



Natural Resource Conservation and Development-III

**Based on March 2018, Version3 Occupational
standards**

**Module Title: - Applying Forest Protection
Strategies and Practices**

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Adama, Oromia, Ethiopia.



East Africa Skills for Transformation and Regional Integration Project (EASTRIP)



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LG #78	LO1- Apply disease and pest preventive and/or control mechanism
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Instruction sheet
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none">• Conducting disease and pest surveillance• Assessment of disease and pest• Identifying important disease and pest• Identifying disease and pest preventive techniques• Disease and pest control mechanism <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none">• conduct disease and pest surveillance according to disease and pest control work procedures and supervisor instruction.• conduct assessment of disease and pest according to the assessment procedures• identify important disease and pest are according to disease and pest control work procedures.• identify preventive techniques to protect pest and disease occurrence in forest according to forest pest and disease prevention guidelines• apply control mechanisms o control pest and disease in forest according to forest pest and disease control guidelines and as directed by supervisor

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Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets”
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



Information Sheet 1- Conducting disease and pest surveillance

Introduction

The field of forest protection embraces a variety of subjects, such as forest fire, forest insect & diseases. Protection of the forest from its numerous enemies is essential for success in the management of forest lands. Forest protection is that parts of silviculture which deals with the protection of forest against various injurious agencies, like disease, insect & pest, fire, grazing animal.

1.1 Conducting disease and pest surveillance

Pest- Any species, strain or biotype of plant, animal or pathogenic agent injurious to plants or plant products [FAO, 1990; revised FAO, 1995; IPPC, 1997; revised CPM, 2012]. Any living organism (plant or animal) that occurs where it is not wanted or that causes damage to Crops or humans or other animals. Almost every part of the tree can serve as food for insects, and some of the more common groups associated with damage to leaves, shoots, flowers, buds, fruit, twigs, branches, stem and roots. Generally, the species importance for forestry are contained in orthoptera (grasshopper, crickets), Hemiptera (plant bugs, leaf hoppers, aphids, mealy bugs (virus or bacteria) Coleopteran (beetles), Isopteran (termites), Hymenoptera (ants, wasps, and bees), Lepidoptera (butterflies,) dipteran (flies) and Thysanoptera (thrips). Feeding habit vary greatly not only between but also within pest groupings.

Disease -is an abnormal state of an individual, be it animal or plant is referred to as disease. Ehrlich (1941), defined plant disease in the following words, “sustained physiological and resulting structural disturbances of living tissues and organs, ending sometimes in death.”

What is surveillance? - The International Plant Protection Convention (IPPC) defines Surveillance as, an official process which collects and records data on pest occurrence or absence by survey, monitoring or other procedures.

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A survey as: An official procedure conducted over a defined period of time to determine the characteristics of a pest population or to determine which species occur in an area. An insect pest survey is a detailed collection of insect population information at a particular time in a given area. The regular surveys of same place or locality at consistent intervals to assess changes in pest species over a time is called 'surveillance'

A monitoring survey as: Ongoing survey to verify the characteristics of a pest population. monitoring and surveillance across a farm involves looking for and recording the presence, absence and population levels of pests. Conducting regular monitoring is a fundamental part of farm management practice and gives the best chance of spotting a new pest soon after it arrives. requirements needed to plan a survey, in order to conduct any type of survey, one must devise a survey plan or protocol. The survey protocol must be practical, scientifically and technically sound, feasible and cost effective. The survey protocol tells the surveyor how, where, what, how many, when and why. the survey protocol consists of, Field manual, Laboratory manual, Stakeholder awareness and Data sheets

The main objectives of surveillance are to:

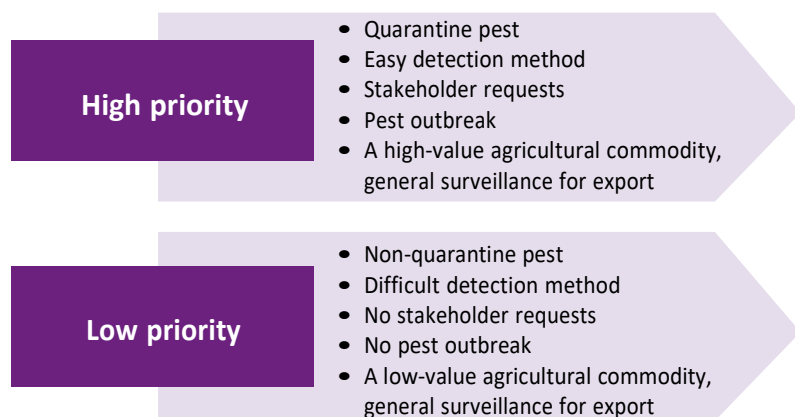
- ◆ conduct surveillance on pests of quarantine importance, alien invasive species, pests of economic and/or farming importance, and natural enemies of pests
- ◆ develop and maintain a database and geographic information system which captures vegetation/ pest species surveyed and inspection details.
- ◆ provide information on pest presence/absence (pest lists: national, regulated non-quarantine, quarantine) for the conduct of pest risk analyses to establish pest free areas.

1. Pest-specific surveillance

According to ISPM 6 (Guidelines for surveillance), a pest-specific surveillance approach should include the following:

- ❖ identification of the target pest(s)
- ❖ identification of scope (e.g. geographic area, production system, season)
- ❖ identification of timing (dates, frequency, duration)
- ❖ in the case of commodity pest lists, the target commodity
- ❖ indication of the statistical basis

Figure 1. Prioritization factors of surveillance programs





Self-check 1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Give short answer (10 point)

1. What is forest protection? (2point)
2. Why forest protection arises? (2point)
3. Define term disease and pest. (3 point)
4. Write down the purpose of pest surveillance (3point)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



Information Sheet 2- Assessment of disease and pest

2.1. Assessment of disease and pest

Assessment is defined as the act (or process) of quantitatively measuring disease intensity (Campbell and Mad- den, 1990; Nutter et al., 1991; Nutter and Gaunt, 1996).

Within an IPM program, assessment is the process of determining the potential for pest populations to reach an action threshold. The art and science of this approach is what makes IPM different from other pest management strategies. The process merges biology, ecology, and economics with the results of monitoring and identification of the pests. disease can be caused by a biotic (non-living) and biotic (living) factors. Abiotic factors include air pollution, temperature extremes, drought, acid rain or mechanical damage. Biotic factors include fungi, bacteria, virus, insects, mites, nematodes or parasitic plants.

Thresholds. Before any pest control action is taken, the IPM approach considers if the pest has exceeded a pre-set threshold; the point at which the pest population or environmental condition indicates that pest control action must be taken. Thus, finding a single pest or even very low numbers of pests does not always result in taking action. Conversely, some pests in a field may be below the threshold while others are above it. Keep in mind that thresholds are crop- and pest-specific, as well as weather-related.

Economic threshold: The pest density at which a control tactic must be implemented to avoid an economic loss.

Action threshold: A pest or damage level at which control is initiated to avoid significant damage or loss of property. Usually, a lower level than the Economic threshold.

Economic damage: The amount of injury which will justify the cost of control action.

Economic injury level: The lowest population density that will cause economic damage.

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Aesthetic threshold: The pest density at which a control tactic must be implemented to avoid unacceptable aesthetic damage.

Forest diseases

Major diseases of trees can be classified in various ways depending on the purpose to be served classification of diseases can be under the basis of cause, symptoms and according to parts affected.

1. Classification on the basis of cause

- Non-infectious disease or non-parasitic or physiological disease
- Infectious or photogenic disease
- Disease of unknown origin

Non-infectious disease

These are the diseases caused by non-living environment which may include poor or shallow soil dept, nutrient deficiency, high temperature etc. symptoms of such diseases may be like that of infectious but on closer observations, the differences could be out by plant pathologist.

Infectious diseases:

These are the diseases caused by other living organisms. The fungi, (the most common disease pathogens in forestry), bacteria and viruses.

2. Classification of diseases on the basis of symptoms

A. Necrotic symptoms

These are the evidence of necrosis or death of affected tissue resulting in marked change of color from yellowing through browning to graying when the tissue finally dies. Examples of this are leaf blight, bud blight, stem canker to mention a few.

B. Atrophic

This is the slowing down in development of the affected plants parts resulting from subnormal cell division (hypoplasia). Dwarfing or stunted growth is an example. The causes could include; unfavorable environmental conditions, unfavorable soil condition, excess or deficiency of certain mineral elements.

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C. Hypertrophic

This is an overgrowth of all kinds which results from abnormal cell increase (excessive cell division). The evidences are the formation of galls or tumors, witches' brooms, hairy roots, leaf curls and deformation of fruits and flowers.

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Operation Sheet 2 - Assessment of disease and pest

Objective to undertake assessment of disease and pest

Materials needed:

1. Note book
2. Pen
3. Hut
4. Over all tent (PPE)

Procedures:

1. Identify forest covered areas
2. Conduct assessment of disease and pest
3. Observe the symptoms of disease correctly
4. Collect the equipment's you used and store in appropriate place
5. Prepare a report to supervisor



Information Sheet 3. Identifying important disease and pest

1.3. Identifying important disease and pest

1. Major insect pests and their feeding habit

Insect attack on forest trees often leads to reduction in growth, poor or deformed growth, lower wood grade (Blue stain) and death of the trees.

A. Defoliation

Are insects which feed on leaf tissue, their activities resulting in complete or partial destruction of leaves. This feeding group also includes leaf-mining insects which feed within the leaf, just below the upper or lower surface, leaf tiers (row) and leaf rollers (breaker) which make shelter from leaves and graze these from within, and leaf skeletonizers which eat the leaf tissue between the network of leaf veins. include forest tent caterpillar, gypsy moth, tussock moth, spruce budworm, and loopers.

B. Sap feeding

Sap feeding insects suck liquid or semi liquid material from succulent parts of the host plant which can be leaves, stems, roots, fruit, flowers or even seed (Elliott et al., 1998) most are true bugs (Hymenoptera) but thrips (Thysanoptera) can feed in a similar fashion except that penetration is relatively shallow. Sap feeders affect tree vitality by extracting sap required for normal functioning of the plant, such as shoot extension and leaf expansion. include the balsam woolly aphid, and the beech scale.

C. Bark and wood feeding

Bark and wood-feeding forest insects are contained in main orders: coleopteran. include the southern pine beetle, the western pine beetle, and the European elm bark beetle.

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D. Shoot boring

Shoot-or tip-boring insects cause the most damage when they attack the apical terminal or leader of the tree which result in irregular stem growth or multiple branching when secondary terminals take over dominance. Trees which has been attacked by such insects may have a stunted (small), bushy appearance, or at least malformed or forked boles, and their value for timber production can be greatly reduced or eliminated (Berryman, 1986). include both moths and weevils. Examples are: the pine tip moth, and the white pine weevil.

E. Fruit and seed boring

Several different groups of insects attack the fruits, cones or seeds of forest trees, some, such as Torymid wasps, lay their eggs directly in to the seed of young cones and their larvae feed within the seed.

