



# Establish turf

AHCTRF302

By the end of this topic, you should be able to:

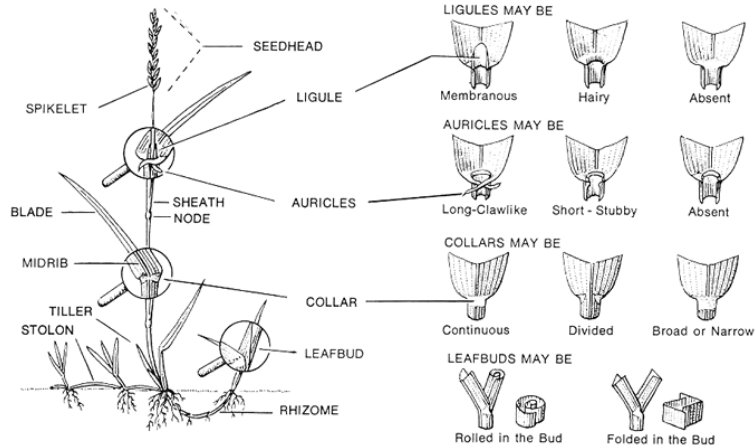
- Sample soil for testing
- Plant turf
- Maintain newly established turf
- Report and repair areas of damaged turf

## Turfed surfaces

- Turfed areas are used for a range of purposes, including:
  - High performance (e.g. ovals, sports fields)
  - Parks and gardens
  - Domestic use (e.g. home gardens)
- When choosing a turf type, consider the following factors:
  - Main use
    - Consider wear tolerance
  - Climate (i.e. cool season or warm season)
    - Drought tolerance
  - Soil profile
  - Aspect
  - Irrigation and drainage
    - Consider available water and quality
    - Salt tolerance

## Turfed surfaces

- When discussing turf, you need to be familiar with its botany



Activity: Research the role of each labelled part of the grass plant

- Grass is categorised as a monocot, as opposed to a dicot:

|                        | Monocot                                                                  | Dicot                                                             |
|------------------------|--------------------------------------------------------------------------|-------------------------------------------------------------------|
| Seed                   | Have only one seed leaf inside the seed coat                             | Have two seed leaves inside the seed coat                         |
| Germination and leaves | Produces a single leaf, which looks long and narrow, like the adult leaf | Produces two seed leaves which come in different shapes and sizes |
| Root pattern           | Fibrous roots                                                            | Tap-root system                                                   |
| Leaf venation          | Usually have parallel venation                                           | Reticulate venation                                               |

## Turfed surfaces

- When discussing turf, you need to be familiar with a range of terminology:

| Term                                | Definition                                                                                                                                                                                                                                                                                                                                                                         |
|-------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Hulled and non-hulled               | <ul style="list-style-type: none"><li>Hulled: Seed that has had the outer coat removed. Typically planted in Summer.</li><li>Non-hulled: Seed that has not had the outer coat removed. Typically planted in Autumn and waits for good growing conditions before its sprouts.</li></ul>                                                                                             |
| Seed                                | Small, hard part of a plant from which a new plant grows after the seed germinates. Some grasses cannot produce viable seed (i.e. sterile), and is grown from stolons.                                                                                                                                                                                                             |
| Sods                                | A section cut from the surface of grassland, containing the matted roots of grass.                                                                                                                                                                                                                                                                                                 |
| Sprigs                              | A live plant, stolon, crown, or section cut from turf.                                                                                                                                                                                                                                                                                                                             |
| Stoloniferous and non-stoloniferous | <ul style="list-style-type: none"><li>Stoloniferous: Plants with stolons are called stoloniferous. Also known as runners, stolons are stems which grow at the soil surface (or just below ground) that form adventitious roots at the nodes, and new plants from the buds.</li><li>Non-stoloniferous: Any turf plant that does not have a stolon (e.g. rhizomes, fescue)</li></ul> |
| Sward                               | A portion of ground covered with grass.                                                                                                                                                                                                                                                                                                                                            |

## Turfed surfaces

- Different types of turf serve different purposes
- For example:
  - Couch or Queensland Blue are suitable for golf fairways
  - Broadleaf Carpet Grass is suitable for residential lawns and commercial parks

Worksheet 1: Research and document a variety of warm season and cool season grasses and identify the circumstances they are best suited to

