GENERAL CERTIFICATE IN ORNAMENTAL HORTICULTURE LEVEL 1

Workbook :

Apply Water to Landscaped Areas

Apply Water to Landscaped Areas Learner Workbook

AgriSETA
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GENERAL CERTIFICATE IN ORNAMENTAL HORTICULTURE LEVEL 1

Workbook :

Apply Water to Landscaped Areas

A c k n o w l e d g e m e n t s

Developed by

Lifestyle College

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Study Session Overview

Purpose

The purpose of this study session is to equip you with the skills and knowledge necessary to:

- Apply the optimum amount of water to various plants to ensure healthy growth and development.
- Select the most suitable watering equipment to water various plantings.
- Select the appropriate frequency of watering to suit prevailing conditions.
- Demonstrate the correct methods of watering to prevent run-off and wastage.
- Utilise knowledge of good watering practices for the propagation and care of plants.

This study session forms part of the General Certificate in Horticulture, NQF level 1 and is aligned with the Unit Standard: Applying water to landscaped areas, which carries 3 credits.

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Who is it for?

This study session and unit standard form the knowledge base for people working with plants within the ornamental horticulture or landscaping industry and gives the learner the skills and knowledge necessary to:

- Select the most appropriate time of day, or conditions to conduct watering.
- Select and demonstrate the use of watering equipment to affect an application rate that suits various conditions.
- Show an understanding of the seasonal water requirements of plants.
- Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.

What's in it for you?

The skills acquired in this study session will equip you with the skills and knowledge needed to be able to apply water to landscaped areas. This knowledge and skill forms the basis of your horticultural studies and will help you to:

- Describe the climatic factors that negatively affect watering efficiency.
- Explain the consequences of watering in windy conditions.
- Explain the effects of conducting watering at the hottest time of the day.
- Describe the ideal time and climatic conditions for watering.
- Demonstrate the various hose and spray nozzles and their adjustments.
- Demonstrate examples of hose end cone sprinklers, their application rates and uses.

- Demonstrate examples of hose end rotary sprinklers, their application rates and uses.
- Demonstrate the correct rate of application of water to suit various soil types.
- Describe the infiltration rates of various soil types.
- Explain the necessity of applying water at or below the infiltration rate
- Explain the effect that slopes and compaction have on the infiltration rate of soils.
- Explain the relationship that the various seasons have on the water requirements of plants.
- Describe the necessity of modifying the frequency and length of watering times to cope with seasonal changes in evapotranspiration rates.
- Explain the need to reduce the watering of deciduous plants in their dormancy period.
- Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.
- Demonstrate the use of a rain gauge and the reading of received rainfall.
- Demonstrate the procedures for the manual testing of the soil water content.
- Explain the importance of increasing the watering timing relative to an increase in E.T.
- Explain the modification of the frequency of watering, to suit varying climatic conditions.
- Describe the adjustment of watering times, in response to rainfall received.
- Explain the importance of regular testing of the soil water content.

What about assessment?

If you can correctly apply water to landscaped areas and answer all the knowledge questions in the summative assessment, you will receive credits for a competent rating on your assessments.

These credits contribute 1 unit standard and 3 credits towards the National Certificate in Ornamental Horticulture Learnership at NQF Level 1.

The laid down policies and procedures with regard to assessment, moderation, RPL and appeals govern this assessment.

You will be rated "Competent" or "Not Yet Competent" against the assessment criteria.

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Unit Standard

Title	**Applying water to landscaped areas.**
Number	119702
Level	1
Credits	3
Field	Agriculture and Nature Conservation
Sub field	Horticulture
Issue date	
Learning assumed to be in place	Demonstrate knowledge of communication and Numeracy at Abet level 3.

Specific Outcomes	Assessment Criteria
1. Select the most appropriate time of day, or conditions to conduct watering.	1.1. Describe the climatic factors that negatively affect watering efficiency. 1.2. Explain the consequences of watering in windy conditions. 1.3. Explain the effects of conducting watering at the hottest time of the day. 1.4. Describe the ideal time and climatic conditions for watering.
2. Select and demonstrate the use of watering equipment to affect an application rate that suits various soil conditions.	2.1. Describe the infiltration rates of various soil types. 2.2. Explain the necessity of applying water at or below the infiltration rate. 2.3. Explain the effect that slopes and compaction have on the infiltration rate of soils. 2.4. Demonstrate the various hose and spray nozzles and their adjustments. 2.5. Demonstrate examples of hose end cone sprinklers, their application rates and uses. 2.6. Demonstrate examples of hose end rotary sprinklers, their application rates and uses.