F. Gall forming

Galls are unusual plant growths which develop as a result of abnormal cell division and/or cell enlargement following infestation of plants by organisms such as insects, mites and fungi (Elliott et al., 1998)

G. Root feeding

A wide range of insects feed on the roots of trees including white grubs, termites, and root weevils, larva of longicorn and buprestid beetles, and root aphids.

H. Stem and branch cutters

Several insects' groups damage trees by completely severing stems or branches in the case of some species of crickets and grasshoppers; such damage mostly occurs on nursery stock or newly planted trees.

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Table 1. Major groups of pests that infest trees.

Pest	Notes	Corresponding color plate
Fungi	A living microorganism characterized by a cell wall containing chitin and lacking chlorophyll, a Common cause of disease Associated with a wide range of symptoms, Diverse group of pest organisms: some with large fruiting bodies visible with the naked eye but many only “visible” when grown in an artificial culture in the laboratory. Fungi also play a secondary role in decays and rots.	Rust fungus on Acacia
Bacteria	A living microorganism characterized by cell membranes and cell walls. Uncommon cause of disease but several species have caused widespread losses in trees. Cannot be detected with the naked eye except an masse in bacterial oozes.	Bacterial ooze of Eucalyptus spp.
Viruses	An ultramicroscopic (one dimension less than 200 μm) organism. Viruses cannot reproduce alone (and thus are not living organisms according to some definitions) but must first infect a living cell and take over its synthetic and reproductive facilities. More common cause of symptoms than generally perceived. Symptoms may resemble those of other pests and factors. Transfer to new host plants by (insect) vectors, sometimes by manual transmission.	Leaf discoloration
Phytoplasmas	Extremely small, phloem-limited plant pathogenic bacteria-like prokaryotes that lack a cell wall. Uncommon cause of disease but	Gliricidia little leaf disease

	more widespread than usually thought, mainly because typical symptoms are not recognized.	
Insects	Widespread, extremely common cause of damage, and rarely host tree specific (unlike many pathogens). Readily seen but often assumed to be the cause of more damage than is supported by biological evidence. Different insect orders are associated with particular patterns of feeding and breeding on trees	Leaf miner damage on <i>Pterocarpus indicus</i>
Mites	Common pests whose feeding results typically in distinct symptoms (e.g. galls); mites are not readily seen with the naked eye	Leaf galls on <i>Vangueria infausta</i>
Parasitic plants	Widely present in many tree species that have been weakened by other factors. Rarely the cause of major losses	Parasitic plant on <i>Schinus mole</i>
Larger animals	Includes large mammals such as elephants, monkeys, deer, smaller rodents and birds that feed on the foliage and bark	Damage and losses can be significant although plants often recover Deer damage on <i>Gmelina arborea</i>



Self-Check –3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (10 point)

1. Why pest depend on forest trees? (2pts)
2. List down at least three pests that attack forest tree. (3pts)
3. How do you identify the presence of pest and disease in a certain forest? (2pts)
4. List and discuss at least three major insect pests and their feeding habit(4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points



Operation Sheet 3 - Identifying important disease and pest

Objective to Identify important disease and pest

Materials needed:

1. Note book
2. Pen
3. Hut
4. PPE

Procedures:

1. Identify forest areas
2. Undertaking assessment of disease and pest
3. Identify the symptom of disease and consumption parts of plant
4. Identify disease correctly
5. Collect the equipment's you used and store in appropriate place.
6. Prepare a report to supervisor



Information Sheet 4- Prevention techniques

1.4. Prevention techniques

The best way to control a pest infestation is to prevent it from happening. There are two main ways to prevent and control the presence of insects, rodents, and other pests:

1. Block entry points (exclusion)

Eliminating entry points for pests will help keep them out of your establishment.

This could include patching holes in walls and keeping doors closed as often as possible. In addition to this, inspecting food shipments for signs of pests and rodents can help keep pests out of your establishment.

2. Eliminate sources of food (manipulating habitat)

Pests are always on the hunt for food, water, and shelter. Denying pests those necessities will deter them from entering and staying in your restaurant.

Some common ways to keep food and shelter from pests include:

- Sealing workplace equipment
- Maintaining a sanitary work environment by cleaning and sanitizing preparation areas immediately after use
- Disposing of trash carefully and regularly
- Keeping dumpster areas clean



Self-Check –4	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (5point)

1. What is prevention? (2pts)
2. How to prevent a pest. (2pts)
3. Why prevention is? (1pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Operation Sheet 4 – Applying Prevention techniques

Objective to apply Prevention techniques

Materials needed:

1. machete
2. axes
3. shovel
4. PPE

Procedures:

1. Identify forest areas
2. Clean and remove dry grass and vegetation
3. Remove debris
4. Prepare disposal structure
5. Burn it in disposal structure.
6. Collect the equipment's you used and store in appropriate place.
7. Prepare a report to supervisor



Information Sheet 5- Disease and pest control mechanism

1.5. Disease and pest control mechanism

1.5.1. Disease prevention and control

Principle of prevention and control of forest diseases. the general principles of forest disease prevention & control can broadly be divided into two groups.

A. Direct measures such as

- Sanitation
- host eradication
- isolation and
- chemical control

A. Indirect measures which include

- silvicultural
- management practices
- cultural operations
- site selection and
- Improvement
- choice of species
- biological control and
- resistance breeding

1. Sanitation

Control by sanitations reduces or eliminates the initial inoculum or pathogen from which the diseases develops on any of the following host

- The principal or main host
- Collateral or alternate host

This method of control involves the following steps which must follow the early detection of the diseases or presence of the pathogen.

- It is necessary to remove the lops and tops from the forest after felling.
- Dispersal of spores or the fungus may also be effectively controlled by soil mulching.
- Sanitation cutting must be done to remove the diseased trees as soon as they are detected or alternatively these individuals should be felled during the next thinning.



2. Host Eradication

This another mode of direct control based on the fact that eradication of the alternate host of the disease helps to control it.

- Eradication of hosts may be done by the following methods
- Mechanical means involving use of mechanized equipment
- Manually
- Use of herbicides

3. Isolation trenches

After establishment, root diseases trend to spread centrifugally from the center to infection to the roots of adjoining trees. The pathogens either spread through the soil or through root contact or root graft.

The diseased trees can be isolated by digging trenches around them. This helps to prevent the disease from spreading

4. Chemical control - Chemicals or fungicides may be used both to prevent the occurrence of a disease.

1.5. 2. Pest control mechanism

Before choosing a control method(s)

1. Correctly identify the organism.
2. Assess the infestation and determine the potential economic damage.
3. Determine the available control methods.
4. Evaluate the benefits and risks of each method or combination of methods.
5. Are there threatened or endangered species or sensitive sites in the area to be treated?
6. Choose effective method(s) that will be least harm to humans and the environment.
7. Follow applicable local, state and federal regulations.
8. Correctly carry out the control practice(s) and keep accurate records so results can be evaluated.

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1.5.3. Integrated Pest Management (IPM)

Integrated Pest Management (IPM) is a comprehensive, environmentally sensitive approach to managing pests that includes a combination of strategies that pose the least hazard to people, property, and the environment.

The simple philosophy is that control will be more effective, and resistance will be less likely to build up, when a range of measures is deployed against a pest. These measures can include

1. Cultural management: Cultural practices are a manipulation of the habitat environment to increase pest mortality or reduce rates of pest increase and damage. There are many different cultural practices that can help to reduce pest impact such as selection of pest resistant varieties of crops, mulching, winter cover crops, changing planting dates to minimize insect impact, burning, flooding, crop rotations that include non-susceptible crops.

2. Mechanical or Physical Management: Mechanical or physical control methods involve using barriers, traps, or physical removal to prevent or reduce pest problems. Tactics may include using row covers or trenches to prevent insects from reaching the crop, baited or pheromone traps to capture insects, or cultivation or mowing (cutting) for weed control.

3. Biological Management: Biological control is the deliberate use of the pest's natural enemies -predators, parasites, and pathogens -to reduce the pest population below damage levels.

4. Chemical Control: When exploring chemical control options, you should select the lowest risk and most effective products. The key is to use pesticides in a way that complements rather than hinders other elements in the strategy and which also limits negative environmental effects.

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Self-Check –5	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I. Choose the correct answer (2point each)

- Which one of the following is a direct control of pest and disease?
 - cultural operations
 - host eradication
 - Management practice
 - silvicultural practice
- Which one of the following is included under pest prevention?
 - Sanitation
 - Chemical control
 - Biological control
 - All
- _____methods involve using barriers, traps, or physical removal to prevent or reduce pest problems.
 - Mechanical control
 - Cultural control
 - Biological control
 - Chemical control
- _____is the deliberate use of the pest's natural enemies' predators, parasites, and pathogens to reduce the pest population below damage levels.
 - Biological control
 - Chemical control
 - Cultural control
 - Chemical control

Test II: Short Answer Questions. (10 point)

- Write down at least four indirect methods of pest control? (4pts)
- Explain the concept of integrated pest management? (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 8 points

Unsatisfactory - below 8 points

Operation Sheet 5 - Disease and pest control mechanism

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Objective: to apply disease and pest control mechanism

Materials needed

1. GPS
2. Pen
3. Note pad
4. PPE
5. First aid

Procedures:

1. Identify forest areas
2. Conduct continuous observation of pest
3. Identify the symptom of disease and consumption parts of plant
4. Identify disease correctly
5. Undertake control mechanism based on IPM approach.
6. Collect the equipment's you used and store in appropriate place.
7. Prepare a report to supervisor. Collect the equipment's you used and store in appropriate place.
8. Prepare a report to supervisor



LAP Test	Practical Demonstration
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Name. _____ ID _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 6 hours.

Task 1. Assessment of disease and pest

Task 2. Identify important disease and pest

Task 3. apply Prevention techniques

Task 4. apply disease and pest control mechanism



LG #79	LO2- Implement prevention and controlling program of invasive species
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Instruction sheet
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none">• Designing quarantine for new species• Applying guideline procedure to conduct quarantine• Supporting and conducting community awareness creation• Preparing necessary materials and facilities• Gathering baseline information <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none">• design quarantine procedures to be followed during introduction of new species• prepare and apply guidelines by appropriate personnel to conduct quarantine for specific species according to the quarantine procedures• support and conduct community awareness creation as directed by supervisor• prepare Necessary materials and facility to conduct the quarantine based on the requirements.• gather baseline information that help in invasive prevention and control according to invasive control procedures• identify invasive species in accordance with the international guidelines and as directed by supervisor• apply controlling mechanisms to prevent their further expansion according to working documents• Assessment is conducted according to the prevention and monitoring

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principles as directed by supervisor.

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6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets”
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



Information Sheet 1- Conducting assessment

Introduction

Invasive species- is a phrase with several definitions. The first definition expresses the phrase in terms of non-indigenous species (e.g. plants or animals) that adversely affect the habitats they invade economically, environmentally or ecologically. It has been used in this sense by government organizations as well as conservation groups such as the IUCN (International Union for Conservation of Nature).

