[PleaseReview document review. Review title: 2025 Second Consultation: 2021-010- Draft revision of ISPM 26 . Document title: 2021-010\_DraftRev\_ISPM26.docx]

***[1]*****COVER PAPER – BACKGROUND**

***[2]****(Prepared by secretariat)*

***[3]***In May 2024, the Standards Committee (SC) approved the draft revision of ISPM 26(*Establishment and maintenance of pest free areas for fruit flies (Tephritidae)*) (2021-010) for first consultation.

***[4]***The SC noted that the Expert Working Group (EWG) had proposed removing Annex 3 (*Phytosanitary procedures for fruit fly management*), Appendix 1 (*Fruit fly trapping*) and Appendix 2 (*Fruit sampling*) from the draft ISPM 26, identifying this as an implementation issue. To address this, the SC recommended to move the annex and appendices to guidance material for easier updates.

***[5]***Recognizing the importance of providing continued access to the Annex 3, Appendix 1 and Appendix 2 of the currently adopted ISPM 26, the SC reviewed several proposals in May 2025, including those from the SC itself, the Implementation and Capacity Development Committee (IC), and the steward of the draft. The SC agreedto reincorporate the annex and the appendices into the draft revision of ISPM 26 in a separate section at the end of the draft. To distinguish them from the main body of the draft standard and clarify that they are not prescriptive, the annex and the appendices will be renamed as attachments. As they are not subject to consultation, they will be presented in a greyed-out format.

***[6]***In May 2025, in line with this decision, the Standards Committee Working Group (SC-7) revised the draft revision of ISPM 26 and approved it for second consultation.

***[7]***Once the information has been updated and made available as guidance material, these attachments will be removed from this standard.

***[8]*DRAFT REVISION OF ISPM 26: Establishment and maintenance of pest free areas for tephritid fruit flies (2021-010)**

***[9]*Status box**

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| ***[10]***This is not an official part of the standard and it will be modified by the IPPC Secretariat after adoption. |
| ***[11]*Date of this document** | ***[12]***2024-06-02 |
| ***[13]*Document category** | ***[14]***Draft revision of ISPM |
| ***[15]*Current document stage** | ***[16]****To* second consultation  |
| ***[17]*Major stages** | ***[18]***2022-04 CPM-16 added topic *Revision of ISPM 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*)* (2021-010) to the work programme with priority 2.***[19]***2022-11 Standards Committee (SC) approved Specification 75 (*Revision of ISPM 26 (*Establishment of pest free areas for fruit flies (Tephritidae)*)*).***[20]***2023-07 Expert working group drafted the revised standard.***[21]***2024-05 SC revised and approved for first consultation. ***[22]***2024-07 Consultation.***[23]***2025-05 SC-7 revised and approved for second consultation. |
| ***[24]*Steward history** | ***[25]***2022-05 SC Joanne WILSON (NZ, Lead Steward)***[26]***2022-05 SC Prudence ATTIPOE (GH, Assistant Steward) |
| ***[27]*Notes** | ***[28]***This section will remain on the drafts going for consultation but will be deleted before adoption.***[29]***2023-07 Expert working group added “and maintenance” to the title (subsequently agreed by SC, 2024-05)***[30]***2024-02 Edited***[31]***2024-05 Edited***[32]***2025-06 Edited |

***[33]***Adoption

***[34]***Text to this paragraph will be added following adoption.

***[35]***INTRODUCTION

***[36]***Scope

***[37]***This standard provides requirements and guidance for the establishment and maintenance of pest free areas for economically important fruit flies (Tephritidae).

***[38]***If an exporting country has declared a fruit fly to be absent in an area in accordance with ISPM 8 (*Determination of pest status in an area*), then establishing a fruit fly pest free area (FF-PFA) in that area should not be required – and hence this standard will not apply – unless there is technical justification by importing countries.

***[39]***Bibliography

***[40]***References

***[41]***The present standard refers to ISPMs. ISPMs are available on the International Phytosanitary Portal (IPP) at <https://www.ippc.int/core-activities/standards-setting/ispms>.

***[42]***Further reading

***[43]***Information to support the implementation of this standard may be available on the IPP at <https://www.ippc.int/en/about/core-activities/capacity-development/guides-and-training-materials/>.