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Specific Outcomes	Assessment Criteria
	2.7. Demonstrate the correct rate of application of water to suit various soil types.
3. Show an understanding of the seasonal water requirements of plants.	3.1. Explain the relationship that the various seasons have on the water requirements of plants. 3.2. Describe the necessity of modifying the frequency and length of watering times to cope with seasonal changes in evapotranspiration rates. 3.3. Explain the need to reduce the watering of deciduous plants in their dormancy period. 3.4. Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.
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Embedded Knowledge

Embedded knowledge is reflected within the assessment criteria of each specific outcome and must be assessed in its own right, through oral and written evidence. Observation cannot be the only assessment.

Critical Cross Field Outcomes

- Identify and solve problems in which responses display that responsible decisions using critical and creative thinking have been made – specific outcome1, 2 and 3.
- Work effectively with others as a member of a team, group, organisation or community. Specific outcome embedded in the learning for this level of learner.
- Organise and manage oneself and one's activities responsibly and effectively. Specific outcome 1, 2 and 3.
- Collect, analyse, organise and critically evaluate information. Specific outcome 1, 2 and 4.
- Communicate effectively using visual, mathematical and/or language skills in the modes of oral and/or written presentation. Specific outcome embedded in the learning for this level of learner.
- Use science and technology effectively and critically, showing responsibility toward the environment and health of others. Specific outcome 1, 3 and 4.
- Demonstrate an understanding of the world as a set of related systems by recognising that problem-solving contexts do not exist in isolation. Specific outcome 1, 2 and 3.

Unit Standard Accreditation and Moderation Options

1. Internal moderation.
2. External moderation.
3. Moderation of assessment will be overseen by the relevant ETQA, according to the moderation guidelines in the relevant qualification the agreed ETQA procedures.
4. Internal assessment.
5. External assessment with the relevant registered/accredited industry body/ETQA.
6. An Assessor accredited by the relevant ETQA, will assess the Learner's competency.
7. Formative and summative assessment of qualifying Learners against this unit standard should be in alignment with the requirements of the NSB.
8. Practical assessment activities will be used that are appropriate to the contents in which the qualifying Learners are working.
9. Assessment will include self and peer assessment, practical and oral assessment, observations, questions and answers, etc.
10. Direct observation is required in simulated or actual work conditions.
11. Reporting skills are demonstrated by effective communication, using verbal and/or writing skills.
12. Assessment is to be structured to include formative and summative component, as well as the submission of a Portfolio of Evidence.
13. The assessment should ensure that all the specific outcomes, critical cross field outcomes and embedded knowledge are assessed.

14. Specific outcomes must be assessed in their own right, through oral and practical evidence and cannot be assessed by observation only.

Essential embedded knowledge must be assessed in their own right, through oral and practical evidence and cannot be assessed by observation only.

15. Special outcomes and essential embedded knowledge must be assessed in relation to each other.
16. If qualifying Learners are able to explain the essential embedded knowledge, but are unable to perform the specific outcomes, then they should not be assessed as competent.
17. If qualifying Learners are able to perform specific outcomes, but are unable to explain the essential embedded knowledge, they should not be assessed as competent.
18. Evidence of the specified critical cross-field outcomes should be found, both in performance and in essential embedded knowledge.
19. Assessment activities must be fair, so that all Learners have equal opportunities. Activities must be free of gender, ethnic or other bias.
20. This unit standard can be assessed together with any other relevant registered unit standard.

Who does what?

You are expected to actively take part in the lessons by:

- Asking questions.
- Planning and preparing for your training and assessment.
- Completing the assessment tasks that you are given.
- Telling your trainer when you need help or don't understand.

Your learning will be supported in the following ways:

- Your trainer will provide you with all the necessary training material.
- Your trainer will manage the learning process during the training.
- The assessor will plan and prepare you for assessment, assess your competence and provide feedback to you and any follow up assessments that may be necessary.

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Introduction

A plant reacts very simply to too little or too much water; it just stops growing and over a period of time dies. So how much water does your plant need to growth healthy and strong?

