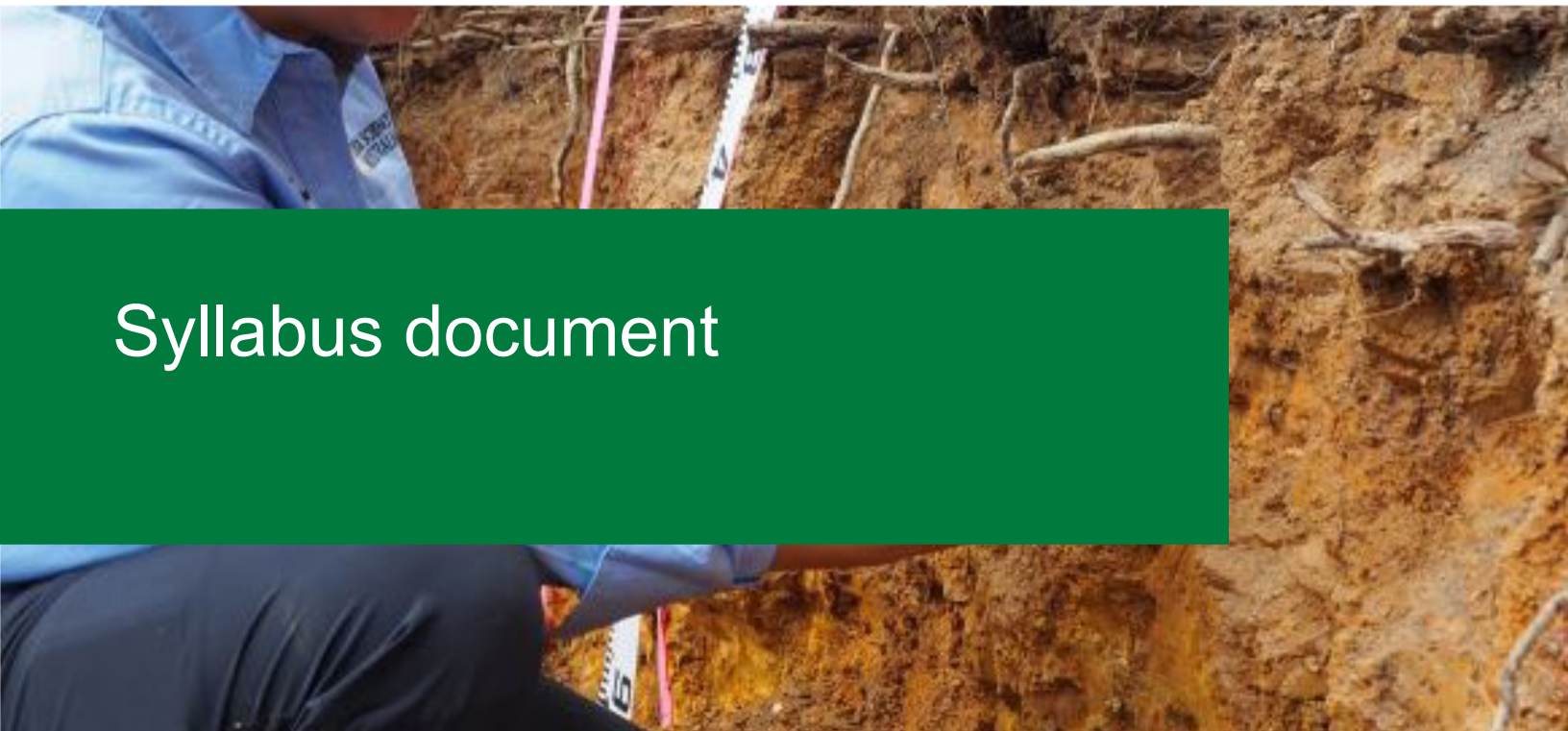




Syllabus document

Soil Management Training

Soil Science Australia – October 2025

Soil Science Australia is the national soil science body and a not-for-profit professional incorporated association for soil scientists and people interested in the responsible management of Australia's soil resources. This project is supported by the Australian Government Department of Agriculture, Fisheries and Forestry as part of the National Soil Strategy.