Invasive Alien Species refer to plants, animals or microorganisms that are not native to specific ecosystem and whose introduction threatens food security, biodiversity, health or economic development (McNeely et al., 2001). Invasive species are of concern because of their capability of spreading fast, their high competitiveness and ability to colonize new areas within short periods. The nature and severity of the impacts of these species on society, economic life, health and national heritage are of global concern (McNeely et al., 2001).

According to CBD (2005), invasive alien species are introduced deliberately or unintentionally outside their natural habitat, where they have the ability to establish themselves, invade, out-compete natives and take over the new environment. Invasive species have significant social, ecological and economic impacts. They reduce agricultural yields, irrigated crop lands, grazing areas, water availabilities, and contribute to spread of vector born diseases (Essa et al., 2006).

Plant invasion is a strong threat to the species diversity around the world during the 21st century after habitat loss. Large number species of IAP are introduced to native country in the world and few of these become problematic; they are introduced in to a country either through human or natural (e.g. winds, birds, animals, water). Thousands of plant species have been transported by humans to areas far from their natural habitats; accidentally or intentionally (e.g. agro-forestry, horticulture, forestry, and animal husbandry purposes). However, invasions by IAPS are one of the largest threats to the ecosystems of the earth, and the services.

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Assessment is the process of gathering and evaluating information in a way that facilitates decision making. Through methods such as ranking systems, geospatial analysis, inventory/survey, and monitoring, assessments can provide a more accurate picture of problems and solutions associated with plant invasions so that land managers are better equipped to identify feasible management strategies, develop measurable objectives, select safe and effective methods, and evaluate program outcomes. Ranging from simple to complex, assessment activities should be designed to accommodate a project's specific needs and resources available for management. Knowledge gained from assessments can provide a deeper understanding of the problems and solutions associated with plant invasions so that land managers are better equipped to

- identify management strategies and options
- establish measurable management objectives and action thresholds
- select safe and effective management methods
- evaluate program outcomes

2.1. Conducting assessment

1. Framework for Assessment

The National Research Council (2002) suggests that a risk assessment framework has the most practical value for prioritizing management actions because risk assessments are designed to evaluate both the likelihood and consequences of events such as the establishment and spread of invasive plants and/or the effects of methods used to control them. Regardless of scale and scope, assessments that follow a risk assessment framework consist of three major phases.

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Risk Assessment Framework Phases

1. Problem formulation	<ul style="list-style-type: none"> a planning and scoping process that establishes the goals, breadth, and focus of the assessment requires identification of known or potential stressors (i.e., invasive plants) and susceptible ecological resources
2. Analysis	<ul style="list-style-type: none"> a process of information gathering and evaluation used to develop “exposure and effect” profiles of the invasive plants within the context of affected ecological communities exposure = likelihood of introduction, establishment, and spread; effect = probability and severity of economic and ecological consequences of invasion
3. Risk characterization	<ul style="list-style-type: none"> compares exposure and effect profiles using a variety of techniques to draw conclusions and make decisions

Within this basic framework, assessments can be conducted in a variety of ways to achieve different outcomes.

Applying Assessments to Management

Knowledge gained from assessments-risk assessments, inventory/survey, and monitoring- provides a basis for making management decisions fundamental to the invasive plant management process.



Self-Check –1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I. Choose the correct answer (2point each)

- _____is the process of gathering and evaluating information in a way that facilitates decision making.
A. Assessment C. Survey
B. Monitoring D. Forest
- Which one of the following is not importance of assessment?
A. identify management strategies and options
B. establish measurable management objectives and action thresholds
C. select safe and effective management methods
D. None
- Risk assessment framework consist one of the following,
A. Problem formulation C. Analysis
B. Risk characterization D. all
- Invasive plant assessment activities describe one of the following except,
A. current status of the invasive plant
B. trends in distribution and abundance of invasive plant populations
C. identify appropriate management strategies
D. None
- _____is the key to eliminating the plants before their population expands
A. Early detection C. Control
B. Rapid response D. All except C.



Test II: Short Answer Questions. (8 point)

1. List the three phases of invasive plant process? (3pts)
2. Describe Invasive plant management strategies (2pts)
3. Describe the three control strategies of invasive plant. (3)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 10 points

Unsatisfactory - below 10 points

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Operation Sheet 1 - Conducting assessment

Objective: to Conduct assessment of invasive plant spp.

Materials needed

1. PPE and clothing
2. Safety equipment
3. First aid equipment
4. Pen
5. Note pad

Procedures:

1. Assess vegetation cover of the areas
2. Identify plant species
3. Categorize them in to two major groups (exotic and indigenous spp)
4. Identify exotic plant spp.
5. Observe invasive plant spp based on their basic characteristics
6. Collect the equipment's you used and store in appropriate place.
7. Prepare a report to supervisor Collect the equipment's you used and store in appropriate place.
8. Prepare a report to supervisor



Information Sheet 2- Designing quarantine for new species

2.2. Designing quarantine for new species

Quarantine is a restriction or other control method imposed upon the production, movement or existence of plants, plant material, animals, animal products or any other goods; or measures which are put in place to prevent, or limit the introduction or spread of quarantine pests. Consequently, many introduced species that were minor pests in their native habitats have become major, invasive pests in their new habitats. The purpose of quarantine is to reestablish these barriers and to restrict movement of pests into areas where they do not occur. quarantine not only helps to ward off the threats of exotic pests, but also aim to eliminate and prevent further spread of pests/pathogens (both indigenous and introduced) with restricted distribution within the country (domestic quarantine). Quarantines and inspections are methods of prevention by which the entry of non-native species through specific pathways might be controlled.

Quarantines operate basically on either of two strategies:

- investing in strict control at points of entry to prevent organisms from leaving the quarantine area (with the risk that it could be too late to prevent escape) or
- attempting to control before the organisms arrive in the country (i.e., trying to act on the source or point of export or regulating the pathway of import).

Quarantine regulations- Plant quarantine regulations are promulgated by the national and the state governments to prevent the introduction and spread of harmful pests and pathogens.

Based on these factors, plant quarantine regulates the introductions as follows:

1. Complete embargo/prohibition: When the pest risk is very high, the safeguards available in the country are not adequate and, therefore, import is prohibited.
2. Post-entry quarantine: The risk is very high but adequate safeguards in the form of post-entry isolation growing facilities are available.

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3. Restricted: Pest risk is not high and import permit is required stipulating conditions for entry, inspection and treatment.

4. Unrestricted: Import permit is not required, and material may enter without restriction.

Common invasive species characters include:

- The ability to reproduce both asexually as well as sexually
- Fast growth
- Rapid reproduction
- High dispersal ability
- Phenotypic plasticity (the ability to alter one's growth form to suit current conditions)
- Tolerance of a wide range of environmental conditions (generalist)
- Ability to live off of a wide range of food types (generalist)
- Association with humans

2.2.1. Threat of Invasive Species

Various abundant invasive species have had severe economic impacts. industries and the natural environment. Damage varies by species and can span an enormous range of effects, including power outages; loss of farmland property value; contamination of grain; spread of disease; increases in operating costs; loss of irrigation water; competition with native plants; loss of sport, game, or endangered species; and ecosystem disturbance.

1. Biodiversity and Ecosystems impact

Although IAS (alien invasive species) comes from diverse taxonomic groups they share some similar impacts. Tree species such as the black wattle from Australia, *Prosopis spp.* (mesqui tree) from Mexico, and *Leucaena leucocephala* (the conflict tree) behave in a similar way to invasive alien fish species, such as *Cyprinus carpio* (the common carp), *Micropterus salmoides* (American black bass), *Oreochromis nilotica* (Nile tilapia) and Mozambiquetilapia, and out-compete native species and convert receiving ecosystems. Invasive may also affect native species by introducing pathogens or parasites that cause disease or kill native species. Among other things, both old and

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newly established IAS contribute to land degradation through soil erosion and the drawing down of water resources, reducing resources available to people and indigenous plants.

2. Genetic pollution

Natural, wild species can be threatened with extinction through the process of genetic pollution. Genetic pollution is uncontrolled hybridization and introgression which leads to homogenization or replacement of local genotypes as a result of either a numerical or fitness advantage of the introduced species. Genetic pollution can bring about a form of extinction either through purposeful introduction or through habitat modification, bringing previously isolated species into contact. These phenomena can be especially detrimental for rare species coming into contact with more abundant ones where the abundant ones can interbreed with them, creating hybrids and swamping the entire rarer gene pool, thus driving the native species to extinction

3. Economic impacts

Invasive alien species are increasingly seen as a threat not only to biodiversity and ecosystem services, but also to economic development and human well-being. They reduce yields of agricultural crops, forests and fisheries, decrease water availability, cause costly land degradation, block transport routes and contribute to the spread of disease. they also reduce the effectiveness of development investments by choking irrigation canals, fouling industrial pipelines. Invasive species therefore contribute to social instability and economic hardship, placing constraints on sustainable development, economic growth, poverty alleviation and food security. Moreover, the spread of invasive species has increased with global trade

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Self-Check –2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (12 point)

1. Invasive species? (3pts)
2. Write down at least four common invasive species characters (4pts)
3. What is the term Quarantine? (2pts)
4. Mention at least three the impacts of AIS? (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 8 points

Unsatisfactory - below 8 points



Information Sheet 3- Applying guideline procedure to conduct quarantine

2.3. Applying guideline procedure to conduct quarantine

The most effective, economical, and ecologically sound approach to managing invasive plants is to prevent their invasion in the first place.

Certainly, it is necessary to manage infestations to limit the spread of invasive plants which are often categorized as “weeds” into non-infested areas.

However, limited resources might be spent more efficiently on proactive weed management that controls existing weed infestations but also focuses strongly on prevention or early detection of new invasions.

Elements of a proactive weed prevention plan include:

- limiting the introduction of weed seeds into an area
- early detection and eradication of small patches of weeds
- minimizing disturbance of desirable vegetation along roadsides, trails, and waterways
- managing land to build and maintain healthy communities of native and desirable plants to compete with weeds
- careful monitoring of high-risk areas such as human and animal transportation corridors and disturbed or bare ground
- revegetating disturbed sites with desirable plants; and
- evaluating annually the effectiveness of the prevention plan so appropriate adaptations can be implemented the following year.

1. Water shade management guideline

Avoid or remove sources of weed seed and propagules to mitigate new weed infestations and the spread of existing weeds.

- a. Frequently and systematically inspect and document riparian areas and wetlands for noxious weed establishment and spread. Eradicate new infestations

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before they become established – effective tools for riparian-area management are limited.

- b. When possible, maintain conditions (for example, water levels) that sustain desired riparian plant systems that compete effectively with weeds.
- c. Promote dense growth of desirable vegetation in riparian areas to minimize the availability of landing and germination sites for weed seeds and propagules that might be produced upstream.
- d. Address noxious weed risks in watershed restoration projects and water quality management plans.

2. Water prevention (aquatic recreation)

To prevent new weed infestations and the spread of existing weeds, avoid or remove sources of weed seed and propagules from recreation equipment. Avoid moving weeds from one body of water to another.