How much water is taken up by your plant depends on two processes:

- **Water absorption**, which is the process by which plants take up water.

- **Transpiration**, which is the process by which plants lose water in the form of vapour.

  During transpiration water passes through the plant's root hairs, travels up the root system, through the stem structure of the plant, into the leaves and then out of the stomata of the leaves into the air. This process helps to move sugars, plant nutrients and food through your plant and helps to cool your plants leaves and stem tissue through a process called evaporation. The objective of regular watering is to replace the moisture that is lost through transpiration so that the moisture level remains more or less the same.

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To understand how much water your plant is using and how much water is being evaporated, you need to know:

- How different soil types affect your plants watering needs.
- How the seasons affect your plants watering needs.
- How climatic factors affect your plants watering needs.

Let's begin our learning today but taking a look at each of these points in detail.

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Lesson 1 : Soils And Water Requirements

Specific outcomes of this lesson :

Select and demonstrate the use of watering equipment to affect an application rate that suits various soil conditions.

Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.

After you have worked through Lesson 1, you should be able to:

- ❑ Describe the infiltration rates of various soil types.
- ❑ Explain the necessity of applying water at or below the infiltration rate.
- ❑ Explain the effect that slopes and compaction have on the infiltration rate of soils.
- ❑ Explain the importance of regular testing of the soil water content.
- ❑ Demonstrate the procedures for the manual testing of the soil water content.

Soil Water Content

Water loss begins at the top of the soil and works its way down. Because your plants root system is generally deep in the soil you need to test your soil to see how wet or dry your soil is. This will tell you whether your plants are getting enough water.

Before you apply water, test how dry or wet your soil is by:

1. Digging about 15 cm below the soil surface:

   - If your soil is dry at this level, your plants are not getting enough water and so you need to water.

   - If your soil is moist at this level, your plants are getting enough water and you are watering correctly.

   - If your soil is soggy at this level, your plants are getting too much water and you are over watering your plants. You need to cut down on the amount of watering you are doing.

2. Using a moisture meter. This is an instrument which you stick into the soil. The gauge on this instrument will then give you a reading of how wet or dry your soil is.

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Your Turn…

ACTIVITY 1
Test the moisture content of the area of soil you have been given. **Is this soil dry, moist or soggy?**

Your Turn…

ACTIVITY 2

Why it is important to regularly test your soil water content?

Soil Types

There are three main types of soil:

- Sandy soils.
- Loam soils.
- Clay soils.

A simple and cheap way to test which soil type you will be watering, is to pick up a handful of soil, wet the soil slightly and then try to roll your handful of soil into a sausage shape, this is called the sausage test.

Sandy Soil	Loam Soil	Clay Soil
Sandy soil will feel gritty and rough in your hand.	Loam soils don't feel very rough or very smooth.	Wet clay soils are smooth and will feel sticky in your hand. Dry clay soils will feel powdery in your hand.
With sandy soils you will not be able to form a sausage shape at all.	With loam sands you will be able to form a sausage shape but it will keep breaking apart.	With clay soils you will be able to form a sausage that holds its shape.

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Your Turn…

ACTIVITY 3

Look at the three trays of soil and then answer the following questions:

- Which tray has clay soil?
- How do you know this is clay soil?
- Which tray has sandy soil?
- How do you know this is sandy soil?
- Which tray has loam soil?
- How do you know this is loam soil?

Infiltration rates of soils

Water is taken up and held by these different types of soils at different rates. How quickly or slowly water moves through the soil is known as the soils infiltration rate.

If you apply water faster than the soil can absorb it, the water simply flows over the surface of the soil and runs-off the soil and so the water is wasted and the soil below the surface does not receive the amount of water needed to supply your plants with their water needs.

Let's take a look at the infiltration rates of the different types of soils.

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Your Turn…

ACTIVITY 4

Infiltration test

- Punch holes into the bottom of three separate tins.
- Now fill one tin with clay soil, one with loam soil and one with sandy soil. The tins should be about ¾ full of soil.
- Place all three tins in a place where they can drain freely.
- Fill all three tins at the same time to the top with water.

Watch and see how long it takes for the water to drain out of the bottom of each tin.

In which tin did the water go down the quickest?

How do you think this affects plants growing in a soil like this?

In which tin did the water go down the slowest?

How do you think that this would affect plants growing in a soil like this?