Soil Science Australia acknowledges the Traditional Owners of the land and pay our respects to their Elders past, present and future.

This project is supported by the Australian Government Department of Agriculture, Fisheries and Forestry as part of the National Soil Strategy.

Soil Management Training

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Aim of the soil management training

Registered Soil Practitioner Soil Management (RSP-Soil Management) accreditation is a national accreditation scheme for soil practitioners, designed to enhance and standardise expertise across Australia. The requirement for this accreditation has been supported by the Australian Government as a part of the National Soil Strategy to assist in competent management of the soil resource.

Within this context, the aim of the soil management training course is to actively assess the applicants against the level of knowledge required, allow self-assessment against this and the accreditation standards, as well as provide indication of the areas of knowledge that might require further professional development.

The intent of this training is to summarise the expected knowledge and provide the key resources that lead to accreditation, as well as set the standards for professional practice within the context of soil management.

Performance objectives of the soil management training

The accreditation for RSP-Soil Management will:

- Support and set national and state/territory standards, as relevant,
- Tailor soil science accreditation at a national level to address the needs of the industries that require these skills.
- Support soil practitioners to provide appropriate, consistent, and evidence-based soil knowledge and advice to land managers, to freshen and expand their soil knowledge and deliver better soil management advice for their clients.
- Increase knowledge of soil science by those who work with soils in agriculture, policy, and natural resource management.
- Provide a career pathway to support individuals wanting a career working in soils-based industry.

Given these accreditation program objectives, the training has been designed to support these and has the following performance objectives:

- Refresh the soil science fundamentals such that trainees can understand the characteristics of soil and its function in order to apply this to a broader soil degradation and management issues.
- Outline a framework for site interpretation and soil field analysis such that trainees can apply this framework to classify sites and justify these classifications.
- Provide a structured approach to a project scheme such that trainees can design a tailored soil sampling regime that supports laboratory analysis requirements and project outcomes.
- Outline soil laboratory data interpretation such that trainees can apply this to ensure project outcomes align with sampling and data requirements to deliver quality outcomes, as well as diagnose soil management issues for clients.
- Highlights requirements for and support ongoing professional development such that trainees can focus their time on the best outcomes for themselves, their employers and their industry.

These performance objectives are broken down further into competency areas and detailed learning outcomes under the relevant synopsis for each of the core modules. Subsequently, each of these learning objectives is mapped back to the RSP Standards for accreditation so it is explicitly apparent what is required for accreditation.

Training content

The training course contains the following modules:

1. Basic soil fundamentals
2. Soil field analysis and site interpretation
3. Soil sampling for laboratory analysis
4. Soil data interpretation and application

More detail on each of these modules can be found in the module relevant synopsis.

Prerequisites

The training assumes that applicants have operational knowledge of soil management through formal or informal (on the job) training. There are no formal prerequisites for this training. It is expected that trainees have a working knowledge of soil fundamentals, have been involved with soil sampling and soil sampling regimes and have some experience with soil analysis reports.

Training mode

Most of the training is asynchronously delivered via pre-recorded lessons, with self- assessment touch points. This allows trainees to pace the learning to suit their lifestyles and job requirements.

A moderated discussion forum is provided to assist trainees to ask questions as the course progresses. Other trainees are encouraged to assist in answering questions to develop a strong professional support network. However, qualified moderators are also available to help answer questions and progress training.

Given the practical nature of soil management, there is a practical component of this course that is condensed into a single face to face, in-field course meeting. These are scheduled at specified dates, around Australia. See the Registered Soil Practitioner web page on the Soil Science Australia website to confirm a date and location relevant to you. Additionally, if there is a large group from your workplace, a face-to-face in-field meeting can be tailored to your desired location; please contact TrainingManager@SoilScienceAustralia.org.au to discuss this if it is applicable.

Training structure

The training follows a Constructivist approach to learning, which requires trainees to apply their own relevant context (e.g. industry and/or region and/or soil) to the training course and its assessment. The structure of the course and its content remain the same, but each trainee brings to the course their own context, which allows exposure to multiple contexts in completing the course. Each of the training modules contains a reflection component to the training assessment that will assist in the ongoing professional development of the trainee.