- a. Inspect boats (including air boats), trailers, and other boating equipment and remove any visible plants, animals, or mud before leaving any waters or boat-launching facilities.
- b. Encourage boat-launching facilities to provide proper washing equipment and kiosks that describe proper and thorough cleaning.
- c. Before transporting to new waters, rinse boat and boating equipment with hot (40°C or 104°F) clean water, clean boat or trailer with a pressure washer, or dry boat and equipment for at least five days.
- d. Inspect seaplanes and remove weeds from floats, wires, cables, water rudders, and pump floats; wash with hot water or spray with high-pressure water, or dry for at least five days.
- e. Avoid taxing seaplanes through heavy surface growths of weeds before takeoff; raise and lower water rudders several times to clear off plants. • Maintain a 100-foot weed-free clearance around boat launches and docks.
- f. Promptly post sites if aquatic invasive weeds are found. Confine an infestation; where prevention is infeasible or ineffective, close the facility until the infestation is contained.



- g. Wash and dry fishing tackle, downriggers, float tubes, waders, and other equipment to remove or kill harmful species not visible at the boat launch.
- h. Avoid running personal watercraft through aquatic plants near boat access locations.

3. Timber Harvest

Avoid or remove sources of weed seed and propagules to prevent new weed infestations and the spread of existing weeds.

- a. Treat weeds on timber-harvest projects – including landings, skid trails, and heli bases – well before activities commence. Identify and avoid infested areas where activities could spread weed seed.
- b. Maintain weed-free mill yards, equipment parking, staging areas, and logging roads.
- c. To prevent weed germination and establishment, retain native vegetation in and around timber harvests and minimize soil disturbance.
- d. Minimize the period from end of logging to site preparation, revegetation, and contract closure. Prompt reforestation and revegetation is required for long-term restoration and weed suppression.
- e. Monitor for and eradicate new weeds promptly.



Self-Check –3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (8 point)

1. Write down the elements of a proactive invasive plant prevention? (3pts)
2. Write down at least three guideline of water shade management (3pts)
3. Mention same guideline for water prevention from invasive plant spp. (2pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points



Information Sheet 4- Supporting and conducting community awareness creation

2.4. Supporting and conducting community awareness creation

Communication and public awareness strategies are essential for prevention and control of invasive spp. public awareness messages should target the general public and other stakeholders in a consistent manner and promote a well-grounded program in the minds of the public and policy makers. Along with the media staff, village/town/municipal/provincial leaders, policy makers, school principals and other community person could deliver information dissemination and public education efforts.

Suggested components of a communication strategy include:

- communication system (internal and/or external) with appropriate expertise and networks
- communication program with objectives, goals, tasks, target audience, communication tools (e.g. television, radio, social media applications, newspapers, booklets, brochures, courses), timelines and budget
- media focal point and media management system to ensure consistency in the quality and nature of the information exchanged between parties and other clients

Efficiently and effectively implemented communication should include:

- ❖ line communication, reporting and feedback
 - ❖ communication among field officers to share experiences and relevant information, problem-solve, etc.
 - ❖ communication among technical managers and supporting administrative staff, regarding budget, procurement and resource distribution, staffing issues, etc.
- External communication with different stakeholders ensures that all parties are directly engaged in the delivery of the program.

Awareness, education and communication efforts should be focused in the places where particular program activities will occur. It is important to use communication channels that are common to the local inhabitants. In many cases, dissemination of in-

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formation using basic media and local outlets can have a greater reach than those relying on more modern technologies. It is essential to find out which communication channels best suit the reality of each situation.

The public awareness and phytosanitary education program should be ongoing and may include information on:

- ✓ permanent or random checkpoints
- ✓ posting signs at entry points and transit corridors
- ✓ disposal bins for host material
- ✓ leaflets or brochures with information on the pest
- ✓ systems to regulate fruit movement
- ✓ non-commercial hosts
- ✓ security of the traps



Self-Check –4	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (6 point)

1. What is communication? (2pts)
2. List down components of a communication strategy. (2 pts)
3. Write down the effective communication methods. (2pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 4 points

Unsatisfactory - below 4 points



Information Sheet 5- Necessary materials and facilities

2.5. Necessary materials and facilities

Good facility like budgeting, materials, human resource is a critical component of successful IAP control. Any plan to manage IAPs should have a section that unpacks the costs of all requirements, including labor, equipment, herbicides, PPE etc. Furthermore, if a plan to clear IAPs on a given site is structured correctly, with regular follow-up events, the overall management costs will quickly decline.

Plant pest surveillance requires different skills and competencies from different groups of people. The NPPO responsible for any given plant pest surveillance program should strive to maintain the technical integrity of all activities and be responsive to emerging and new pest situations.

Safety at work is an important consideration to which management should be committed. Where applicable, management should lead by example.

Management should also ensure adequate funding for:

- ✓ protective equipment
- ✓ personal security gear
- ✓ adequate health care and medical coverage
- ✓ first aid equipment
- ✓ clearly marked or identifiable means of conveyance or transport, where appropriate proper identification

Effective resource planning is essential to ensure that field activities are delivered in a timely and efficient manner. It is the responsibility of both the surveillance manager and operational staff to ensure that the staffing, financial and physical resources (equipment, traps and consumables) are in place before starting field activities

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Major components of facilities are

1. Human resources - should include the relevant technical skills and training to effectively deliver the surveillance activity.
2. Financial resources - should cover all expenses relating to the delivery of the surveillance activities (travel, accommodation, per diems, equipment and supplies, etc.)
3. Physical resources - Infrastructure resources may include laboratory buildings, offices for staff, storerooms and warehouses, processing areas, communications infrastructure and waste facilities. Equipment and supply resources may include vehicles, pest traps, lures and consumables. Data collection resources may include cameras, GPS units, smartphones, tablets, notebooks, computer equipment and stationary. Public awareness resource materials refer only to the physical materials used to enhance or gain support for surveillance activities, and may include items such as brochures, posters, postcards and calendars.

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Self-Check –5	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (10point)

1. What type of physical resources would require during AIP control? (3 pts)
2. List down at least four materials used during data collection. (3pts)
3. What is the role of Human resources during AIP control? (4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Information Sheet 6- Gathering baseline information

2.6. Gathering baseline information

About 14,000 alien species have been reported so far in Europe. Plenty of information is available about them, but it is generally scattered across many different information systems and databases. (Katsanevakis et al. 2015).

It is therefore crucial for management, scientific, and educational purposes, to establish a single aggregation point for sharing and disseminating information, where available knowledge on AS from various data sources is standardized, harmonized and integrated. To address this need, the European Alien Species Information Network (EASIN¹) has been developed by the European Commission's Joint Research Centre. The EASIN system aims to facilitate easier access to data of AS in Europe, and to provide a single repository for accessing all the information necessary to underpin AS related policy and management decisions. EASIN facilitates the exploration of AS data from distributed sources through a network of publicly and freely available interoperable web services, following internationally recognized standards and protocols (Katsanevakis et al. 2015).

Invasive Alien Species (IAS) constitute one of the most important threats to biodiversity, causing severe ecological and socio-economic impacts. Recognizing the need for a coordinated set of actions to prevent, control and mitigate IAS, the European Parliament and the Council have adopted the EU Regulation 1143/2014 (hereafter referred to as the IAS Regulation). The IAS Regulation gives priority to a list of IAS, named as IAS of Union concern. Species are included in this list inter alia because they can cause such a significant damage in Member States (MS) justifying the adoption of dedicated measures at Union level. The first list of IAS of Union concern includes 37 species. Under the IAS Regulation, MS must prevent the species to be introduced and spread, enforce effective early detection and rapid eradication mechanisms for new introductions, and adopt management measures for those that are already widely spread. Detailed and up to date spatial information on the IAS of Union concern in the

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MS territories is needed for setting a geographic baseline of their current distribution, in support of the IAS Regulation implementation, in particular with reference to Art. 16 dictating the mandatory notification of early detections of listed species to the European Commission (EC) and to the other MS.

There are about 35 invasive alien species threat the biodiversity of the country

Key conclusions

- ✓ The distribution baseline of the 37 IAS of Union concern is an important tool supporting the implementation of the IAS Regulation, and also provides a factual basis for the review of the application of the IAS Regulation.
- ✓ A commonly acknowledged baseline will help MS in the establishment of a surveillance system of the targeted species under Art. 14, and can foster MS cooperation and coordination across borders or within shared biogeographical regions, as recalled by Art. 22. The distribution of IAS of Union concern will also help the discussion amongst MS about the appropriate management measures to be implemented (Art. 19).
- ✓ A shared baseline will also help MS and the EC in monitoring the evolution of the IAS distribution in Europe and the effectiveness of the actions undertaken by MS Competent Authorities by implementing the IAS Regulation. The evaluation of those data can eventually lead to reconsider or modify implementation activities and give an input when updating the list of IAS of Union concern.
- ✓ The distribution baseline provides valuable information also to the implementation of other EU policies related with AS, such as the Birds and Habitats Directives, the Marine Strategy, and Water Framework Directives.
- ✓ EASIN proved to be a good source of information of IAS of Union concern distribution records within EU countries, attesting as the role of official information system supporting MS in the implementation of the IAS Regulation (Art. 25).



Self-Check –6	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (6 point)

1. What is an important tool supporting the implementation of the IAS Regulation? (2pts)
2. How many invasive alien species threat biodiversity Ethiopia. (3pts)
3. Which country provide base line information about invasive spp. (2pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 5 points

Unsatisfactory - below 5 points



Information Sheet 7- Identifying invasive species

2.7. Identifying invasive species

Ethiopia is rich in biodiversity and is one of the 12 Vavilovian centers of origin (UNEP, 2003). However, there are about 35 invasive alien species threat the biodiversity of the country (McGinley, 2007). These IAS pose a serious threat to agriculture (crop and livestock), livelihoods and human health at various levels (Haysom and Murphy, 2003). Few aggressive IAPS which are threatening biodiversity in Ethiopia are discussed below.

1. *Prosopis juliflora*

It is a perennial evergreen multipurpose dry land tree or shrub native to the Caribbean, North and South America. It Introduced to Africa in 1822 in Senegal; South Africa (1880), Egypt (1900) and Kenya was in 1973. It introduced to Eritrea from the Sudan, probably during the early 1980s. It introduced in Ethiopia in the late 1970s at Goro nursery- Dire-Dawa. *Prosopis* was planted over large areas until 1982, continued by the Food for Work Programme from 1986 to 1988. This species is now commonly found in Afar, Oromia, Amhara, Somali, Dire-Dawa regions and Sothern Nations and Nationalities. Nowadays, it is repeatedly reported to be one of the invasive and problematic trees in the Afar Region and progress to Rift Valley of Ethiopia.

2. *Parthenium hysterophorus*, *in the family heliantheae: asteraceae*

It is a perennial herb. *Parthenium* genus has 16 species native to northern South America, Central America, Mexico, Texas, and Florida, Mexico. It introduced to Ethiopia accidentally in the 1970s when drought induced famine triggered a massive multinational relief effort. It was first reported from Ethiopia in 1988 at Dire- Dawa and Harerge, Eastern Ethiopia and subsequently found near Desse, Northeastern Ethiopia as well.