***[44]*IPPC Secretariat**. 2019. *Guide for establishing and maintaining pest free areas – Understanding the principal requirements for pest free areas, pest free places of production, pest free production sites and areas of low pest prevalence*. IPPC Secretariat. Rome, FAO. xviii + 107 pp. <https://www.ippc.int/en/publications/90620/>

***[45]***Definitions

***[46]***Definitions of phytosanitary terms used in this standard can be found in ISPM 5 (*Glossary of phytosanitary terms*).

***[47]***In this standard, the pest specified in an FF-PFA is referred to as the “target fruit fly” regardless of whether it is a single species, multiple species or multiple genera.

***[48]***Outline of requirements

***[49]***An FF-PFA is a phytosanitary measure that may be used to protect plant resources and facilitate safe trade. National plant protection organizations (NPPOs) should consider an FF-PFA to be a phytosanitary measure that, when used alone, is sufficient for managing the pest risk posed by a specified fruit fly.

***[50]***This standard provides requirements for programmes to establish and maintain an FF-PFA and buffer zone, surveillance activities (fruit fly trapping and fruit sampling), corrective action planning, control measures in the event of pest detections, and the suspension, reinstatement and withdrawal of the FF-PFA designation. It also includes requirements for documentation and record-keeping and for transparency and stakeholder communication.

***[51]***Sterile fruit flies released in a sterile insect technique are not considered to be pests in an FF-PFA, as they may be used as part of a pest control programme in the buffer zone and disperse into the FF-PFA.

***[52]***BACKGROUND

***[53]***Tephritid fruit flies are a very important group of pests for many countries because of their potential to cause damage in host fruit and the potential to restrict trade of host fruit.

***[54]***This standard, which focuses specifically on the establishment and maintenance of pest free areas for fruit flies, supplements the more general guidance on pest free areas provided in ISPM 4 (*Requirements for the establishment of pest free areas*). The measures and specific phytosanitary procedures in this standard target fruit flies of the economically important species of the order Diptera, family Tephritidae, such as the genera *Anastrepha*, *Bactrocera*, *Carpomya* (synonym *Myiopardalis*), *Ceratitis*, *Dacus*, *Euleia*, *Rhagoletis*, *Strauzia* and *Zeugodacus*.

***[55]***Areas initially free from fruit flies may remain naturally free from fruit flies as a result of the presence of physical barriers, unsuitable climatic conditions or the absence of hosts. Other areas initially free from fruit flies may need to be maintained free through restrictions on the movement of regulated articles and related measures (if fruit flies have the potential to establish there). Areas where fruit flies are present may be made free by an eradication programme (ISPM 9 (*Guidelines for pest eradication programmes*)).

***[56]***IMPACTS ON BIODIVERSITY AND THE ENVIRONMENT

***[57]***This standard may contribute to the protection of biodiversity and the environment by preventing the introduction and spread of regulated fruit flies. When establishing and maintaining FF-PFAs, countries are encouraged to consider measures and phytosanitary procedures that minimize impact on biodiversity and the environment.

***[58]***General Requirements

***[59]***When initiating, establishing and maintaining an FF-PFA, NPPOs should follow the requirements outlined in ISPM 4 as well as the requirements in this standard.

***[60]***The decision to establish an FF-PFA may be made based on the factors provided in this standard, such as the biology and ecology of the target fruit fly, the size of the area, the population levels and dispersal pathways of the target fruit fly, the geographical isolation of the area, and the availability of methods for eradication of the target fruit fly.

***[61]***If an FF-PFA is established and maintained in accordance with this standard, importing countries should not require additional phytosanitary measures specific to the target fruit fly for host fruit originating from the FF-PFA.

***[62]***1. Resources and infrastructure

***[63]***When establishing and maintaining an FF-PFA, the NPPO of the exporting country should ensure that it has in place, or has ready access to, adequate infrastructure and operational capability and resources to establish and maintain the FF-PFA.

***[64]***2. Communication and stakeholder engagement

***[65]***An important factor determining the success of an FF-PFA programme is the support and participation of the public close to the area (especially the local community) and individuals who travel to or through the area, including parties with direct or indirect interests. This is particularly so in areas where the risk of introducing the target fruit fly is higher. The NPPO of the exporting country should therefore implement a public-awareness programme. The public and stakeholders should be informed through different media (e.g. written, radio, television, social media, internet) of the importance of establishing and maintaining the FF-PFA, and of avoiding the introduction or reintroduction of potentially infested hosts. This may contribute to and improve compliance with the various measures used to establish and maintain the FF-PFA. The public-awareness programme should be ongoing while the FF-PFA is being maintained.