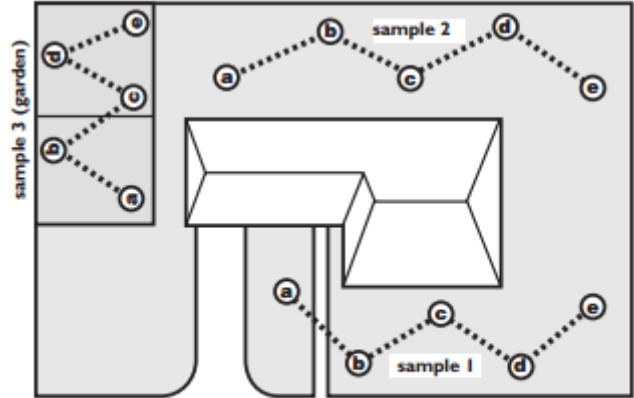
## Testing soil

- It is important to take and test soil samples to ensure the area is prepared to establish turf
  - You should test for:
    - Physical characteristics, such as: Soil structure, texture, compaction, root health
    - Chemical characteristics, such as: pH levels, salinity, nutrition
  - Soil testing for sports turf is critical and soil samples should be sent away for analysis
- These characteristics will help establish improvements that are needed

Activity: Obtain and analyse a turfed area soil analysis report from your workplace.  
Submit your findings during your practical assessment.

## Testing soil

- When taking samples, you should complete the following:
  - Ensure that tools to be used are clean
    - Even a small amount of fertiliser residue on tools can contaminate a soil sample
  - Clear away any weeds and loose organic material to uncover the soil surface
  - Take multiple soil samples at each selected site
    - Ensure that samples are only collected in paper bags if they are lined with plastic
  - Take random samples from the designated area, according to recognised sampling techniques
    - Sample garden and turf areas separately
    - Sample problem areas separately



Make a composite sample by collecting small cores from at least five locations.

- When taking samples, you should complete the following:
  - Ensure that an appropriate sample size is taken (e.g. 1-2 cups of soil per sample)
  - Take samples to approximately 10cm deep
  - Label the sample appropriately:
    - Include the date and location of sample (i.e. address, GPS coordinates), depth of sample
    - The soil sample will be assigned a number and entered into the laboratory register

## Testing soil: Physical characteristics

- There are a range of tests that can be conducted to determine the physical characteristics of soil/media, including **soil texture**:

| Test                                                                                                                                                                                                                                                                                                              | Results                                                                                                                                                                                                                    | Improvements                                                                                                                                                                                                                                                                                                                                                                                                           |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>Soil texture is an estimate of the relative amounts of sand, silt and clay particles in soil. Soil texture affects the movement and availability of air, nutrients and water in soil.</p> <p>To test soil texture, moisten a small amount and roll it between your hands to try to make a 'sausage' shape.</p> | <ul style="list-style-type: none"><li><b>Clay:</b> Keeps its shape and feels sticky</li><li><b>Sandy:</b> Disintegrates and has a gritty feel</li><li><b>Silt:</b> Does a bit of both, has a soapy or silky feel</li></ul> | <p>The soil texture requirements will differ depending on the area usage (i.e. cricket pitches require black clay; recreational parks require sandy loam)</p> <p>Soil amendments and additives that can be used to improve the texture of soil:</p> <ul style="list-style-type: none"><li>• Animal manure</li><li>• Leaves</li><li>• Straw and hay</li><li>• Plant manures and cover crops</li><li>• Seaweed</li></ul> |

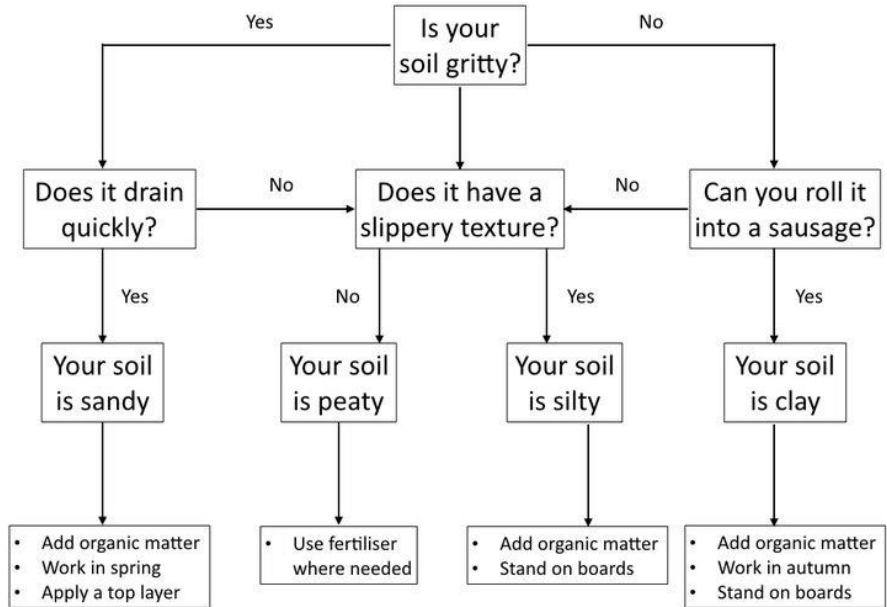
## Testing soil: Physical characteristics