Soil Type	Infiltration Rate
Sandy soils	Have large air pockets between their grains. These large air pockets allow water to run very quickly through the soil, this is knows as a **high infiltration rate.**
Clay soils	Have very small air pockets between their grains. These small pockets allow water to move slowly through the soil, this is known as a **slow infiltration rate.**
Loam soils	Have a combination of sand particles and humus (organic matter) and so has medium size air pockets between their grains. These moderate air pockets allow the loam soil to hold water. Water moves through these soils at a moderate rate and this is known as a **moderate infiltration rate.**

Your Turn…

ACTIVITY 5
Describe the infiltration rate of various soil types.

Soil Infiltration Rates and Watering Needs

When you water you need to make sure that the water is infiltrating the soil at the correct rate because if you apply water faster than the soil can take it up, the water will simply flow over the surface of the soil and run-off the soil. This will mean a lot of the water is wasted and the water will not have had a chance to reach the roots of your plants, which means that your plants can dehydrate and die.

Let's take a look at how to water different types of soils.

Soil Type	Infiltration Rate	Watering Needs
Sandy soils	Have large air pockets between their grains. These large air pockets allow water to run very quickly through the soil, this is knows as a **high infiltration rate.**	Because sandy soils have a fast infiltration rate, you need to allow a large amount of water to flow quickly into the soil. Sandy soils need much more water than other soil types. Because sandy soils dry out quickly, plants growing in sandy soils will need to be watered more frequently than plants growing in other soils.

Soil Type	Infiltration Rate	Watering Needs
Clay soils	Have very small air pockets between their grains. These small pockets allow water to move slowly through the soil, this is known as a **slow infiltration rate.**	Because clay soils have the lowest infiltration rate, water moves slowly through clay soils and is often held below the surface of the soil although the surface may look dry. So if you are watering plants in clay soil you need to water slowly. Because clay soils hold water, plants growing in clay soils will need to be watered less frequently than plants growing in other soils.
Loam soils	Have a combination of sand particles and humus (organic matter) and so has medium size air pockets between their grains. These moderate air pockets allow the loam soil to hold water. Water moves through these soils at a moderate rate and this is known as a **moderate infiltration rate.**	Because loam soils don't dry out as quickly as sandy soils and don't hold as much water as clay soils, plants growing in loam soil will require a moderate rate and frequency of watering.

Can you see that if you are watering:

- A sandy soil the water moves almost directly down into the soil and so reaches deep into the soil.
- Clay soil the water moves slowly down and sideways.

So if the same amount of water is applied to sandy soil and clay soil, the water will reach deeper in the sandy soil. This is important to understand because the water you are applying needs to reach the roots of your plants which are often growing deep in the soil.

Your Turn…

ACTIVITY 6

Why do you need to water at or below the soils infiltration rate?

Watering Compacted Soil

Soil becomes compacted when the soil is frequently walked or traveled over. When a soil becomes compacted it has less air pockets or spaces between the soil participles for water to move through and so compacted soils absorb water more slowly than other soils.

If you are watering compacted soil, you should firstly loosen the soil with a gardening pick or fork to allow for better water infiltration. Be careful when working with very clayey soils because as you spike the soil with your fork, the soil around the hole made by the fork can become more compacted.

If you don't have the time to do this you will need to water slowly so that the water gets a chance to penetrate the soil.

You can also water for a few minutes and then stop watering for a short while, allowing the water to penetrate into the soil and then water again.

Watering Sloping areas

The steeper a slope, the faster the water will run off it. As the water runs off slopes it can take with it the top layer of the soil and so cause soil erosion.

If you are watering on a slope, you will need to water slowly so that water can penetrate the soil.

Your Turn…

ACTIVITY 7
Explain the effect that slopes and compaction have on the infiltration rate of soils.

Lesson Checkpoint

Now that you have worked through this lesson, please check that you are able to do all the specific outcomes and meet the assessment criteria:

- ❑ I can describe the infiltration rates of various soil types.
- ❑ I can explain the necessity of applying water at or below the infiltration rate.
- ❑ I can explain the effect that slopes and compaction have on the infiltration rate of soils.,
- ❑ I can explain the importance of regular testing of the soil water content.
- ❑ I can demonstrate the procedures for the manual testing of the soil water content.