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3. *Eichhornia crassipes*, (Mart.) Solms in A. DC. (Pontederiaceae)

Water hyacinth is native to South America and it is originally from the Amazon Basin its entry into Africa, Asia, Australia, and North America was facilitated by human activities and lack of naturally occurring enemies. It introduced in to Kenya (1957), Lake Victoria in East Africa, and began to cause problems in 1990.^{3,4} Zimbabwe (1937), Mozambique (1946), Ethiopia (1956), Rwanda and Burundi colonized in the late 1950s, Tanzania were infested in 1955 and 1959, Zambia (1960s), Uganda (1988-89), Malawi (1996). Water hyacinth has also spread to West Africa and Cameroon (1997-2000), Nigeria (almost all water bodies). Water hyacinth in Ethiopia has also been marked on a large scale in many water bodies of the Gambella area, in Blue Nile Watershed, and Lake Tana.

4. *Lantana camara* L. (Verbenaceae)

A shrub IAPS introduced to Ethiopia from native Tropical America and the West Indies. But, no clear year of introduction from native range has been indicated in literatures regarding this species in Ethiopia. Lantana has been introduced throughout the tropics and subtropics as an ornamental, often used as a hedge plant. It is a cosmopolitan weed and, in many countries.

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Table 1 Identified and prioritized Invasive Alien Species in Ethiopia (Source: GEF, 2002).

No	Scientific names	Common names
1	E. crassipes	Water hyacinth
2	L. camara	Lantana, Wefkolo (Amh)
3	p. hysterophorous	Parthenium, Congress weed, White top, Feremsisa (Orm)
4	P. juliflora	Mesquite, Prosopis, Woyanezaf (Amh)
5	triga species	Striga
6	Acacia species*	Fullsa (Orm)
7	Orobanche species	Orobanche , Atequrit (Amh)
8	Cuscuta campestris	Cuscusta
9	A. Mexicana	Argemone, Nech Lebash (Amh)
10	verbesina encelioides	Verbesina
11	Opuntia species	Opuntia, Qulqual (Amh)



Self-Check –7	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (10 point)

1. Write at least 4 IAPS which are threatening biodiversity in Ethiopia (4pts)
2. How many invasive alien species threat biodiversity Ethiopia. (3pts)
3. Lantana camara was first reported from Ethiopia in 1988 at _____ (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



Operation Sheet 7 - Identifying invasive species

Objective: to Identify invasive species

Materials needed

1. PPE and clothing
2. Safety equipment
3. First aid equipment
4. Pen
5. Note pad

Procedures:

1. Assess vegetation cover of the areas
2. Identify types plant species
3. Categorize them in to two major groups (exotic and indigenous spp)
4. Identify exotic plant spp.
5. Observe invasive plant spp based on their basic characteristics
6. Identify and prioritize invasive plant (if available)
7. Collect the equipment's you used and store in appropriate place.
8. Prepare a report to supervisor Collect the equipment's you used and store in appropriate place.
9. Prepare a report to supervisor

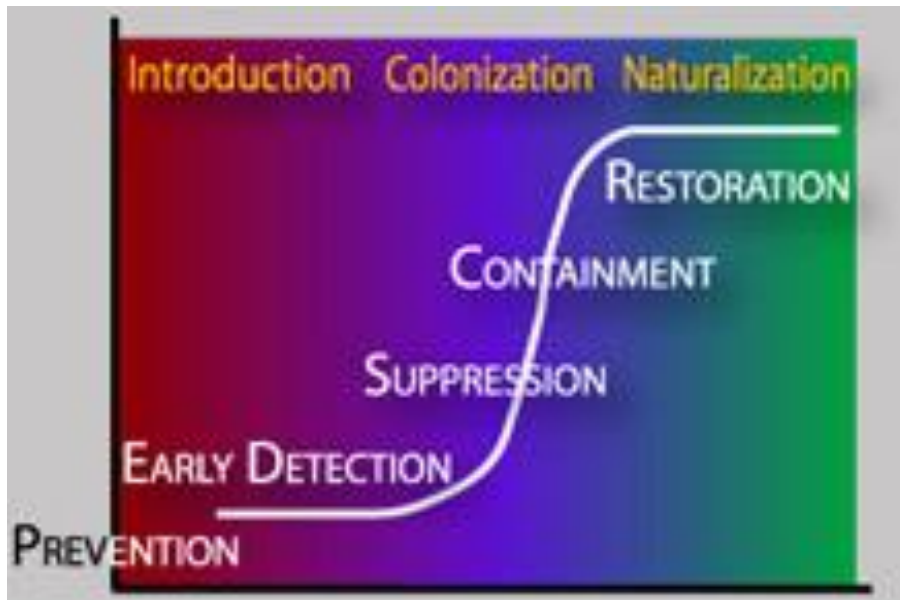
Information Sheet 8- Applying control mechanisms

2.8. Applying control mechanisms

1. Management Strategies and Options

Invasive plant assessment activities that describe current status and trends in distribution and abundance of invasive plant populations (i.e., inventory/survey and monitoring) can help identify appropriate management strategies by characterizing the phase of the plant invasion process for populations.

Management and the Invasion Process



The process of plant invasions can occur in three phases (Cousens and Mortimer 1995).

1. Introduction phase
2. Colonization phase
3. Naturalization phase

Invasive plant management strategies can be described in four categories:

1. Prevention
2. Early detection
3. Control
4. Restoration

1. Prevention

Preventing invasive plants from becoming established is less expensive, less time-consuming, and more effective than trying to control them after they have become widespread or have had significant ecological impacts. Prevention can be applied only to invasive plant species that do not occur on the site or in areas where invasive plant species do not occur. It requires identification of potential invaders, awareness of vectors and pathways of introduction, mechanisms of reproduction and spread, habitat requirements, and conditions that favor the species. Assessments can help identify areas where invasive plant populations do not occur as well as habitats that may be particularly susceptible to introduction and spread of new infestations.

2. Early Detection

Once unwanted plants begin to invade an area, detecting and controlling invasions when they are small and localized provides the next best return. Early detection and rapid response (EDRR) is the key to eliminating the plants before their population expands. Detecting and responding to plant invasions requires a complex series of actions that can be grouped into three main categories:





3. Control

As populations begin to expand, control strategies may be required, demanding significantly more resources.

Control Options	
Eradication	<ul style="list-style-type: none"> eliminate all invasive plants and their propagules practical on small-scale infestations, generally in the introduction phase
Suppression	<ul style="list-style-type: none"> reduce invasive plant populations in size or abundance (i.e., density and cover); promote desirable vegetation effective suppression of large-scale, naturalized infestations is unlikely without massive resource inputs
Containment	<ul style="list-style-type: none"> prevent large infestations of invasive plants from spreading to uninfected areas may involve methods that prevent reproduction and propagule dispersal, treating the perimeter of a large infestation, or eliminating small satellite infestations

Multiple strategies and options are often applied to manage a complex of invasive plant infestations throughout a management area.

A Typical Prioritization Scheme for Management Strategies and Control Options			
1	2	3	4
Strategy: Prevention	Strategy: Control	Strategy: Control	Strategy: Control
<i>prevent</i>	<i>eradicate</i>	<i>contain</i>	<i>suppress</i>
new isolated infestations becoming established	“satellite” perimeter of large “core” infestations	the interior of large “core” infestations	



4. Restoration

Extensive, naturalized infestations may be beyond feasible control with conventional methods because the desirable plant community composition may not be sufficient to fill niches left open by controlled/suppressed invasive plants, invasive plant populations have altered the site, or other reasons. In these cases, further efforts may be necessary to restore the site. Restoration can be very labor intensive and costly. Restoration may be considered for high value areas that are relatively small. Assessment can help determine if expending resources into extensive restoration is worth the relative benefit. Several methods may be used to address an invasive species population, including cultural controls, mechanical controls, baits and attractants, biological controls, chemical controls, and bounties. To apply any of these strategies, substantial knowledge of the target species' behavior, biochemistry, dietary preferences, diseases, or other aspects of its biology is usually essential. Combining pest control with an understanding of the underlying ecology of the species is central to integrated pest management (IPM), which may be defined as: an ecosystem-based strategy that focuses on long-term prevention of pests or their damage through a combination of techniques such as biological control, habitat manipulation, modification of cultural practices, and use of resistant varieties. Pesticides are used only after monitoring indicates they are needed according to established guidelines, and treatments are made with the goal of removing only the target organism. Pest control materials are selected and applied in a manner that minimizes risks to human health, beneficial and nontarget organisms, and the environment.

Generally, "the most effective, long-term way to manage pests is by using a combination of methods that work better together than separately.

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Self-Check –8	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (10 point)

1. As IA populations begin to expand, control strategies may be required.
Mention the three strategies. (3pts)
2. List the four Invasive plant management strategies. (4pts)
3. Write down at least 3 Limitations of chemical control (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



Operation Sheet 8 - Applying control mechanisms

Objective: to Apply control mechanisms of invasive plant spp.

Materials needed

1. PPE and clothing
2. Safety equipment
3. First aid equipment
4. Axe, machete,
6. Note pad

Procedures:

1. Assess vegetation cover of the areas
2. Identify types plant species
3. Identify exotic plant spp.
4. Observe invasive plant spp. (if available)
5. Identify and prioritize invasive plant
6. Apply appropriate control measures
7. Collect the equipment's you used and store in appropriate place.
8. Prepare a report to supervisor Collect the equipment's you used and store in appropriate place.
9. Prepare a report to supervisor



LAP Test	Practical Demonstration
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Name. _____ ID _____ Date: _____

Time started: _____ Time finished: _____

Instructions: Given necessary templates, tools and materials you are required to perform the following tasks within 5 hours.

Task 1. Conduct assessment of invasive plant spp.

Task 2. Identify invasive species

Task 3. Apply control mechanisms of invasive plant spp



LG #80	LO 3- Implement fire prevention and controlling program
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Instruction sheet
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none">• OHS regulation to detect fires• Identifying smoke and current position in the field• Locating current position on the map or plan• Establishing and maintaining communication with others• Communication equipment• Relying accurate location to fire command• Recording sighting details• Identifying situations requiring specialist advice <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none">• identify and compile applicable OHS, legislative and organizational requirements, certification and environmental requirements relevant to detecting fires• identify smoke and current position in the field using landmarks and key geographical features• locate current position in the field on a map or plan in accordance with site procedures• establish and maintain communication with others in accordance with OHS requirements• use communication equipment to relay information accurately and clearly in accordance with safe working practices, training and site procedures• relay location of own position and sightings are accurately and clearly to fire command or control using conventional descriptions

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- record sighting details in accordance with required formats, conventions and site procedures
- identify situations requiring specialist advice and assistance sought as required in accordance with site procedures

Learning Instructions:

1. Read the specific objectives of this Learning Guide.
2. Follow the instructions described below.
3. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
4. Accomplish the “Self-checks” which are placed following all information sheets.
5. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
6. If you earned a satisfactory evaluation proceed to “Operation sheets
7. Perform “the Learning activity performance test” which is placed following “Operation sheets” ,
8. If your performance is satisfactory proceed to the next learning guide,
9. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



Information Sheet 1- OHS regulation to detect fires

Introduction

Fire is a chemical reaction that requires three elements to be present for the reaction to take place and continue. The three elements are: Heat, or an ignition source, Fuel, Oxygen. These three elements typically are referred to as the “fire triangle.” Fire is the result of the reaction between the fuel and oxygen in the air. Scientists developed the concept of a fire triangle to aid in understanding of the cause of fires and how they can be prevented and extinguished. Heat, fuel and oxygen must combine in a precise way for a fire to start and continue to burn. If one element of the fire triangle is not present or removed, fire will not start or, if already burning, will extinguish. Ignition sources can include any material, equipment or operation that emits a spark or flame—including obvious items, such as torches, as well as less obvious items, such as static electricity and grinding operations

The name wildfire refers to any large or destructive conflagration. Is any uncontrolled fire in combustible vegetation that occurs in the countryside or a wilderness area. Other names such as ,bushfire, forest fire, desert fire, grass fire, hill fire, vegetation fire, and wild land fire may be used to describe the same phenomenon depending on the type of vegetation being burned. A wildfire differs from other fires by its extensive size, the speed at which it can spread out from its original source, its potential to change direction unexpectedly, and its ability to jump gaps such as roads, rivers and firebreaks.