***[66]***3. Review activities

***[67]***The FF-PFA programme, including regulatory control, surveillance procedures (e.g. trapping, fruit sampling – see details in Annex 1) and corrective action planning (see section 6.3), should comply with phytosanitary procedures.

***[68]***Once the FF-PFA is established, including the administrative activities, the performance of the FF-PFA maintenance programme should be regularly reviewed by the NPPO to verify correct implementation of the maintenance programme. This review should allow the NPPO to find and correct deficiencies, incorporate any new and relevant information on the target fruit fly or associated pathways, and adjust and improve the maintenance programme accordingly.

***[69]***In circumstances where an entity is authorized to undertake certain activities on behalf of an NPPO, this should be done in accordance with ISPM 45 (*Requirements for national plant protection organizations if authorizing entities to perform phytosanitary actions*).

***[70]***4. Documentation and record-keeping

***[71]***The measures and phytosanitary procedures used to establish and maintain an FF-PFA should be adequately documented. They should be reviewed and updated regularly, and they should include corrective actions if required.

***[72]***The records of surveys, detections and incursions should be retained for at least 24 months, depending on the biology of the target fruit fly.

***[73]***Specific requirements

***[74]***4. Initiating the establishment of a fruit fly pest free area

***[75]***When initiating the establishment of an FF-PFA, the NPPO of the exporting country should:

* ***[76]***ensure that a regulatory framework is in place to establish and maintain the FF-PFA;
* ***[77]***describe and delimit the area proposed as an FF-PFA (maps or coordinates showing the boundaries, natural barriers, entrance points and host area locations, and, where necessary, the buffer zone);
* ***[78]***specify the target fruit fly species, describe its biology and ecology, and determine its distribution within, and adjacent to, the proposed area;
* ***[79]***list the commercial and non-commercial host species of the target fruit fly in the proposed area;
* ***[80]***describe potential pathways of entry for the target fruit fly into the proposed area (e.g. movement of commercial and non-commercial hosts and other regulated articles, natural dispersal);
* ***[81]***describe the annual climatic conditions in the proposed area (e.g. rainfall, relative humidity, temperature, prevailing wind speed and direction) and the potential effect of these on the establishment and spread of the target fruit fly; and
* ***[82]***record any other relevant information.

***[83]***5. Establishment of the fruit fly pest free area

***[84]***5.1 Surveillance for the establishment of the fruit fly pest free area

***[85]***General surveillance may be sufficient in cases where the target fruit fly has never been introduced into the area proposed as an FF-PFA, nor into the surrounding areas, and there have been no records of the target fruit fly’s presence in the area proposed as an FF-PFA.

***[86]***If specific surveillance is needed to support the establishment of the FF-PFA, it should be conducted in accordance with Annex 1. A detection survey programme should be implemented (see ISPM 6 (*Surveillance*)). For attractant-responsive species, trapping should be used to determine fruit fly absence or presence in the area with sufficient confidence. Sampling of fruit may be used to complement the trapping programme, including in cases where trapping is less effective (e.g. if species are less attractant-responsive), or instead of the trapping programme where species are not responsive to specific attractants.

***[87]***When specific surveillance is used during the establishment of the FF-PFA, it should be undertaken for a period determined by:

* ***[88]***the biology and the ecology of the target fruit fly;
* ***[89]***the climatic conditions in the area;
* ***[90]***the availability of hosts; and
* ***[91]***the sensitivity of the survey method used (e.g. how effective a trapping network is at detecting an established population).

***[92]***The NPPO of the exporting country should have trained personnel to identify specimens of the target fruit fly in a timely manner.

***[93]***5.2 Controls on the movement of regulated articles

***[94]***Controls on the movement of regulated articles should be applied to prevent the target fruit fly entering and establishing in the area proposed as an FF-PFA. These controls depend on the assessed pest risk (after identification of pathways) and should include:

* ***[95]***regulation of the target fruit fly species;
* ***[96]***the establishment of domestic movement restrictions, phytosanitary import requirements, or other measures to control the movement of regulated articles into or through the area proposed as an FF-PFA;
* ***[97]***inspection of regulated articles, where technically justified, and examination of the relevant documentation; and
* ***[98]***where necessary in cases of non-compliance, the implementation of an appropriate phytosanitary action (e.g. treatment, refusal, destruction).