- There are a range of tests that can be conducted to determine the physical characteristics of soil/media, including **soil structure**:

| Test                                                                                         | Results                                                                     | Improvements                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Highly experienced greenkeepers are able to visually read the soil based on look and colour. | Ideally the soil aggregates should hold their shape under slight pressure.  | Increasing soil organic matter content helps create and stabilise soil structure.                                                                                                                                                                                                    |
| Break apart a soil profile sample to determine whether it is cloddy, powdery or granular.    | Aggregates that break apart only with difficulty mean the soil is too hard. | Organic matter is integral in the capacity of a soil to maximise water storage through its effect on creating and stabilising soil pores and its absorption capacity. Organic matter, however, is generally not used within the turf industry due to the high potential of diseases. |
| Open, porous soils allow the free movement of water and oxygen.                              |                                                                             |                                                                                                                                                                                                                                                                                      |

## Testing soil: Physical characteristics

- To identify soil types, you may refer to a reference chart for guidance
- An example reference chart that is shown to the right



## Testing soil: Chemical characteristics

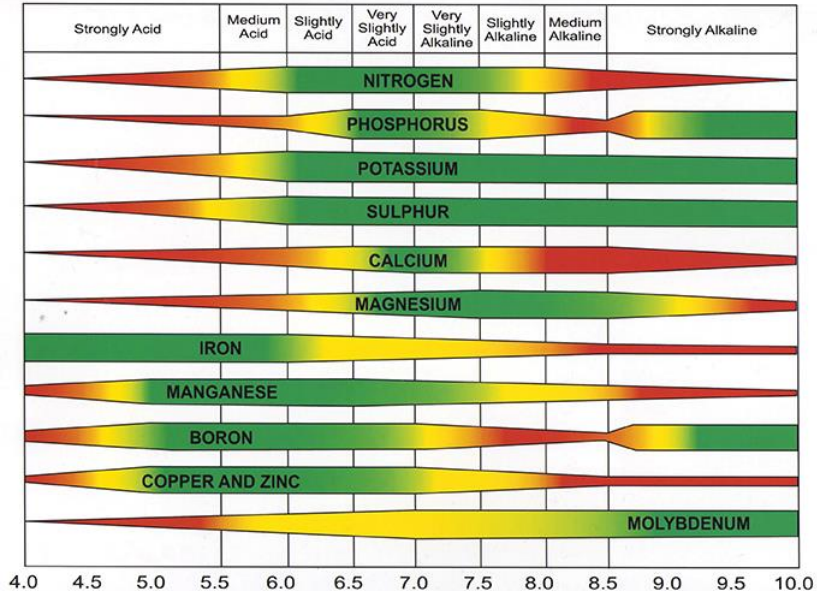
- Soil pH is a measure of the acidity or alkalinity in soils
  - You can test soil/media pH yourself using an over-the-counter kit or meter



- Soil pH affects plants in various ways
  - Having the correct soil pH is important for healthy plant growth
  - Soil pH affects the amount of a particular nutrient that can be taken up by plant roots
  - Soil pH influences turf diseases, weed species, herbicide/pesticide effectiveness
- Soil pH changes rapidly by irrigation and rainfall due to nutrient leaching, as well as traffic on the turf surface

# Testing soil: Chemical characteristics

How soil pH affects availability of plant nutrients.