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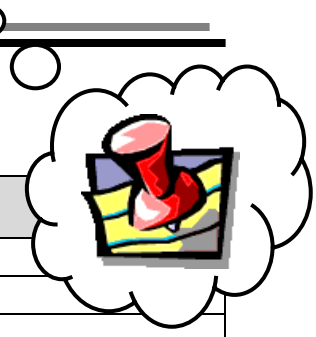

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Lesson 2: Seasons and Water Requirements

Specific outcomes of this lesson :

Show an understanding of the seasonal water requirements of plants.

Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.

After you have worked through Lesson 2, you should be able to:

- ❑ Explain the relationship that the various seasons have on the water requirements of plants.
- ❑ Describe the necessity of modifying the frequency and length of watering times to cope with seasonal changes in evapotranspiration rates.
- ❑ Explain the need to reduce the watering of deciduous plants in their dormancy period.
- ❑ Modify the frequency and quality of watering to suit the evapotranspiration and rainfall.
- ❑ Describe the adjustment of watering times, in response to rainfall received.
- ❑ Demonstrate the use of rain gauge and the reading of received rainfall.

Introduction

There are four seasons in a year – spring, summer, autumn and winter. Each season brings changes in temperature and different amounts of rain and these factors will influence the amount of water you need to give to your plants.

Let's first take a look at seasonal temperatures.

Seasonal Temperatures

Spring is a time of awakening and plants are beginning to actively grow after the dormant (sleeping) winter season.

During this cool season your plants need enough water to sustain their needs but not as much water as they will need during the hot summer because the evapotranspiration rate is generally low.

As a general rule, in spring you need to water each section of your landscaped area for about 20 minutes twice a week depending on the type of watering system you are using.

Summer is the time that plants are actively growing. This is the hottest season, and high air temperatures mean that the evapotranspiration rate (the rate at which your plants are losing moisture) is high.

High evapotranspiration rates can cause your plants to loose large amounts of moisture and this can cause your plants to wilt. Wilting that occurs during the heat of a summer day is common and temporary, but if your plants show signs of wilting in the early morning or late afternoon your plants are not getting enough water.

In the summer months during very hot periods with little rain or breeze you need to give your plants a lot of water, regularly. So as a general rule, water each section of your landscaped area for 10 to 15 minutes, daily. depending on the type of watering system you are using.

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Autumn is the time of the year when the growth of your plants starts to slow down and many plants are in their seeding and fruiting phase.

In the autumn you need to cut back on the amount and frequency that you are watering your landscaped area. So as a general rule water each section of your landscaped area 20 minutes, three times a week because during this cooler season, transpiration slows down as the days get shorter depending on the type of watering system you are using.

Winter is the time when many plants especially deciduous plants are in their dormant period (this means that they are resting). Because plants in their dormant period are not actively growing, they do not need much water and nutrients and so need to take up less water. If you keep on watering these plants, in the same way as you did during the summer months when they are actively growing, these plants will drown.

This is the coolest time of the year which means that the evapotranspiration rate is low, especially for deciduous trees that have lost their leaves.

During this time plants require little watering and so the frequency and duration of watering should be bought down to a minimum. So as a general rule, water each section of your landscaped area 15 minutes, once a week, depending on the type of watering system you are using. If you are watering in cold winter climates it is recommended that you water during the warmer part of the day, for example between 10h00 and 14h00 so that your plants are not wet at night because this water can freeze and damage your plants.

Early in the morning usually at sunrise when the air is cool and the soil gives off heat, small water droplets, called dew drops form on the leaves of the plants. This time of day is known as dew point. In winter in cold climates that receive below zero degree Celsius night temperatures, this time of the day can be very dangerous for plants because these dew drops can freeze if the temperature is low. This is called frost. Frost is frozen dew drops and is as sharp as razors. If wind blows lightly over these pieces of sharp ice they rub over the leaves of the plant and make tiny ‘cuts’ all over the surface of the leaves. The leaves then shrivel and turn black. This is called frost damage.

Summary

So can you see that the hotter it is the higher the rate at which your plants will be losing water through the process of evapotranspiration and so you will need to give your plants lots of water. The hotter it is the more frequently and more deeply you will need to water.

And the cooler it is the lower the rate at which your plants will be losing water through the process of evapotranspiration and so you will need to give your plants less water.

Your Turn…

ACTIVITY 8
How do the different seasons effect the water requirements of plants?