Wildfires are characterized in terms of the cause of ignition, their physical properties such as speed of propagation, the combustible material present, and the effect of weather on the fire.

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3.1. OHS regulation to detect fires

Occupational Health is a multi-disciplinary activity that aims at

- Protection and promotion of health workers by preventing and controlling occupational disease and accident and eliminate occupational factors and condition hazards.
- The enhancement of physical, mental and social well-being of workers

The Occupational Safety and Health requires employers to implement fire protection and prevention programs in the workplace.

OHS requirements are to be in line with applicable Commonwealth, State or Territory legislation and regulations, and organizational safety policies and procedures, and may include:

- personal protective equipment and clothing
- safety equipment
- first aid equipment
- firefighting equipment
- hazard and risk control
- fatigue management
- elimination of hazardous materials and substances
- safe forest practices including required actions relating to forest fire
- manual handling including shifting, lifting and carrying
- machine isolation and guarding
- hot work permits to be issued by authorized personnel
- protective shields for welding and grinding activities
- written/displayed evacuation procedures
- appropriate fitness for the task

Risk and hazard identification.

Risk- is defined as the chance of fire starting from one caused or another, such as people, lighting, and electricity.

Hazard- is the fuel complex by type, arrangement, volume, condition and location that forms a special threat of ignition or difficult in suppression. Areas covered with grass,

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bush and forest fuel are example of hazard and a such potential area could be identified. The 'responsible person' must manage any fire risk on your premises, and to do this they need to carry out a fire risk assessment.

The recommended way to carry out a risk assessment is to follow a step-by-step process.

Identify the hazards

Hazards include:

- anything that can **start** a fire, such as naked flames, heaters or commercial processes such as cookers or hot-air dryers
- anything that can **burn** in a fire, including piles of waste, display materials, textiles or other flammable products
- oxygen sources such as air conditioning, medical products or commercial oxygen supplies which might **intensify** a fire

Identify people at risk: These include:

- people who work close to or with fire hazards
- people who work alone, or in isolated areas such as storerooms
- children or parents with babies
- elderly people
- disabled people

Evaluate, remove or reduce the risk: You should:

- where possible, get rid of the fire hazards you identified - eg remove build-ups of waste - and reduce any hazards you can't remove entirely
- replace highly flammable materials with less flammable ones
- keep anything that can start a fire away from flammable materials
- have a safe-smoking policy for employees or customers

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Self-Check –1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions. (10 point)

1. Define Occupational (3pts)
2. What is risk in the concept of fire control. (4pts)
3. Define Hazard (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 6 points

Unsatisfactory - below 6 points



Information Sheet 2- Identifying smoke and current position in the field

3.2. Identifying smoke and current position in the field

A smoke detector is a device that senses smoke, typically as an indicator of fire.

The most important fuels in forest and other wild land fires that need to be treated are the surface fuels and the aerial fuels between the surface and the canopy of the over storey trees to be protected. The surface fuels (grass, herbs, and shrubs) are the main carrier of fire, both for horizontal spread and for build-up of vertical development of the fire. Aerial fuels are all combustibles not in direct contact with the ground, which carry the fire into the crowns ('fuel ladders'). The treatment of these fuels either concentrates on buffer zones (firebreaks or fuel breaks between wild land vegetation and the forest stands to be protected, or by breaking up larger continuous forested areas) or is practised inside the forest stand to be protected.

1. Fire protection

is the study and practice of mitigating the unwanted effects of fires. It involves the study of the behavior, compartmentalization, suppression and investigation of fire and its related emergencies, as well as the research and development, production, testing and application of mitigating systems. In the event of fire emergencies, Firefighters, fire investigators, and other fire prevention personnel called to mitigate, investigate and learn from the damage of a fire. Lessons learned from fires are applied to the authoring of both building codes and fire codes.

2. Fire control (or firefighting)

Consists of depriving a fire of fuel (Reducing Agent), oxygen(Oxidizing Agent), heat and/or the chemical chain reaction that are necessary to sustain itself or re-kindle (also known as the four components of the *fire tetrahedron*). Firefighters are equipped with a wide variety of equipment to accomplish this task. Some of their tools include ladder

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trucks, pumper trucks, tanker trucks, fire hose, and fire extinguishers. Very frequent training and refresher training is required.

3. Fire behavior

Fuel types

Fuels can be classified into three broad categories based on their vertical distribution:

A. Ground fuels: organic soils, forest floor duff, stumps, dead roots, and buried fuels. ground fuels are those forest fuels that lie below the litter layer or within the soil, including organic soils, forest floor duff, stumps and dead roots, and buried fuels. ground fuels can ignite and smolder for days to months following flaming front passage. Ground fires produce persistent and harmful smoke and can re-ignite surface fuels making them a bane for fire managers. the forest floor is the layer of organic matter overlying the mineral soil and has both surface and ground fuel components. The forest floor fuel complex contains distinct horizons, each with different moisture relationships, particle sizes, chemical composition, densities, and depths. Organic soils are important forest fuels in several southeastern ecosystems. The moisture content of ground fuels is influenced by three different moisture gradients, or layers of differing water potential: one between the fuel and the air, another between the fuel and the soil, and still another between the top and bottom of the fuel bed itself.

B. Surface fuels: litter layer, downed woody materials, and dead and live plants to 2 m (6 ft.) height. Surface fuels include understory plants < 2 m (6 ft.) tall (dead and alive), the litter layer, downed woody materials, and often mid story tree and shrub fuels. Surface fuel availability for consumption is determined by moisture content, particle size, horizontal continuity, compactness, and fuel type (particularly fuels with high volatile compounds). Under most burning conditions in most southeastern ecosystems these fuels carry surface fires.

The forest floor is the layer of organic matter overlying the mineral soil and has both surface and ground fuel components. The surface fuel component of the forest floor is the litter horizon. The ground fuel component of the forest floor is



the duff layer. Surface fires can be carried solely by litter fuels. Litter fuels may also ignite live understory fuels, pre-heat larger woody fuels, and initiate smoldering of underlying ground fuels, if present.

C. Crown fuels: Canopy fuels are the crowns of trees that form the over story. The receptivity of the canopy fuels to crown fire is based primarily on three factors: canopy base height, canopy bulk density, and to a lesser degree, foliar moisture content. Canopy base height relates the bottom of the over story tree crowns to the top of the understory fuel bed and ladder fuels. Canopy bulk density is a measure of the amount of fuel contained in a unit volume of the canopy. High bulk densities present large fuel loads for a fire

4. Cause of forest Fire

1. Accidental Fire Cause. Accidental fires involve all those for which the proven cause does not involve a deliberate human act to ignite or spread fire into an area where the fire should not be. In most cases this classification will be clear, but some deliberately ignited fires can still be accidental. For example, in a legal setting, a trash fire might be spread by a sudden gust of wind. The spread of fire was accidental even though the initial fire was deliberate.

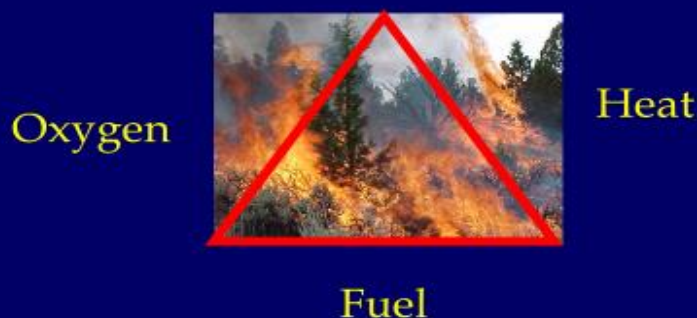
2. Natural Fire Cause. Natural fire causes involve fires caused without direct human intervention, such as lightning, earthquake, wind, and the like.

3. Incendiary Fire Cause. The incendiary fire is one deliberately ignited under circumstances in which the person knows that the fire should not be ignited.

4. Undetermined Fire Cause. Whenever the cause cannot be proven, the proper classification is undetermined. The fire might still be under investigation, and the cause may be determined later. In the instance in which the investigator fails to identify all of the components of the cause of the fire, it need not always be classified as undetermined. If the physical evidence establishes one factor, such as the presence of an accelerant, that may be sufficient to establish the cause even where other factors such as ignition source cannot be determined. Those situations are also encountered to a lesser degree in accidentally caused fires.

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The Fire Triangle



The fire triangle

The **fire triangle** or **combustion triangle** is a simple model for understanding the ingredients necessary for most fires.

The triangle illustrates a fire requires three elements: heat, fuel, and an oxidizing agent (usually oxygen). The fire is prevented or extinguished by removing any one of them. A fire naturally occurs when the elements are combined in the right mixture.

Without sufficient **heat**, a fire cannot begin, and it cannot continue. Heat can be removed by the application of a substance which reduces the amount of heat available to the fire reaction. This is often water, which requires heat for phase change from water to steam.

Introducing sufficient quantities and types of powder or gas in the flame reduces the amount of heat available for the fire reaction in the same manner. Scraping embers from a burning structure also removes the heat source

Without **fuel**, a fire will stop. Fuel can be removed naturally, as where the fire has consumed all the burnable fuel, or manually, by mechanically or chemically removing the fuel from the fire. Fuel separation is an important factor in wild land fire suppression,



and is the basis for most major tactics, such as controlled burns. Removing the fuel thereby decreases the heat.

Without sufficient **oxygen**, a fire cannot begin, and it cannot continue. With a decreased oxygen concentration, the combustion process slows. In most cases, there is plenty of air left when the fire goes out so this is commonly not a major factor. If any one of these is missing, a fire cannot start. Taking measures to avoid the three coming together will therefore reduce the chances of a fire occurring. The remainder of this step will advise on how to identify potential ignition sources, the materials that might fuel a fire and the oxygen supplies that will help it burn

4. Forest fire management

Fire management encompasses three activities required to protect wild land resources from fire: *prevention*, *pre-suppression* and *suppression*. Fire management also includes the use of prescribed fire to meet land management objectives.