This training is structured as follows:

- Course – refers to the stacking of the four training modules.
- Modules – refer to the four discrete training areas and are stackable.
- Section – refer to smaller parts of a module that are generally under 15 min of tuition and are followed by self-assessment.
- Self-assessment – is conducted at the end of each section and is designed to test progressive comprehension, as well as progressively complete training assessment for the relevant modules.
- Training assessment – is completed at the end of each module with most of the content pulled from the self-assessment to make the training assessment less onerous. A field assessment is also conducted face-to-face at the completion of the online component and is a requirement to be considered for accreditation.
- Accreditation – is conducted once the training course is completed and is additional to the training. Completion of the training satisfactorily does not guarantee accreditation.

Training assessment

Assessment is a requirement for accreditation. Undertaking the assessment does not guarantee accreditation, as prior experience is a prerequisite: i) have at least three years professional work experience in soil management; or ii) relevant formal tertiary qualifications and at least one year of professional work experience in soil management. Where assessment requirements for RSP-SM are met and the requisite experience in soil management can be demonstrated, completion of this training results in direct accreditation. For further information on the accreditation pathways that this training facilitates, see accreditation requirements on the Soil Science Australia website.

Where a trainee has no prior formal training in soil science it should be expected that the RSP training will demonstrate shortfalls that require addressing to meet accreditation requirements. The training assessment has been designed to assist this as best possible. It is certainly possible to pass all training assessment satisfactorily without any formal training (i.e. on the job training only). This then facilitates the accreditation pathway.

Training assessment is broken into an online quiz and a learning portfolio. The self-assessment touch points that accompany each training section build into the learning portfolio such that assessment is completed gradually through the module. This assists trainees to deliver assessment quickly without it being onerous, but the assessment still having rigour. Detailed assessment mechanisms are provided for each module.

Importantly, there is a practical assessment that is undertaken as a part of the face to face, in-field meeting.

Recognition of prior learning

Recognition of prior learning is available where it can be demonstrated that prior learning maps sufficiently to the learning outcomes of the training.

Time to complete training

The time to complete the training course depends on the level of background knowledge each trainee brings to the course, along with any potential recognition of prior learning. However, the average time to complete the course has been designed as eight (8) days of training material and four (4) days of exercise, with an additional two (2) days of in-the-field, face-to-face training and assessment.

Basic soil fundamentals

Refreshing the underpinning concepts for soil management

Module 1 summary

The Basic fundamentals in soil science module is designed to provide participants with a refreshed understanding of soil functions, ecosystem services, soil classification methods, and soil-threatening processes in an agricultural and environmental context. Participants will learn about the various functions and ecosystem services delivered by soil, such as food production, water storage, habitat support, pollutant filtration, nutrient cycling, and more. The course will cover practical aspects of soil description, identification of soil development factors, field and data-based soil classification, and understanding the causes, impacts, and mitigations of soil-threatening processes. Additionally, participants will gain knowledge of the basic physical, chemical, and biological properties of soil and their relevance in an agricultural, agronomic, and environmental setting.

Competency areas

1. Critical soil functions and ecosystem services of the landscape.
2. Soil formation, composition, classification, and distribution.
3. Basic physical, chemical, and biological soil properties
4. The impact of soil degradation processes, specifically their impacts on soil function and potential productivity and/or environmental impact.

Learning outcomes

- A. Identify and explain the functions and ecosystem services provided by soil.
- B. Describe a soil profile at the desk-top level and demonstrate the ability to identify and describe relevant soil development factors, such as topography and geology.
- C. Understand and explain the causes, impacts, and mitigations of soil-threatening processes, such as salinisation, erosion, acidity, and soil degradation.

- D. Demonstrate broad knowledge and understanding of the basic physical, chemical, and biological properties of soil in an agricultural, agronomic and environmental setting.
- E. Explain nutrient cycles, the impacts of changing one element within a cycle, and the role of soil organisms.
- F. Describe basic soil properties, including physical properties (structure, texture, water holding capacity), chemical properties (pH, CEC), and biological properties (organic carbon, soil macrofauna).