***[99]***5.3 Establishment of a buffer zone

***[100]***Where the geographical isolation of the area proposed as an FF-PFA is not adequate to prevent the natural spread of the target fruit fly into it, the establishment of a buffer zone should be considered. The population of the target fruit fly in the buffer zone should be maintained at or below a specified level, which should be verified by surveillance. The NPPO should describe, with the use of supporting maps, the boundaries of the buffer zone. Factors that should be considered when determining the boundaries of a buffer zone against the target fruit fly include:

* ***[101]***the biology and ecology of the target fruit fly;
* ***[102]***the rate and range of dispersal of the target fruit fly;
* ***[103]***the population density of the target fruit fly in surrounding areas;
* ***[104]***host availability, host phenology in the previous year, cropping systems, natural vegetation;
* ***[105]***the climatic conditions in the area;
* ***[106]***the geography of the area;
* ***[107]***the likelihood of assisted spread through identified pathways;
* ***[108]***the presence of a system to monitor the target fruit fly in the buffer zone (e.g. trapping network);
* ***[109]***pest-control strategies that may be used; and
* ***[110]***regulation of the target fruit fly and the pathways that require control in relation to the buffer zone.

***[111]***5.4 Additional information for the establishment of the fruit fly pest free area

***[112]***Additional information that may be useful while establishing the FF-PFA includes:

* ***[113]***historical records of detections of, and surveys for, the target fruit fly in the area proposed as an FF-PFA;
* ***[114]***the results of phytosanitary actions taken following detections of the target fruit fly in the area;
* ***[115]***knowledge of hosts in the area; and
* ***[116]***a list of the other fruit fly species of economic importance that may be present in the area.

***[117]***5.5 Criteria for the area to qualify as a fruit fly pest free area

***[118]***For the area to qualify as an FF-PFA, there should be no evidence of a breeding population (established or not) of the target fruit fly. Detection of an immature life stage, or gravid female, of the target fruit fly should be considered a sign of a breeding population. Although the detection of fertile adults may also be evidence of a breeding population, this will depend on the number of adults captured. The number of captured fertile adults required to indicate the presence of a breeding population may be determined in advance by the NPPO of the exporting country. This number will depend on the biology and ecology of the target fruit fly, the trapping sensitivity (trapping density and the response of the target fruit fly to attractants), the distance and time between detections, the climate, the season and the geographical location. Other information obtained, such as from modelling, may also be used to help determine whether a breeding population is present.

***[119]***To provide confidence that the target fruit fly is not present in the area, a determination that the area is free from the target fruit fly should be made only after a sufficient period without evidence of a breeding population. The required period should be predetermined, based on scientific information such as trapping sensitivity, fruit fly fecundity and environmental conditions including temperature, and it should provide a sufficient level of confidence that the area is free from the target fruit fly.

***[120]***Detections of marked sterile fruit flies, such as those that are part of a sterile insect technique programme, do not constitute a breeding population and do not affect the fruit fly free status of an area.

***[121]***5.6 Official designation of the fruit fly pest free area

***[122]***When the pest status in the area is determined as absent in accordance with ISPM 8 (including when the target fruit fly has been eradicated in accordance with ISPM 9) and an FF-PFA has been established in accordance with the requirements of this standard, the NPPO of the exporting country should officially designate the area as an FF-PFA.

***[123]***6. Maintenance of the fruit fly pest free area

***[124]***The NPPO of the exporting country should set up a programme to ensure maintenance of the FF-PFA. This programme should be risk-based and should incorporate at least the following elements:

* ***[125]***a regulatory framework to control the movement of regulated articles;
* ***[126]***surveillance and collection of relevant data to inform the management of the FF-PFA, including a framework for reporting pest detections; and
* ***[127]***a corrective action plan, with associated provisions for suspension and reinstatement of the FF-PFA designation in accordance with ISPM 4.

***[128]***6.1 Controls on the movement of regulated articles

***[129]***Controls on the movement of regulated articles are the same as for the establishment of the FF-PFA (see section 5.3).

***[130]***6.2 Surveillance for maintaining the fruit fly pest free area

***[131]***After declaring the FF-PFA, the surveillance programme should be continued at a level assessed as providing sufficient confidence that the FF-PFA is being maintained. Surveillance records should be well maintained and reports on surveillance activities should be made available on request. The information available in section 5.1 and Annex 1 is relevant to both establishment and maintenance of the FF-PFA.