- Factors affecting pH include:

| Acidic soils (less than 5.5 pH)                                                                                                                                                                                                                  | Alkaline soils (greater than 7.5 pH)                                                                                                                                                                  |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>• Aluminium toxicity</li><li>• Manganese toxicity</li><li>• Calcium deficiency</li><li>• Magnesium deficiency</li><li>• Low levels of essential plant nutrients (e.g. phosphorus and molybdenum)</li></ul> | <ul style="list-style-type: none"><li>• Sodium toxicity (pH greater than 9)</li><li>• Zinc deficiency</li><li>• Copper deficiency</li><li>• Boron deficiency</li><li>• Manganese deficiency</li></ul> |

Activity: Research what occurs at levels of toxicity and deficiency

## Testing soil: Chemical characteristics

- You can lower or raise soil pH using a range of common products

| Lower soil pH                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Raise soil pH                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li><b>Acidic fertiliser</b> (e.g. containing ammonium sulfate, or sulphur-coated urea)</li><li><b>Elemental sulphur</b> (Flowers of sulphur), needs to be broken down by soil bacteria to be available for plant uptake<ul style="list-style-type: none"><li>Apply at 35g/m<sup>2</sup> on soils with sandy structure</li><li>Apply at 100g/m<sup>2</sup> on clay soils</li></ul></li><li><b>Manure</b> (i.e. from poultry, cows, horses and sheep)</li></ul> | <ul style="list-style-type: none"><li><b>Agricultural lime</b> (Calcium carbonate), a finely ground limestone which is untreated</li><li><b>Hydrated/slaked lime</b> (Calcium hydroxide), which is more soluble and faster acting than agricultural lime</li><li><b>Dolomite</b> (Calcium magnesium carbonate), which contains more magnesium than agricultural lime</li><li><b>Quick lime</b> (Calcium oxide), but not for garden use</li></ul> |

Activity: Research the differences in products required for adjusting the pH of sports turf

- Fertilisers are generally classified as
  - Organic (plant or animal waste), such as manure, leaves or compost; or
  - Inorganic (man-made chemical-based)
- There are a range of inorganic fertilisers on the market:

| Type     | Description                                                                                    |
|----------|------------------------------------------------------------------------------------------------|
| Simple   | Supplies only one nutrient                                                                     |
| Blended  | A number of simple fertilisers mixed together, but the different components can be easily seen |
| Compound | Two or more nutrients are contained within the same granule                                    |
| Complete | Contains the three main nutrients (N, P, K)                                                    |

Activity: Research the advantages/disadvantages of organic vs inorganic fertilisers

- Soil salinity is the salt content in the soil
  - Salinity from irrigation can occur over time wherever irrigation occurs, since almost all water (even natural rainfall) contains some dissolved salts
  - When the plants use the water, the salts are left behind in the soil and eventually begin to accumulate
  - Since soil salinity makes it more difficult for plants to absorb soil moisture, these salts must be leached out of the plant root zone by applying additional water
- Proper irrigation and drainage management can prevent salt accumulation by providing adequate drainage water to leach added salts from the soil

- Salinity is tested in the following way using an EC 1:5 test:
  - Take a soil sample and leave it to dry
  - Crush the dried sample so there are no large clods of soil
  - Add soil to water in a testing container
  - Shake the container to make sure the salts dissolve
  - Allow the solution to settle and place the salinity meter in the solution (but not in the soil at the bottom of the container)
  - Read and record the display once it has stabilised
  - Convert the salinity meter readings to soil salinity ( $EC_e$ ) by multiplying the value of the Conversion Factor (which is based on the texture of the soil sample)

- To prepare for turf establishment, you should familiarise yourself with the task requirements
  - Refer to documentation
    - The establishment plan will identify the planting site, planting methods and turf plant species and cultivars, top dressing requirements, drainage system design, irrigation system design
  - Speak to your supervisor
  - Apply calculations
    - Area ( $\text{m}^2$ ):  $L \times W$
    - Volume ( $\text{m}^3$ ):  $L \times W \times D$
    - Ratios and application rates

Do you think that the time of the year is important when planting turf?

- To prepare for turf establishment, you should familiarise yourself with the work area
  - Identify any WHS hazards and assess risks (e.g. underground services, manual handling injuries)
  - Identify environmental hazards (e.g. damage to flora/fauna, waste)
  - Report hazards to your supervisor within a timely fashion – especially emergency situations

- To prepare for turf establishment, you should organise the required PPE, machinery, tools and equipment
  - **PPE may include:** Gloves, wide brimmed hat, work boots
  - **Safety equipment may include:** Signage and barricades (e.g. witches' hats)
  - **Machinery may include:** Skid steer, Dingo, Turf roller, Buggy, Plate compactor
  - **Tools and equipment may include:** Rake, shovel, tape measure, wheeled lawn level, drum roller, lawn leveller, mower, hose and sprinkler, irrigation components, drainage system components
    - These will be influenced by the turf establishment area design requirements
  - Ensure they are appropriately selected, prepared, calibrated and used for the task