Your Turn…

ACTIVITY 9
Why do you need to change the frequency and length of watering to cope with seasonal changes in evapotranspiration rates?

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Your Turn…

ACTIVITY 10
Why do you need to reduce the amount of water you give to deciduous plants when they are in their dormancy period?

Rainfall Patterns

In South Africa we have three rainfall pattern areas – summer rainfall areas, winter rainfall areas and in a small area around George the summer and winter rainfall areas overlap and they have rainfall all year round.

To make sure that you are not over watering or under watering your plants, you need to adjust how much and how often you water your landscaped area to suit the rainfall of each region. Keeping track of how much it has rained helps you to do this. The best way to check on how much rain your landscaped area is getting is to place a rain gauge, which is sold at most garden centres, in or around your landscaped area. Rain gauges need to be placed out in the open, on a stand, several meters from trees, or any other features because these can stop the rain from getting into your rain gauge and give you a false reading

Rain gauges help you to work out watering patterns that compliment rainfall patterns. By keeping a daily record of the rainfall over a year, you will be able to work out when the landscaped area will need more watering and when it will need less because in the dry season your plants will need more watering and in the rainy season they will need less watering.

A rain gauge needs to be read every day at the same time in order to get an accurate reading, during the rainy season and emptied after each reading.

Rain gauges have markings on their sides which are in millimeters, beginning at zero. By holding the rain gauge still, making sure that the water inside is not moving around, you will be able to see where the water level is. You will see a downward curving line, read the millimeter markings in line with the bottom of this line.

How to use your rain gauge readings

If 2 ½ cm of rain has fallen, then this means that the rain has penetrated:

- About 30 cm into sandy soil.
- About 21 cm in a loam soil.
- About 15 cm in a clay soil.

So if you want to water to a depth of 30 cm, you will need:

- 2 ½ cm of water or rainfall in a sandy soil.
- 3 ½ cm of water or rainfall in a loam soil.
- 5 cm of water or rainfall in a clay soil.

If after a few days you see that less than 15 mm of rain has fallen, you should water your area.

Your Turn…

ACTIVITY 11

Take a reading of the three rain gauges in front of you.

- **Rain gauge 1 = _____ rain has been received.**
- **Rain gauge 2 = _____ rain has been received.**
- **Rain gauge 3 = _____ rain has been received.**

If it is a hot summer's day, how would you change the frequency and quantity of watering to suit the evapotranspiration and rainfall as shown by rain gauge 1?

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ACTIVITY 11

If it is a hot summer's day, how would you change the frequency and quantity of watering to suit the evapotranspiration and rainfall as shown by rain gauge 2?

If it is a cool spring day, how would you change the frequency and quantity of watering to suit the evapotranspiration and rainfall as shown by rain gauge 3?

Lesson Checkpoint

Now that you have worked through this lesson, please check that you are able to do all the specific outcomes and meet the assessment criteria:

- ❑ I can explain the relationship that the various seasons have on the water requirements of plants.
- ❑ I can describe the necessity of modifying the frequency and length of watering times to cope with seasonal changes in evapotranspiration rates.
- ❑ I can explain the need to reduce the watering of deciduous plants in their dormancy period.
- ❑ I can modify the frequency and quality of watering to suit the evapotranspiration and rainfall.
- ❑ I can describe the adjustment of watering times in response to rainfall received.
- ❑ I can demonstrate the use of a rain gauge and the reading of received rainfall.

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Lesson 3: Climate and Water Requirements

Specific outcomes of this lesson :

Select the most appropriate time of day, or conditions to conduct watering.

Modify the frequency and quantity of watering to suit the evapotranspiration and rainfall.

After you have worked through Lesson 1, you should be able to:

- ❑ Describe the climatic factors that negatively affect watering efficiency.
- ❑ Explain the consequences of watering in windy conditions.
- ❑ Explain the effects of conducting watering at the hottest time of the day.
- ❑ Describe the ideal time and climatic conditions for watering.
- ❑ Explain the importance of increasing the watering timing, relative to an increase in evapotranspiration.
- ❑ Explain the modification of the frequency of watering to suit varying climatic conditions.

What are climatic factors?

Climatic factors means the weather conditions of the landscaped area in which your plants are growing. Because plants lose water when moisture is sucked out of the leaves of the plant by:

- The heat of the day.
- The amount of wind and air movement in the area.