- 1. Prevention-** Wild fire prevention is the means of reducing the number of uncontrolled, unwanted escaped wild fire. Prevention includes two general areas: activities directed at *people*, the major cause of fire, and activities directed at mitigating the *flammability* of the forest resource. The former includes public information campaigns and incentives for wise use of fire and the latter include fuel management to reduce fire risk (e.g. prescribed burning, thinning, waste removal). Legislation must complement fire prevention by establishing the setting of incendiary fires as a crime and penalizing offenders in proportion to the damage caused.
- 2. Pre-suppression-** This group of activities includes all fire management activities planned and accomplished in advance of ignition. They are designed to ensure effective suppression and include fire detection, fire danger rating and training.
- 3. Suppression** – The objective of fire suppression is to suppress wildfires at minimum cost and consistent with land and resource management objectives. There are three methods for bringing a wildfire under control: *direct attack* (an attack on the burning edge of the fire when fires are small); *parallel attack* (construction of a fire



line parallel but close to the edge of the fire); and *indirect attack* (construction of fire lines some distance from the fire edge and burning out of all intervening fuels when the fire is very intense).

Fire class

Class A: Suitable for cloth, wood, rubber, paper, various plastics, and regular combustible fires. The extinguishing agent is water or foam.

Class B: Suitable for gasoline, grease, and oil fires. The extinguishing agent is a dry chemical or carbon dioxide. Extinguishers smaller than 6 pounds (2.72 kg) are not recommended.

Class C: Suitable for energized electrical fires. The extinguishing agent is a dry chemical or carbon dioxide.

Class D: Suitable for combustible metals. The extinguishing agent is a dry powdered chemical.

Class K: Suitable for kitchen fires, including oil, grease, and fat. The extinguishing agent is a wet or dry chemical.

The Fire Triangle



Fuel + Oxygen + Heat = FIRE

Remove one or more of these elements and the fire is extinguished

by cutting a line
removing the fuel

by spraying water
or throwing dirt

by hot spotting
cooling with
water or dirt

= NO FIRE

09-6-S130-EP

**Self-Check – 2****Written test**

Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Part I. Choose the correct answer (2pts each)

1. _____ is the study and practice of mitigating the unwanted effects of fires
 - A. Fire protection
 - B. Fire control
 - C. Fire prevention
 - D. Fire
2. One of the following is not a natural cause Fire.
 - A. Lightning
 - B. Earthquake
 - C. Deliberate setting
 - D. wind
3. _____ is a simple model for understanding the ingredients necessary for most fires.
 - A. fire triangle
 - B. Smoke
 - C. Ignition
 - D. Fuel
4. _____ includes all fire management activities planned and accomplished in advance of ignition
 - A. Prevention
 - B. Pre-suppression
 - C. Suppression
 - D. Control

Test I: Short Answer Questions

1. Define forest fire (2pts)
2. What are the causes of forest fire. (2pts)
3. Fuels can be classified into three broad categories. list them (3pts)
4. How a forest fire occurs? (2pts)
5. Write down the three methods of fire control. (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating - 12 points

Unsatisfactory - below 12 points



Information Sheet 3- Locating current position on the map or plan

3.3. Locating current position on the map or plan

1. Fire prevention planning

For organizing fire prevention operation as effectively as possible, the written part should include:

- Map, tables and graphs as requested by the fire services.
- The material should be updated at least once a year.

The first step is to collect and compile all the basic facts and data from occurred fires. For instance,

- How or why the fires were started?
- When and where they were started (month, date, time?)
- When do they occur most frequently (weather, hazard, time?)
- How many fires were started from the different causes (number of fires listed under each list of causes)
- Where do they occurred (map location, forest type)?

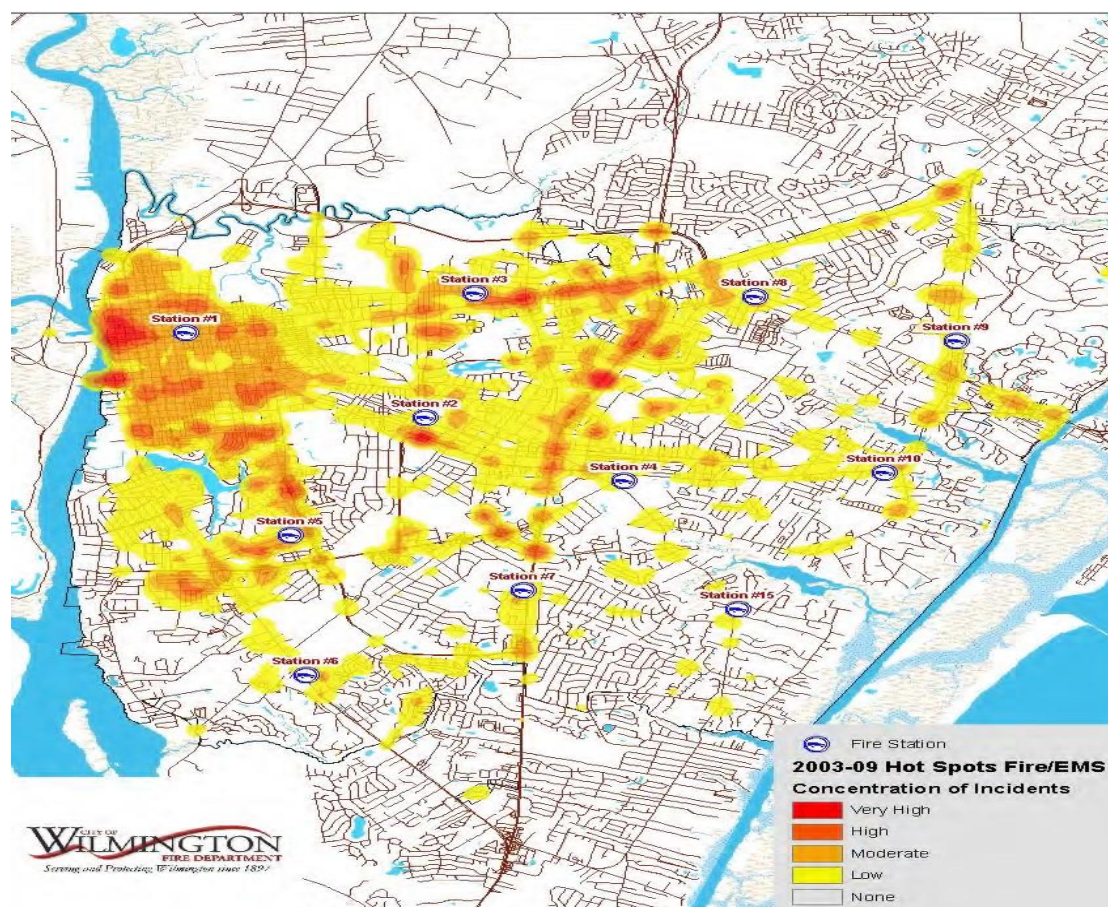
Fire prevention plan help a summary of the main problems such as,

- What are the main causes of forest fires (shifting cultivation? debris burning? Etc.)
- Location of very high-risk areas
- Location of areas that should be protected
- What are the main objectives and methods of protection?

During fire prevention plan, the first option should be giving education to the local community. The second step is preparation of regulation to control fire caused by different parties: farmers, campfires, hunters, etc.

Finally, then enforcing the laws and regulation (shifting cultivation, agriculture, etc.)

Eventually, assure the responsibility to be taken for the prevention of fire completed



Wildfire prevention plan format (General guide)

1. Bases of the fire plan
 - 1.1 Fire occurrence map
 - 1.2 Fire statistics, graphs
 - 1.3 Fire risk area map
 - 1.4 Forestry operations map
 - 1.5 Hazard areas map
 - 1.6 Sign and warning board map
2. Fire prevention objectives
3. Summary of problems and measures to be taken



4. Resources for fire prevention operations

- Use of firemen, forests, police, etc.
- Contact persons and co-operation with village leaders
- Finance

5. Laws, regulations, rules, and restrictions for fires

6. Public education, mass media and guidelines for tourists, hunters, etc.

7. Rules and regulations for forestry, farmers, etc..

8. Reduction of the physical hazard in high risk areas

9. Signs, posters, warning boards, and other information material

10. Fire prevention training and education

11. Feedback information

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Self-Check –3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why Fire prevention plan is needed? (3pts)
2. Write down at least four bases of the fire prevention plan. (4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 4 points

Unsatisfactory - below 4 points



Information Sheet 4 - Establishing and maintaining communication with others

3.4. Establishing and maintaining communication with others

Communication is the creation or exchange of thoughts, ideas, emotions, and understanding between sender(s) and receiver(s). It is essential to building and maintaining relationships b/n organization and stakeholders.

There are many means of communication. To be an effective and valuable member of stakeholders it is important to become skilled in all of the different methods of communication that are appropriate and it is important to understand the communication process.

Communication helps to ensure that stakeholders and staff understand and support phytosanitary surveillance activities, requirements and systems, and have sufficient information to manage their own related activities. A communication strategy for plant pest surveillance will ensure that communications are handled as effectively as possible. Communication May include, but not limited to:

- Verbal and non-verbal language,
- Relaying of information using prescribed formats and conventions, constructive feedback, active listening, questioning to clarify and confirm understanding,
- Use of positive, confident and cooperative language,

Use of language and concepts appropriate to individual social and cultural differences, control of tone of voice and body language

Communication equipment

May include, but not limited to, radio and telephone networks or those used by the organization, local fire brigades, emergency management organizations, face to face, mobile phone, e-mail communication (phone or tablet computer)

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Self-Check –4

Written test

Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Write and describe the elements of communication process (4pts)
2. Write at least three communication equipment in fire prevention. (3pts)
3. What is the importance of establishing communication with client? (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Information sheet 5. Relying accurate location to fire command

3.5. Relying accurate location to fire command

This may include from all types and locations commonly found in forested and grassland. fire detection systems are designed to discover fires early in their development when time will still be available for the safe evacuation of occupants. Early detection also plays a significant role in protecting the safety of emergency response personnel. Property loss can be reduced and downtime for the operation minimized through early detection because control efforts are started while the fire is still small.

Most alarm systems provide information to emergency responders on the location of the fire, speeding the process of fire control.

Fire detection methods

The majority of smoke detectors work either by optical detection or by ionization, and in some cases both detection methods are used to increase sensitivity to smoke. A complete fire-protection system will typically include spot smoke detectors that can signal a fire control panel to deploy a fire-suppression system.

Fire detectors sense one or more of the products or phenomena resulting from **fire**, such as smoke, heat, infrared and/or ultraviolet light radiation, or gas.

smoke detectors are often stand-alone devices. A photoelectric smoke detector uses an infrared LED light beam to tell if there is smoke in the air. Over time, the sensor emits the light through the optical detector's chamber. If the light detects numerous smoke particles passing through it, then an alarm is triggered.