Training assessment

The module has one main assessment:

- i. A multiple-choice assessment of all module content where a trainee must achieve 70% or greater to receive a satisfactory result.

There is no rubric for this assessment as it is a multiple-choice assessment.

Module 1 requirements and resources

There are no formal prerequisites for this course. Basic knowledge of soil science concepts and agricultural/ environmental principles would be beneficial but not mandatory.

Intended audience

This course is designed for agricultural professionals, soil scientists, agronomists, environmental consultants, and individuals involved in soil management and agricultural practices. While it is suitable for beginners, it is targeted at individuals with some background knowledge in soil science, agriculture and the environment.

Module 1 duration

The module is self-paced with content comprising two 6-hour days in terms of cumulative instruction and desk-top exercises.

This project is supported by the Australian Government Department of Agriculture, Fisheries and Forestry as part of the National Soil Strategy.

Module 1 content

Topic 1: Soil functions and ecosystem services

- Introduction to soil functions and their significance in agricultural systems
- Understanding the delivery of ecosystem services by soil, including food production, water storage, biomass production, habitat support, pollutant filtration, and more

Topic 2: Soil development factors and soil profile description

- Identifying and explaining relevant soil development factors, such as topography and geology, in relation to soil properties
- Describing a soil profile and its components

Topic 3: Soil classification methods

- Field-based soil classification techniques and practices
- Data-based soil classification methods and their applications
- Interpreting soil classification systems for industry purposes

Topic 4: Basic physical, chemical, and biological properties of soil

- Overview of the physical properties of soil, including structure, texture, and water holding capacity
- Understanding the chemical properties of soil, such as pH and CEC
- Role and significance of biological properties, including organic carbon and soil macrofauna

Topic 5: Nutrient cycles and soil organisms

- Knowledge of nutrient cycles and their importance in agricultural systems
- Explaining the impacts of altering elements within nutrient cycles
- Role and contributions of soil organisms, such as worms, bacteria, and fungi, in soil fertility and nutrient cycling

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Topic 6: Soil-degradation processes and mitigations

- Causes, impacts, and mitigations of soil-degradation processes, such as salinisation, sodicity, erosion, acidity, soil degradation, and inundation
- Strategies for managing and mitigating soil threats in agricultural settings

Soil field analysis and site interpretation

A framework for a structured approach to soil and site assessment

Module 2 summary

The Soil field analysis and site interpretation module is designed to provide participants with the knowledge and skills necessary to assess a site to develop an appropriate sampling regime (development in next module), and classify soil samples accurately. Participants will gain a comprehensive understanding of the processes involved in site assessment, including the selection of sampling sites, sampling techniques, record-keeping, and soil classification. The course will cover various aspects of soil classification, including location records, horizon identification, colour assessment, texture analysis, pH measurement, density determination, and field dispersion assessment.

Competency areas

1. Site selection and fit-for-purpose soil sampling design
2. Soil sampling for testing
3. Soil classification in the field

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Learning outcomes

- A. Develop the ability to assess a site and determine a suitable sampling regime.
- B. Justify and explain the selection of sampling sites and the sampling techniques used.
- C. Identify and address key concerns related to site assessment, such as record-keeping.
- D. Determine when soil sampling should take place based on site-specific factors.
- E. Understand the range of tests required for soil analysis and select suitable tests accordingly.
- F. Demonstrate proficiency in soil classification techniques, including location records, horizon identification, colour assessment, texture analysis, pH measurement, density determination, and field dispersion assessment.

Training assessment

The module has two main assessments:

- i. Development of a site selection case study in the form of a fact sheet including the formative soil classification of a major soil type at the chosen site.
- ii. Field classification of a soil using the Australian Soil Classification
 - a. Formative – Initial practise and recording of a soil classification for a chosen site of interest.
 - b. Substantive – Assessment of soil classification proficiency at the face-to-face, in-field meeting.

Rubrics for these assessments will be provided with the course materials.

This project is supported by the Australian Government Department of Agriculture, Fisheries and Forestry as part of the National Soil Strategy.

Module 2 requirements and resources

This module requires successful completion, or recognition of prior learning, of the Basic fundamentals in soil science module.

