moving the body part back and forth, from side to side, and in circles.

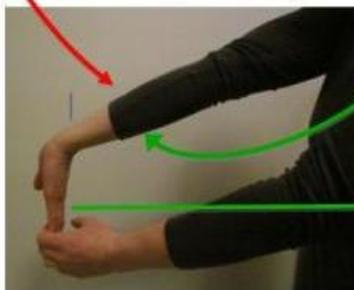
What you are really doing is warming-up your tissues. Muscle, tendon and ligament are a bit like plastic, rigid when cold but more pliable and elastic when warm. This type of “stretching” is great as a start and finish to your day, but keep in mind that any changes in the tissues only last about 20 minutes. The best time to warm-up would be no more than 10 or 15 minutes before beginning your activity.

The Tension Releasing “Stretch”

Another reason for stretching is to relieve excess tension that results from fatigue or over-use. When the muscle is irritated the reflex action is to shorten; and can even result in a spasm or cramp. The best way to relieve the tension is to use the nerve loop to stop the contraction signal. Since muscles always work in pairs, if you contract one muscle, the opposing muscle will relax.

Flexor Stretch

Nerve loop
makes these
muscles relax



These muscles
are contracting

1. Push the back of
Right Hand fingers
backwards against Left
hand to contract
extensors

2. Stop actively
contracting and pull
fingers back to
increase Flexor stretch

Another way to get the relaxation loop working is to contract the muscle that you want to stretch.

For example to stretch your hamstring (back of your leg), put your foot up on a stump, bumper or chair and push your heel downward as though you are trying to lower your leg to the floor while keeping it straight. Contract for 3 seconds, and then exhale and concentrate on relaxing your leg completely. Do the contraction/relaxation cycle 3 times and without letting go of the sense of relaxation, tilt forward from the hips as though reaching forward and down to place your chest on your knee. (Don't round your back). Hold this position for 20 seconds breathing deeply, concentrating on maintaining the relaxation.

As your leg relaxes you will gradually be able to stretch out the muscle even further. Make sure to keep your spine in neutral and your hips square. You should feel the stretch in the back of your leg and not in your lower back.

The advantage of this type of stretch is that it actually elongates the muscle itself and not the tendons and ligaments. Not only will this type of "stretching" release a tight muscle, it actually encourages the muscle to grow in length; effectively increasing range of motion and strength, two things we know do decrease the risk of injury.



So the final call... Yes, at the right time and in the right way, stretching can be a great tool for recovery and injury prevention. You just have to be careful to make sure your posture is neutral and that you are actually stretching what you think you want to stretch. Stay away from stretches that put your joints at the limit of their range, and instead use these "smart-stretches" to stay limber.

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Ice

When muscle and connective tissue are damaged by over use or sudden strains they release molecules that signal the immune system. Blood flow is increased and white blood cells are attracted to the area to kill off any invading pathogens and digest away damaged tissue prior to rebuilding (your immune system can't tell if the signal was due to mechanical damage or cells dying due to an infection).

Unfortunately, this response is often bigger than it needs to be and much of the symptoms of redness, swelling, pain and dysfunction are due to collateral damage by the activated immune system. Ice and anti-inflammatory medications help to keep this response from escalating.

Ice the sore area right after work and another couple of times during the evening. Blue gel packs or a dedicated bag of frozen peas inside a thin pillowcase let you contour the pack around the sore area. But don't leave it on for more than 10-15 minutes at a time. It's possible to damage your skin if it gets too cold for too long. For muscle strains, alternating ice and warmth can also be effective.

Tendonitis

Tendons are fibrous structures that connect muscles to bones. They are only slightly elastic but have good tensile strength, this characteristic is due to the bundles of a protein called collagen that make up the bulk of tendon and ligament (ligaments are similar to tendons but they connect bone to bone). The collagen bundles are encased in a connective tissue sheath that normally slides easily over the collagen bundles during movement.

Repetitive movement that pulls the tendon through the sheath over and over, or higher than normal tension on the tendon can damage some of the collagen causing fluid to accumulate between the sheath and the collagen bundles. The extra fluid causes even more friction as the collagen tries to slide through the sheath, which further irritates the tissue. The result is visible swelling, redness, pain and eventually, as the sheath grabs at the tendon, the characteristic crepitus or juddering that is the defining symptom.

Although the popular name for this syndrome is tendonitis, it isn't really a true inflammation of the tendon itself. The inflammation is between the tendon and the sheath, and therefore a more accurate medical term is tenosynovitis. If the tendon is not allowed to recover it can start to break down further, eventually the collagen degrades – which is called tendinosis. If allowed to progress the damage becomes irreversible.

Non-steroidal Anti-Inflammatory Drugs (NSAIDS)

Pain and tissue damage are mediated by small molecules produced in damaged tissue. Non-steroidal anti-inflammatory drugs are very effective at inhibiting the production of these signaling molecules, blocking pain and decreasing peripheral damage (you are trying to do the same thing when you ice). Beware however, that these molecules have many important functions in your body (like blood clotting for example) and the drugs block

them all. Eating cold water fish gives you a natural anti-inflammatory. Omega-3-fatty acids are used inside your body to produce the same results. Taking omega-3 oils is easier, but expensive and because omega-3s are very unstable the contents of the bottle may or may not still be active.

Be aware that using NSAIDS not only blocks pain but also a very important safety signal. Working through the pain can escalate something minor into a more serious, long term problem.

Crepitus

Repetitive movement that pulls the tendon through its surrounding sheath over and over, or higher than normal tension on the tendon can damage some of the collagen bundles and cause fluid to accumulate between the sheath and the collagen bundles. The extra fluid causes even more friction as the collagen tries to slide through the sheath, which further irritates the tissue. The result is visible swelling, redness, pain and eventually, as the sheath grabs at the tendon, the characteristic crepitus or juddering that is the defining symptom.

Abduction

Movements that move the limb off to the side and further away from the center of the body are called abduction.