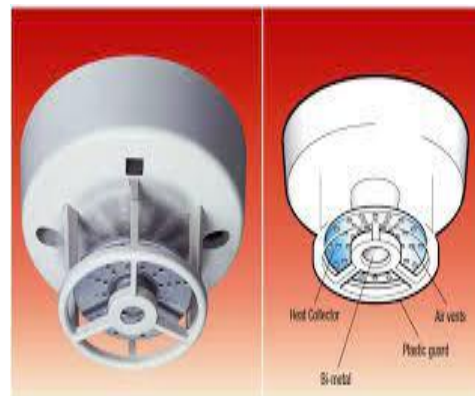
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A smoke detector is a device that senses smoke, typically as an indicator of fire.



A flame detector is a sensor designed to detect and respond to the presence of a flame or fire, allowing flame detection. Responses to a detected flame depend on the installation, but can include sounding an alarm, deactivating a fuel line, and activating a fire suppression system.

UV IR Flame detector



heat detector is a fire alarm device designed to respond when the convected thermal energy of a fire increases the temperature of a heat sensitive element. The thermal mass and conductivity of the element regulate the rate flow of heat into the element. All heat detectors have this thermal lag



Self-Check –5

Written test

Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What are the most alarm systems that provide information to emergency responders on the location of the fire speeding the process of fire control. (4pts)
2. What is the importance of establishing communication with client? (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Information Sheet 6- Recording Sighting details

3.6 Recording Sighting details

What is the maximum distance to a fire exit?

If there is more than one escape route, the travel distance should not normally be more than 45 meters (around 25 meters in areas where the risk of fire is high and about 60 meters in areas where the risk of fire is very low.

the advised distance to use a fire extinguisher ranges between 8 and 12 feet

Many fire extinguishers have a range of between 8 and 12 feet (2.4 to 3.7 m). Before discharging the extinguisher, move toward or away from the fire so you're standing 6 to 8 feet (1.8 to 2.4 m) (1.8 to 2.4 m) away



Self-Check –6	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. What is the maximum distance to a fire exit2pts
2. responders on the location of the fire speeding the process of fire control. (4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Information Sheet 7- Identifying situations requiring specialist advice

2.7. Identifying situations requiring specialist advice

Fire protection experts design systems, products, and procedures that prevent fire damage. fire protection expert witnesses may become highly relevant for numerous fire-related lawsuits, since fire protection refers to the process of controlling fires so as to prevent possible destruction and damage. Fire protection expert consulting can provide insightful information for cases involving such areas as safety engineering, fire safety science, fire protection engineering, fire and building codes, fire research, heat transfer, fire and explosion investigation, occupational safety and health (OSHA), fire cause and origin, workplace safety, and other related issues, each of which might be at the focus of litigation pertaining to fire protection. working conditions for fire protection experts vary. Some work primarily in offices while others travel to perform inspections and provide on-site consultations.

The development agents of the Ministry of Agriculture provide information to farmers on the impacts of wildfire on forest resources and its relation to the production system.

They are informed and updated on the possible causes of fire and on precautions to be taken during the dry season.

The government and radio channels, which disseminate agriculture-related programs, provide educational messages to make the local farmers aware of possible fire impacts. They are also involved in firefighting through mobilization as legislation clearly states that all citizens have the obligation to cooperate in firefighting if fires occur in their surrounding area. Local communities participate in firefighting activities.

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Responsibilities

Consult with Designers on Fire Safety Issues

Fire protection experts provide technical support to other, create plan for fire detection tools, such as extinguishers, alarm systems, sprinklers, fire pumps, and more.

Direct Fire Safety Installation Activities

Managing the installation of fire safety devices is another important role of fire protection engineer. They direct the maintenance and repair of fire prevention equipment and coordinate key safety activities within departments.

Perform Fire Prevention Investigations

Fire protection experts carefully investigate deficiencies in buildings and construction sites that could cause fires in the future. They are also responsible for determining the causes of recent fires to uncover how they could have been prevented. Fire protection experts work with fire departments to prevent blazes by drafting sprinkler design specifications, making hydraulic calculations, and selecting fire pumps.

Conduct Fire Prevention Trainings

Conducting fire prevention workshops and training sessions is another responsibility of fire protection. They educate community and experts of low level. during fire prevention classes, they share fire safety rules and regulations and suggest policy changes.

Write Documentation Reports

Preparing and writing reports that outline specific fire prevention topics and procedures is another responsibility of fire protection engineer. They review work performed and provide written updates to key stakeholders.

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Self-Check –7	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Why consulting fire protection expert. (4pts)
2. Write at least four responsibilities of experts? (4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 5 points

Unsatisfactory - below 5 points

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LG #81	LO4. Record and report information
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Instruction sheet
<p>This learning guide is developed to provide you the necessary information regarding the following content coverage and topics:</p> <ul style="list-style-type: none"> • Recording disease and pest assessment result • Recording relevant information and condition • Reporting fire detecting processes and outcomes <p>This guide will also assist you to attain the learning outcomes stated in the cover page. Specifically, upon completion of this learning guide, you will be able to:</p> <ul style="list-style-type: none"> • Record, document and report disease and pest assessment result to appropriate personnel • record relevant information and conditions accurately in accordance with instructions • record and report fire detecting processes and outcomes are to the appropriate personnel <p>/</p>

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Learning Instructions:

Instruction sheet

Read the specific objectives of this Learning Guide.

4. Follow the instructions described below.
5. Read the information written in the “Information Sheets”. Try to understand what are being discussed. Ask your trainer for assistance if you have hard time understanding them.
6. Accomplish the “Self-checks” which are placed following all information sheets.
7. Ask from your trainer the key to correction (key answers) or you can request your trainer to correct your work. (You are to get the key answer only after you finished answering the Self-checks).
8. If you earned a satisfactory evaluation proceed to “Operation sheets
9. Perform “the Learning activity performance test” which is placed following “Operation sheets”
10. If your performance is satisfactory proceed to the next learning guide,
11. If your performance is unsatisfactory, see your trainer for further instructions or go back to “Operation sheets”.



Information Sheet 1- Recording disease and pest assessment result

4.1. Recording disease and pest assessment result

The concept of **record** is variously defined. The ISO 15489-1:2016 defines *records* as "information created, received, and maintained as evidence and as an asset by an organization or person, in pursuit of legal obligations or in the transaction of business". While there are many purposes of and benefits to records management, as both these definitions highlight, a key feature of records is their ability to serve as evidence of an event. Proper records management can help preserve this feature of records.

Recording disease in forestry is important to know the types of disease and to conduct control methods when they occurred. The expert and supervisor has a responsibility to report the results of surveillance activities, specifically the occurrence, outbreak and spread of plant pests, and efforts to control them. Information gathered through general surveillance will be used most often for reporting to concerned trading partners.

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Pest Control Inspection Report

Inspection Date	Star Time	Finish Time	Warranty	Certificate No

Company Name:

Address:

Phone Number:

Web Site:

Location of Inspection

Address:

City,

State

Phone Number:

Type of Pest	Location	Tolerances	Checking Method	Measured	Infestation	
					Active	None

Treatment Report:

Pests Covered

<input type="checkbox"/> Rats	<input type="checkbox"/> Crawling Insects	<input type="checkbox"/> Cockroaches	<input type="checkbox"/> Fly Control Maintenance
<input type="checkbox"/> Mice	<input type="checkbox"/> Flying Insects	<input type="checkbox"/> Bird Control	<input type="checkbox"/> Others
Next Service Due:			
<input type="checkbox"/> JAN	<input type="checkbox"/> FEB	<input type="checkbox"/> MAR	<input type="checkbox"/> APR
<input type="checkbox"/> JUN	<input type="checkbox"/> JUL	<input type="checkbox"/> AUG	<input type="checkbox"/> SEP
<input type="checkbox"/> OCT	<input type="checkbox"/> NOV	<input type="checkbox"/> DEC	

Technician Signature

Date:

DD/MM/YYYY

Client Signature

Date:

DD/MM/YYYY



Self-Check –1	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Define record. (4pts)
2. What is the importance of establishing communication with client? (3pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points



Information Sheet 2- Recording relevant information and condition

4.2. Recording relevant information and condition

- Identify potential hazards to the health and safety of workers
- Encourage early reporting and corrective actions
- Reduce the number of incidents arising from work activities
- Enable senior management to identify areas concern
- To identify the steps to be taken for reporting difficulties conditions that may arise in the workplace

4.2.1. Principles of Records Management

1. **Justification:** The purpose for which records are maintained should be justifiable. There is no need of keeping all information on the ground that they may be useful in future. If the records are maintained in the light of the principle of purpose, there may be many records which have no purpose and should not be preserved at all.

2. **Verification:** A record should be capable of verification. A record has no value if the concerned record cannot be verifiable.

3. **Classification:** Records should be properly classified according to its requirements in future

4. **Simplicity:** Records should be maintained in a simple manner and according to the requirements of the disease symptom.

5. **Availability of Information:** The desired information should be available when required. All the records are not necessary at one time. Hence, there is no need of instant availability of all the records. But, the required records should be available in the shortest possible period of time.

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6. **Accuracy:** Records should be maintained accurately so as to minimize the chances of errors and fraud.

7. **Reasonable Cost:** The expenses of records management should not be ignored. All types of records have no equal importance. More safety arrangement is necessary to keep valuable and important documents. Some records are more important than others. Hence, safety lockers may be used to keep such records.

8. **Flexibility:** The systems of records maintenance should be elastic.

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Self-Check –2	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. Mention Principles of Records Management (4pts)
2. Mention relevant information to be recorded during disease and pest control.(4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 5 points

Unsatisfactory - below 5 points



Information Sheet 3- Reporting fire detecting processes and outcomes

4.3. Reporting fire detecting processes and outcomes

Report - is a statement of the results of an investigation or of any matter on which definite information is required.

Outline of a Report format

- Title page
- Acknowledgements
- Contents
- Abstract or summary
- Introduction
- Methodology
- Results or findings
- Discussion
- Conclusion and recommendations
- References
- Appendices

Introduction, which:

- gives the background
- explains the purpose, scope and methods used
- outlines the terms of reference

It should be a brief, accurate background for the body of the report

- The body, which covers the work done and what you found. It's divided into topics which are arranged in a logical order with headings and sub-headings

Methodology – methods or procedure used

Result and discussion – out puts of findings

Conclusion covers the writer's judgment based on information in the body of the report

Recommendations:

- ✓ gives solutions to the problems

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- ✓ suggests possible courses of action as a result of the conclusions,
e.g. Who should take action?

What should be done?

When and how it should be done?

Appendices- contain evidence which supports the report but is not essential because it's either too long or too technical for the audience.

Bibliography -includes all sources of information used in the report and often those used for background reading as well.

Glossary- is an alphabetical list of special words, phrases and terms used in the report, accompanied by a short explanation of each.

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Self-Check –3	Written test
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Name..... ID..... Date.....

Directions: Answer all the questions listed below. Examples may be necessary to aid some explanations/answers.

Test I: Short Answer Questions

1. what is documenting information. (3pts)
2. What is a report? (3pts)
3. Write down outline of a Report format(4pts)

You can ask you teacher for the copy of the correct answers.

Note: Satisfactory rating – 6 points

Unsatisfactory - below 6 points

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