- When preparing the turf establishment area, you should assess the following soil features:
  - **Nearby plants**
    - Aim to minimise environmental disturbance
    - Remove debris and pollutants (e.g. decaying plant material)
    - Treat competing plants
  - **Depth**
    - Optimum soil depth for turf root establishment is 200-300mm
  - **Moisture**
    - Water the establishment site according to the planting method
  - **Tilth**
    - Evenly rake out surface to achieve consistent texture
    - Uniformly level to defined contour requirements
    - Ensure there are adequate fertiliser reserves, measuring and adding as required

## Planting turf

- There are a number of ways that turf can be established, including:

| Establishment method     | Description                                                                                                                                                                                                                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Sowing                   | Planting seed by scattering it on or in the soil.                                                                                                                                                                                                                                                                                                                      |
| Laying                   | Vegetative establishment by transplanting a healthy sod from one location to another.                                                                                                                                                                                                                                                                                  |
| Chaffing / stolonisation | Vegetative establishment by broadcasting stolons over the planting site. The stolons are rolled to ensure contact with the soil.                                                                                                                                                                                                                                       |
| Sprigging                | Vegetative establishment of turf from relatively short (i.e. 3-5cm) pieces of stolons and rhizomes that are planted in furrows, small holes, or spread directly onto the soil surface and partly covered by lightly scarifying the area or top-dressing. Success is highly dependent on the weather, as well as fertilisation and top-dressing in the first two weeks. |
| Hydro mulching           | Uses a slurry of seed and mulch. Usually conducted on sloped areas.                                                                                                                                                                                                                                                                                                    |

- Advantages and disadvantages of vegetative propagation:

| Advantages                                                                                                                                                                                                                                                                  | Disadvantages                                                                                                                                                                                                |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"><li>Quick establishment of mature sward</li><li>Able to propagate out of season</li><li>Instant effect if turfing used</li><li>Limited follow-up maintenance</li><li>Maintains purity of type</li><li>Some seeds are not viable</li></ul> | <ul style="list-style-type: none"><li>Expensive over large areas</li><li>Creation of soil layer</li><li>Introduces weeds, pests and diseases</li><li>Problems in maintaining desired surface level</li></ul> |

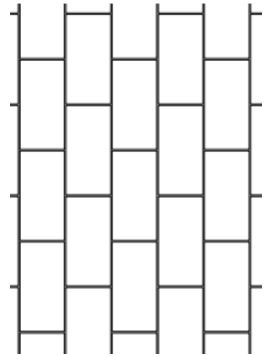
Activity: The turf area usage will highly influence the advantages and disadvantages.  
Can you add to the above list?

- Undertake the following when establishing turf by seed:
  - Sow seeds by hand and mechanically distribute evenly
    - Ensure there is no overlap of seeds
    - Ensure there is no missed areas
    - Seed mixes may be used to ensure that there area is covered regardless of aspect
  - Rake or roll the entire sown surface
  - Keep the newly sown area moist until the seed is well-established
    - The first germination will be fescue, which grows and protects the turf

Cool season grasses (e.g. tall fescue, creeping bent, perennial ryegrass) are generally established by seed

## Planting turf

- Undertake the following when establishing turf by vegetative propagation:
  - Inspect turf material structure
    - Inspect stolons/rhizomes for health and vigour prior to planting
    - Refer to published data, supplier's specifications, industry standards and historical data
    - Discard turf plant material with major defects
    - Trim or treat plant material with minor defects to maintain health and vigour
  - Orient and roll sods onto a moist surface, interlocking into a pattern
    - Ensure the area is covered evenly and efficiently – flat and uniformly
    - Minimise the gaps between sods – fill with the desired soil type
  - Consistently water newly laid turf until roots are established



Activity: What are the benefits of interlocking sods as shown above?

Warm season grasses (e.g. broadleaf carpet grass, common/hybrid couch, kikuyu, saltine) are generally established by vegetative propagation

- As part of post-planning care, you may carry out the following:
  - If inorganic fertilisers were used to prepare the soil, fertilise newly established turf again at six weeks, considering:
    - Method of turf establishment
    - Soil nutrient and pH levels
    - Intended use of the turfed area
  - Mow turf to a pattern
    - Ensure the turf has a tight bind to the soil before the first mowing
    - Mow in a regular pattern, making wide turns so not to cause damage
    - Cut to encourage grass to grow horizontally
    - Do not remove more than one-third of the leaf blade