This module assumes access to an existing field site of relevance, or the ability to travel to a local area of interest to conduct the case study application.

This module assumes access to soil sampling equipment through existing employment, or local services. In cases where no soil sampling equipment is available, alternatives can be discussed with the module custodian through Soil Science Australia.

The key resources for this module are:

Isbell, R. (2016). The Australian soil classification. CSIRO publishing.

McKenzie, N. J., Grundy, M. J., Webster, R., & Ringrose-Voase, A. J. (Eds.). (2008). Guidelines for surveying soil and land resources. CSIRO publishing.

National Committee on Soil, Terrain (Australia), & CSIRO Publishing. (2009). Australian soil and land survey field handbook (No. 1). CSIRO PUBLISHING.

Accompanying resources for this module are:

Gruijter, J. J., Bierkens, M. F., Brus, D. J., & Kotters, M. (2006). Sampling for natural resource monitoring. Springer-Verlag Berlin Heidelberg.

Intended audience

This course is designed for environmental scientists, soil scientists, geologists, agricultural professionals, and anyone involved in site assessment and soil analysis. It is suitable for both beginners and individuals with some background in soil science or environmental sciences.

Module 2 duration

The module is self-paced with content comprising three 6-hour days in terms of cumulative instruction and practical exercises.

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Module 2 content

Topic 1: Introduction to site assessment and sampling regime

- Importance of site assessment in environmental and agricultural contexts
- Factors to consider when selecting sampling sites
- Justification and explanation of suitable sampling techniques
- Key concerns and best practices for record-keeping

Topic 2: Soil sampling techniques

- Timing of soil sampling based on site-specific factors
- Field collection methods and equipment

Topic 3: Soil analysis tests

- Overview of common soil analysis tests
- Selection of tests based on site assessment objectives

Topic 4: Soil classification techniques

- Importance of accurate soil classification in site assessment
- Location records and their role in soil classification
- Horizon identification methods and terminology
- Colour assessment and its significance
- Texture analysis and its implications
- pH measurement and its relationship to soil properties
- Density determination and its importance in soil classification
- Field dispersion assessment and its relevance to soil characterisation

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Soil sampling for laboratory analysis

Project development that ensures soil sampling is fit for purpose

Module 3 summary

The Soil sampling for laboratory analysis module is designed to provide participants with the knowledge and skills necessary to develop and justify an appropriate soil sampling regime, manage field sampling sites effectively, and understand the fundamentals of record-keeping for soil analysis. Participants will learn how to make informed decisions regarding site access, approvals, and sampling purposes based on site specifics. The course will cover various aspects of laboratory sample management, including planning, sampling methodology, tests, sample collection, equipment requirements, sample labelling, storage, and distribution. Additionally, participants will gain an understanding of digital record-keeping practices and learn how to identify suitable laboratories for soil analysis.

Competency areas

1. Site selection and fit-for-purpose soil sampling design
2. Sampling regime design
3. Appropriate sample management record keeping

Learning outcomes

- A. Develop and justify a soil sampling regime based on a project scheme.
- B. Communicate appropriate management strategies for field sampling sites, including planning, sample methodology, tests, sample collection, equipment requirements, and sample management.
- C. Understand and apply fundamental record-keeping techniques, including site description, soil description, date, and location details.

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- E. Understand and apply the role of digital record-keeping and the key issues to consider, such as privacy, accuracy, and the choice and role of apps.
- F. Identify suitable laboratories and methods to undertake analysis, while justifying the reasons for selecting specific soil laboratories and methods.

Training assessment

The module has two main assessments:

- i. Development of a project scheme for a chosen site and project context where a design, or model based, sampling regime is selected, and applicable aspects of the scheme are identified in detail such that the sampling regime could be implemented by a third party.
- ii. Field classification of a soil using the Australian Soil Classification
 - a. Formative – Initial practise and recording of a soil sampling at a chosen site of interest.
 - b. Substantive – Assessment of soil sampling proficiency at the face-to-face, in-field meeting.

Rubrics for these assessments will be provided with the course materials.