***[132]***6.3 Corrective actions

***[133]***The NPPO of the exporting country should prepare a corrective action plan to be implemented if an incursion of the target fruit fly is detected in the FF-PFA or the target fruit fly is intercepted in host fruit from that area (see detailed guidance in Annex 2), or if procedures are found to be inadequate for maintenance of the FF-PFA. This plan should cover:

* ***[134]***determination of when the FF-PFA designation, for the whole area or a part of it, should be suspended;
* ***[135]***notification of the suspension of the FF-PFA designation, for the whole area or a part of it, both to stakeholders domestically and to the NPPOs of importing countries receiving host fruit from the FF-PFA, the latter in accordance with ISPM 17 (*Pest reporting*);
* ***[136]***determination of the appropriate, technically justified response to an incursion, depending on the biology and ecology of the target fruit fly and the characteristics of the FF-PFA or part of the FF-PFA, including:
* ***[137]***a delimiting survey or surveys (trapping and fruit sampling) to determine the infested area under corrective actions and whether a target fruit fly population has established in the area,
* ***[138]***eradication measures (see Annex 3),
* ***[139]***increased surveillance, when a breeding population is found, to determine the effectiveness of eradication measures in the infested area and any buffer zone and hence whether the FF-PFA designation may be reinstated,
* ***[140]***movement controls of host fruit,
* ***[141]***communication and stakeholder engagement; and
* ***[142]***determination of the appropriate responses to interceptions of the target fruit fly in consignments originating from the FF-PFA, including:
* ***[143]***a traceback investigation to identify and address, where possible, the cause of the interception.

***[144]***The corrective action plan may include interim measures proportionate to the number of detections in a specified period, agreed between relevant NPPOs to enable the continuation of trade.

***[145]***The corrective action plan should be initiated as soon as possible after the confirmed identification of the target fruit fly.

***[146]***In circumstances where the target fruit fly is considered unable to establish a breeding population within the FF-PFA, no action may be necessary unless the presence of the target fruit fly poses an unacceptable risk to plant trade.

***[147]***7. Suspension, reinstatement or withdrawal of the fruit fly pest free area designation

***[148]***7.1 Suspension

***[149]***The designation of the FF-PFA, or the affected part within the FF-PFA, should be suspended when the presence of a breeding population is determined based on one of the following triggers:

* ***[150]***detection of an immature life stage of the target fruit fly;
* ***[151]***detection of a gravid female;
* ***[152]***detection of fertile adults (depending on the number of adults captured, see section 5.5); or
* ***[153]***interception of the target fruit fly in consignments originating from the FF-PFA.

***[154]***The designation of the FF-PFA, or a part of it, should also be suspended if procedures have been implemented incorrectly (e.g. inadequate trapping, host-movement controls or treatments required to manage the target fruit fly from within the FF-PFA).

***[155]***If there is a detection, the corrective action plan should be implemented as specified in this standard (see Annex 2) and, if the criteria determining the presence of a breeding population are met, the NPPOs of relevant importing countries should be notified in accordance with ISPM 17. Where a suspension is applied, the criteria for lifting the suspension should be made clear to the relevant importing countries.

***[156]***7.2 Reinstatement

***[157]***Reinstatement should be based on the same requirements as for establishment, with the following conditions:

* ***[158]***no further detection of the target fruit fly (other than marked sterile fruit flies) in the suspended area for a period determined by the biology and ecology of the species, the prevailing environmental conditions, and the effectiveness of the surveillance system used (see Annex 1); and
* ***[159]***in the case of a fault in the procedures, only when the fault has been corrected and the consequences have been mitigated.

***[160]***To provide confidence that the target fruit fly is not present in the area, the reinstatement of the FF-PFA designation should occur only after a sufficient period has elapsed without evidence of a breeding population. The required period should be based on the scientific information outlined in section 5.5.

***[161]***The NPPO of the exporting country should notify the NPPOs of relevant importing countries when the FF-PFA designation has been reinstated, in accordance with ISPM 17.

***[162]***7.3 Withdrawal

***[163]***If the target fruit fly becomes established in the whole or a part of the FF-PFA, and if eradication is no longer pursued, the NPPO of the exporting country should withdraw the FF-PFA designation from the whole area or the affected part of it. In this event, the NPPO should notify both stakeholders domestically and the NPPOs of importing countries, the latter in accordance with ISPM 17.