You need to look at the landscaped area that your plants are growing in and ask yourself these questions:

Climatic Factors

- **How hot is the day?**

  On hot days the soil dries out quicker than on cold days and plants lose a lot of water through their leaves, this is called evapotranspiration. The hotter the day is the higher the rate of evapotranspiration.

  If you water your plants at midday when the sun is at its hottest, a lot of the water you are giving your plants will evaporate before your plants get the chance to take up the water. This is a waste of water, so it is better to water your plants early in the morning. This gives your plants a chance to absorb and store enough water for the day.

If you can't water early in the morning then you can water late in the afternoon or at sunset when the temperature is cooler as this also allows your plants to absorb and store water overnight for use the next day. A drawback with sunset watering is that when moisture is kept overnight on the leaves of your plants (especially in humid climates) fungi often have time to develop on the leaves of your plants and infest the plant. By watering in the early morning this can be avoided as the sun dries any moisture off the leaves before fungi can set in.

- **How hot is the area?**

  Plants growing in a hot, exposed north or west facing position will need more water than plants growing in cooler, shady east or south facing positions because the soil in shade stays wetter for a longer period of time.

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Your Turn…

ACTIVITY 12
Why it is important to water more often when there is a high evapotranspiration rate?

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Your Turn…

ACTIVITY 13
Why should you not water at the hottest time of the day?

More about Climatic Conditions

- **How much air movement or wind is there?**

  When the wind blows it dries out the soil quicker and increases the rate at which your plants loose water through their leaves and so your plants will use more water on windy days.

  Areas sheltered from the wind will tend to dry out more slowly than an area that is windy, so plants growing in windy positions need more frequent watering.

  When you water plants in the wind, a lot of the water is blown away by the wind and so is not available for your plants. This is a waste of water, so it is better to water when there is no wind and the air is still. Early morning is usually when the air is at its stillest.

Your Turn…

ACTIVITY 14
Why should you not water in windy conditions?

Your Turn…

ACTIVITY 15

What are the best climatic conditions and time for watering?

So can you see that the best time of day to water the landscaped area is early in the morning on a calm sunny day?

Your Turn…

ACTIVITY 16
How will you change the frequency of watering to suit varying climatic conditions?

Lesson Checkpoint

Now that you have worked through this lesson, please check that you are able to do all the specific outcomes and meet the assessment criteria:

- ❑ I can describe the climatic factors that negatively affect watering efficiency.
- ❑ I can explain the consequences of watering in windy conditions.
- ❑ I can explain the effects of conducting watering at the hottest time of the day.
- ❑ I can describe the ideal time and climatic conditions for watering.
- ❑ I can explain the importance of increasing the watering timing, relative to an increase in evapotranspiration.
- ❑ I can explain the modification of the frequency of watering to suit varying climatic conditions.

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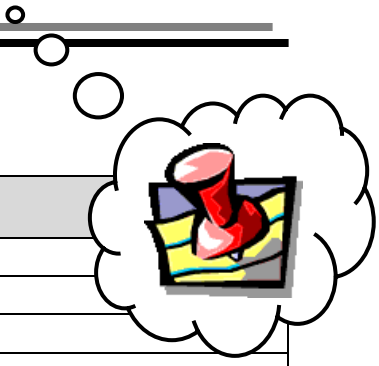

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Lesson 4: Watering Equipment

Specific outcomes of this lesson :

Select and demonstrate the use of watering equipment to affect an application rate that suits various soil conditions.

After you have worked through Lesson 4, you should be able to:

- ❑ Demonstrate the various hose end spray nozzles and their adjustments.
- ❑ Demonstrate examples of hose end cone sprinklers, their application rates and uses.
- ❑ Demonstrate examples of hose end rotary sprinklers, their application rates and uses.
- ❑ Demonstrate the correct rate of application of water to suit various soil types.

Hose End Spray Nozzles

Hose end spray nozzles are used to water by hand and are attached to the end of your hose pipe. You will need to hand water your seedlings, newly planted plants, pots and small landscaped areas.

These nozzles can be either:

- **Adjustable** and with these nozzles you can adjust the amount of water coming through the nozzle and so water harder or softer. If the water pressure is too high, you can wash away the soil from the roots of your plants and also damage flowers, soft stems and leaves of your plants.