Module 3 requirements and resources

This module requires successful completion, or recognition of prior learning, of the Basic fundamentals in soil science module and the Soil field analysis and site interpretation module.

This module assumes access to an existing field site of relevance, or the ability to travel to a local area of interest to conduct the case study application.

This module assumes access to soil sampling equipment through existing employment, or local services. In cases where no soil sampling equipment is available, alternatives can be discussed with the module custodian through Soil Science Australia.

The key resources for this module are:

Gruijter, J. J., Bierkens, M. F., Brus, D. J., & Kotters, M. (2006). Sampling for natural resource monitoring. Springer-Verlag Berlin Heidelberg.

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McKenzie, N. J., Grundy, M. J., Webster, R., & Ringrose-Voase, A. J. (Eds.). (2008). *Guidelines for surveying soil and land resources*. CSIRO publishing.

National Committee on Soil, Terrain (Australia), & CSIRO Publishing. (2009). *Australian soil and land survey field handbook (No. 1)*. CSIRO PUBLISHING.

Accompanying resources for this module are:

McKenzie, N., Coughlan, K., & Cresswell, H. (2002). *Soil physical measurement and interpretation for land evaluation (Vol. 5)*. Csiro Publishing.

Rayment, G. E., & Lyons, D. J. (2011). *Soil chemical methods: Australasia (Vol. 3)*. CSIRO publishing.

Intended audience

This course is designed for environmental scientists, soil scientists, geologists, agricultural professionals, and anyone involved in site assessment and soil analysis. It is suitable for both beginners and individuals with some background in soil science or environmental sciences.

Module 3 duration

The module is self-paced with content comprising four 6-hour days in terms of cumulative instruction and practical exercises. Time to complete can be significantly shorter depending on the trainee level of expertise in soil sampling regime development from a statistical foundation.

Module 3 content

Topic 1: Determining a soil sampling regime

- Considerations for site access and approvals
- Linking sampling decisions to the purpose and specifics of the client, project and site
- Importance of understanding site-specific factors in determining a sampling regime

Topic 2: Project scheme development

- Planning the field sampling process

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- Identifying suitable tests for analysis
- Sample collection techniques and best practices
- Equipment requirements for field sampling
- Selection of appropriate sample methodology
- Combining the scheme development process for a superior sampling regime

Topic 3: Fundamentals of record-keeping

- Importance of accurate and comprehensive record-keeping in soil sampling
- Management of collected samples: labeling, storage, and distribution
- How effective site management supports soil management decisions and recommendations
- Components of record-keeping: site description, soil description, date, and location details
- Best practices for documenting essential information during soil sampling

Topic 4: Digital record-keeping

- Understanding the role of digital record-keeping in modern soil sampling practices
- Key considerations for privacy and data protection
- Ensuring accuracy and data integrity in digital records
- Evaluation and selection of appropriate apps for digital record-keeping

Topic 5: Accepted methodology for soil analysis

- Overview of commonly used methods for soil analysis
- Understanding the principles and procedures behind soil analysis tests
- Justifying the selection of specific soil laboratories based on analysis requirements and expertise

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Topic 6: Identifying suitable laboratories for soil analysis

- Criteria for selecting suitable laboratories for soil analysis
- Evaluating laboratory capabilities, accreditation, and quality control procedures
- Considerations for specific analysis requirements and turnaround times
- Justifying the choice of laboratories based on project needs and objectives

Soil data interpretation and application

Data to support project design, method selection and constraint diagnosis

Module 4 summary

The Soil data interpretation and application module is designed to provide participants with a broad understanding and practical skills related to the interpretation of physical, chemical, and biological properties of soil in an agricultural, agronomic and environmental setting. Participants will gain knowledge of how key soil properties influence fertility, nutrient availability, and plant production. The course will cover nutrient cycles, soil biology, the capacity of soil to store and exchange nutrients and water, and management options for optimizing agricultural production within the broader environment. Participants will also learn to interpret and classify data in a soil test report, relate it to soil characteristics, and determine management implications. The module will focus on identifying soil limitations, providing recommendations, and understanding amelioration methods through case studies and practical examples.