Activity: Research the optimum cutting heights for turf varieties

- As part of post-planning care, you may carry out the following:
  - Apply top dressing over the whole area, working/rubbing into the surface
    - Top dressing levels the surface and applies nutrients
      - This process is most commonly undertaken with home yards, parks and gardens
      - Sports turfs are generally not top dressed, as this may introduce weeds and diseases
  - Undertake watering
    - Keep the turf moist for the first two weeks to keep it firmly rooted
    - Water using irrigation system, where possible
    - Water dry or under-watered turf by hand
    - Implement infrequent deep watering
  - Protect the planted site from animals, pedestrian and vehicular traffic

Activity: Research watering practices and how they are affected by evaporation

- Be aware of the factors that affect turf growth and should be monitored:
  - Drainage
    - Sports turf should incorporate slit drainage and sand dressing
  - Humidity
  - Sunshine
  - Wind
  - Temperature
    - High soil temperatures can cause death of a germinating seed

Activity: Research how each factor affects turf growth

Identify, record and report to your supervisor any incorrect planting or situations that will prevent plants from reaching their full potential (including any recommendations)

- Common causes of failure of newly planted lawns include:
  - Selection of an unsuitable species for the climate, soil, water supply and available maintenance
  - Incorrect or insufficient preparation of the top-soil (e.g. drainage, aeration, pH, fertility)
  - Use of poor quality seed
  - Smothering of the new grass by weeds
  - Incorrect watering
  - Faulty mowing (e.g. first mowing is too close or delayed too long)
  - Insect damage or disease
  - Compaction due to unsuitable soil type, use of heavy mowers or other traffic

## Damaged turf

- Turf can be affected by a number of pests. For example:

**African Black Beetle**



**Argentine Stem Weevil**



**Armyworm**



**Billbug**



**Cutworm**



**Grasshoppers**



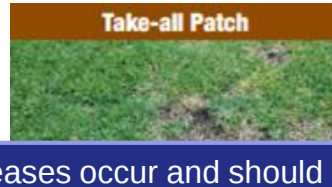
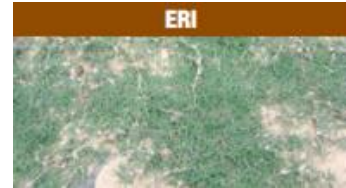
**Sod Webworm**



Activity: Research where these pests occur and how they should be treated

## Damaged turf

- Turf can be affected by a number of diseases. For example:



Activity: Research how these diseases occur and should be treated

- Turf may be afflicted with disorders, just like humans.
- Common plant disorders include:
  - Air pollutants
  - Damage from environment (e.g. ozone and salt)
  - Damage from people and equipment (e.g. heavy use, compaction, mower damage)
  - Lack of light, water or soil nutrients
  - Pet urine
  - Soil toxicity
  - Temperature extremes (e.g. hot, cold, wind)

- If you observe plant pests, diseases and/or disorders, you should report these to your supervisor.
  - Your supervisor can provide you with advice on appropriate treatment methods
    - Question and ask for clarification, as necessary
    - Apply active listening
- Be sure to record the following details:
  - Identification of the plant species affected
  - Signs and symptoms displayed and their severity
  - Environmental history in the area

## Damaged turf

- There are a variety of treatment methods for turf pests, diseases and disorders, including:

| Treatment method | Definition                                                                                                                                                                                                                                                          |
|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Biological       | Uses other animals and plants                                                                                                                                                                                                                                       |
| Chemical         | Includes: <ul style="list-style-type: none"><li>Fungicides: Modes of action are contact and systemic</li><li>Herbicides: Modes of action are contact, systemic and translocated</li><li>Pesticides: Modes of action are contact, suffocating and systemic</li></ul> |
| Cultural         | A preventative measure that works to keep the plant healthy and strong so that it can combat problems before they take hold                                                                                                                                         |
| Mechanical       | Uses physical barriers and traps to stop pests from reaching plants                                                                                                                                                                                                 |
| Physical         | Uses environmental extremes                                                                                                                                                                                                                                         |
| Sanitary         | Stops the spread of the problem (e.g. slash and burn)                                                                                                                                                                                                               |

Worksheet 2: Identify 15 weeds and outline appropriate treatment methods

- As part of completing turf establishment, you are required to complete the following practices:
  - Clean up the work area
  - Record and/or report your work outcomes to your supervisor
    - Use appropriate paperwork
  - Shut down, maintain, clean and store plant, tools and equipment
    - Follow manufacturer's specifications
    - Report faults to your supervisor
  - Dispose of materials that cannot be reused or recycled
    - Be environmentally aware and act safely