- **non-adjustable** and with these nozzles you can't adjust the amount of water coming through the nozzle and so need to adjust the amount of water coming out of the tap in order to water harder or softer.

How quickly or slowly water moves into the soil is known as the soils infiltration rate:

- Because **sandy soils** have a fast infiltration rate, you will need to adjust the amount of water coming out of the end of your nozzle to make sure that you have a large amount of water flowing quickly into the soil.

- Because **clay soils** have a slow infiltration rate, you will need to adjust the amount of water coming out of the end of your nozzle to make sure that you have a smaller quantity of water flowing into the soil at a much slower rate.

- **Loam soils** have a moderate infiltration rate and so you will need to adjust the amount of water coming out of the end of your nozzle to a medium flow.

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Your Turn…

ACTIVITY 17
Using the adjustable spray nozzle that you have been given, show how you would adjust the nozzle to water at the correct rate: • **Sandy soil.** • **Clay soil.** • **Loam soil.**

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Your Turn…

ACTIVITY 18
Using the non- adjustable spray nozzle that you have been given, show how you would adjust watering rate to water: • **Sandy soil.** • **Clay soil.** • **Loam soil.**

Sprinklers

Sprinklers are attached to the end of your hose pipe and are used to when you are manually watering large areas of the landscaped area and want to leave the sprinkler on the ground.

There are basically two types of manual sprinklers:

- **Cone sprinklers** are used for over head watering in small landscaped areas.

  Cone sprinklers spray an arc of water, in a circular pattern around the sprinkler, so that the areas further away from the sprinkler and the areas closer to the sprinkler get less water, giving a fairly even water distribution pattern. You can't adjust the amount of water coming through the sprinkler and so need to adjust the infiltration rate by adjusting the amount of water coming out of the tap in order to water more quickly or slowly.

  Different areas have differing water pressure coming out of the tap. If you find that the water pressure in your area is low, a cone sprinkler will give you better watering results.

  There are many kinds of cone sprinklers available and in general there are less dry spots created by this watering pattern and the average rate of water application is 40 mm per hour over a set area.

Your Turn…

ACTIVITY 19
When would you use a cone sprinkler?

Your Turn…

ACTIVITY 20

Using a cone sprinkler show how you would adjust the watering rate to water:

- **Sandy soil.**
- **Clay soil.**
- **Loam soil.**

- **Rotary sprinklers** are used for over head watering of larger landscaped areas.

  Rotary sprinklers have moveable parts which allow water to be spread over larger areas in a more uneven distribution pattern than hose end cone sprinklers.

  The average rate of water application is 8 to 9 mm per hour over an area.

  The two most common types of rotary sprinklers are the sprinklers that move backwards and forwards and those that move in a circulation pattern. Once again with these nozzles you can't adjust the amount of water coming through the nozzle and so need to adjust the amount of water coming out of the tap in order to water harder or softer.

Your Turn…

ACTIVITY 21
When would you use a rotary sprinkler?

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Your Turn…

ACTIVITY 22
Give examples of two types of rotary sprinklers.

Your Turn…

ACTIVITY 23

Using a rotary sprinkler, show how you would adjust the watering rate to water:

- **Sandy soil.**
- **Clay soil.**
- **Loam soil.**

Lesson Checkpoint

Now that you have worked through this lesson, please check that you are able to do all the specific outcomes and meet the assessment criteria:

- ❑ I can demonstrate the various hose and spray nozzles and their adjustments.
- ❑ I can demonstrate examples of hose end cone sprinklers, their application rates and uses.
- ❑ I can demonstrate examples of hose end rotary sprinklers, their application rates and uses.
- ❑ I can demonstrate the correct rate of application of water to suit various soil types.

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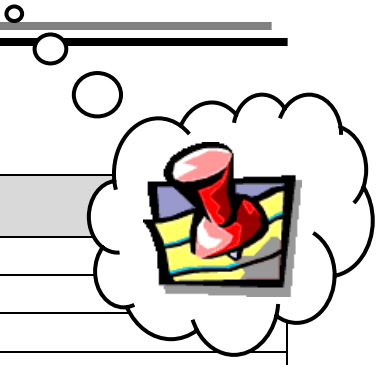

Notes:

References

- **Sunset New Western Garden Book**
- **The South African Garden Manual, 12th revised edition 1982, 1983.**