Competency areas

1. Basic physical, chemical, and biological soil properties
2. Identify and understand the data obtained from a soil test report
3. Determine soil/site limitations and suggest management recommendations

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Learning outcomes

- A. Demonstrate broad experience and understanding of the physical, chemical, and biological properties of soil in an agricultural, agronomic and environmental setting.
- B. Explain how key physical soil properties influence fertility and nutrient availability.
- C. Understand nutrient cycles and their relation to nutrient availability and plant production in the soil.
- D. Recognize the role and influence of soil biology in agricultural production.
- E. Assess the capacity of soil to store, cycle, and exchange nutrients and water for plant production and determine appropriate management options.
- F. Interpret and classify data in a soil test report, considering soil characteristics and management implications.
- G. Identify site limitations using site assessment and soil test results.
- H. Provide recommendations for addressing soil limitations.
- I. Understand chemical and technical methods for soil amelioration.
- J. Justify site-specific recommendations based on a thorough understanding of soil properties and management approaches.

Training assessment

The module has two main assessments:

- i. Identification of the constraints limiting the case study site and provide a justified amelioration program for key recommendations for the chosen site.
- ii. Field classification of a soil using the Australian Soil Classification
 - a. Formative – Desk-top interpretation of soil analysis data and identification of site limitations.

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- b. Substantive – Assessment of proficiency in soil analysis data interpretation and identification of site limitations at the face-to-face, in-field meeting.

Rubrics for these assessments will be provided with the course materials.

Module 4 requirements and resources

This module requires successful completion, or recognition of prior learning, of the Basic fundamentals in soil science module, the Soil field analysis and site interpretation module, and the Soil sampling for laboratory analysis module.

This module assumes access to an existing field site of relevance, or the ability to travel to a local area of interest to conduct the case study application.

This module assumes access to soil sampling equipment through existing employment, or local services. In cases where no soil sampling equipment is available, alternatives can be discussed with the module custodian through Soil Science Australia.

The key resource for this module is:

Hazelton, P., & Murphy, B. (2016). Interpreting soil test results: What do all the numbers mean? CSIRO publishing.

Accompanying resources for this module are:

McKenzie, N., Coughlan, K., & Cresswell, H. (2002). Soil physical measurement and interpretation for land evaluation (Vol. 5). Csiro Publishing.

Rayment, G. E., & Lyons, D. J. (2011). Soil chemical methods: Australasia (Vol. 3). CSIRO publishing.

Intended audience

This course is designed for environmental scientists, soil scientists, geologists, agricultural professionals, and anyone involved in site assessment and soil analysis. It is suitable for both beginners and individuals with some background in soil science or environmental sciences.

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Module 4 duration

The module is self-paced with content comprising three 6-hour days in terms of cumulative instruction and practical exercises. The duration can be significantly less depending on the participant and their level of expertise in soil analysis and data interpretation.

Module 4 content

Topic 1: Reminder of the importance of soil properties in agriculture and the environment

- Importance of soil properties for agricultural production within the environment
- Revisiting physical, chemical, and biological properties of soil
- Understanding the relationships between soil properties and fertility

Topic 2: Nutrient cycles and plant production

- Understanding nutrient cycles and their significance in agriculture
- Exploring nutrient availability and its impact on plant growth
- Linking nutrient cycles to soil properties and management practices

Module 3: Soil biology and agricultural production

- Role and influence of soil biology on soil fertility and nutrient cycling
- Exploring the interactions between soil microorganisms and plant health
- Managing soil biology for optimized agricultural production

Topic 4: Soil capacity for nutrient and water management

- Assessing the soil's capacity to store, cycle, and exchange nutrients and water
- Determining management options based on soil characteristics
- Understanding the implications for nutrient and water availability to plants

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Topic 5: Interpretation of soil test reports

- Key information in a soil test report: detection limits, errors, thresholds, etc.
- Relating soil test data to soil characteristics and fertility
- Identifying limitations and potential nutrient imbalances

Topic 6: Addressing soil limitations and recommendations

- Identifying site limitations using site assessment and soil test results
- Suggesting recommendations for addressing soil limitations
- Understanding chemical and technical methods for soil amelioration
- Justifying site-specific recommendations based on soil properties and management needs

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