***[164]*Potential implementation issues**

***[165]***This section is not part of the standard. The Standards Committee in May 2016 requested the secretariat to gather information on any potential implementation issues related to this draft. Please provide details and proposals on how to address these potential implementation issues.

***[166]***This annex is a prescriptive part of the standard.

***[167]***ANNEX 1: Specific surveillance for fruit flies (trapping and fruit sampling)

***[168]***This annex contains general information on specific surveillance for fruit flies.

***[169]***1. Trapping procedures

***[170]***Trapping procedures for fruit fly surveys should provide confidence that an FF-PFA is free from breeding populations, be able to rapidly detect any new breeding populations, and support incursion response and the reinstatement of the FF-PFA designation when needed. Factors to consider include:

* ***[171]***the biology and ecology of the target fruit fly;
* ***[172]***the conditions in the survey area (e.g. climate, environment, geography);
* ***[173]***the trap types and attractants;
* ***[174]***the trap density (number of traps per unit area) and their distribution;
* ***[175]***the presence of hosts of the target fruit fly;
* ***[176]***trap servicing (maintaining the traps);
* ***[177]***trap examination and specimen collection;
* ***[178]***record-keeping (including trap locations); and
* ***[179]***the diagnostic capacity and capability of the NPPO to identify target fruit fly species.

***[180]***1.2 Trap type and attractants

***[181]***Several types of traps and attractants have been developed to survey fruit fly populations. The type of attractant selected should be appropriate for the target fruit fly. The type of trap selected should be appropriate for the target fruit fly, the environmental conditions and the nature of the attractant.

***[182]***When trapping multiple species of fruit fly, more than one attractant may be used. However, the potential for interference and cross-contamination between attractants, and the consequential reduction in trap effectiveness, should be considered.

***[183]***1.3 Trap density

***[184]***Trap density (number of traps per unit area) is a critical factor for effective fruit fly surveys. Trap density should be based on the effectiveness of the trap at detecting the target fruit fly, host cultivation practices, and other biotic and abiotic factors (e.g. time of year, climate, existing pest-management practices) that may affect the effectiveness of the survey. Trap density may change depending on the phase of the FF-PFA programme, with the density required during the establishment phase being different to that required during the maintenance phase.

***[185]***1.4 Trap deployment

***[186]***Traps should be strategically placed where they are most likely to detect breeding populations of fruit flies. This includes placing traps in places with conditions favourable to fruit fly breeding and potential incursions. The exact placement of traps within a network should be guided by the characteristics of the area, such as the climate, environment, geography, host presence and distribution, commercial-management practices, and the biology and ecology of the target fruit fly. Trap locations, including their rotation, should align with the sequence of fruit maturity in hosts. In commercial-production areas, the location of traps and the interpretation of results should take account of pest-management practices, such as the regular application of insecticides or other chemicals, that may lead to false-negative results in the trapping programme.

***[187]***Where feasible, the geographical coordinates of deployed traps should be recorded to facilitate the management of a trapping network.

***[188]***1.5 Trap servicing

***[189]***The frequency of trap servicing (maintaining and refreshing the traps) during the period of trapping should depend on the longevity of attractants (attractant persistency) and killing agents, the retention capacity (e.g. sticky traps’ retention capacity declines over time), the rate of catch of target and non-target species, the placement of the traps, the biology and ecology of the target fruit fly species, and environmental conditions.

***[190]***When servicing traps, measures should be taken to avoid cross-contamination between different attractant types (e.g. cue-lure and methyl eugenol). Cross-contamination may reduce trap effectiveness and may delay corrective actions. Attractants are highly volatile and care should be taken when storing, packaging, handling and disposing of attractants to avoid compromising the attractant effectiveness and operator safety. Similarly, care should be taken when handling the trap itself, as mishandling may reduce trap functionality.

***[191]***1.6 Examining traps for fruit flies

***[192]***The frequency with which traps are examined for the presence of fruit flies should be adjusted according to the prevailing environmental conditions, the likely catch rate and the biology and ecology of the target fruit fly.

***[193]***2. Fruit sampling procedures

***[194]***If trapping is not effective (or sensitive) enough to provide sufficient levels of confidence in pest freedom over a suitable period, it may be combined with fruit sampling to improve the overall detection sensitivity. Fruit sampling is particularly effective in small-scale delimiting surveys in an incursion area. Samples should be held in suitable conditions to maintain the viability of all immature stages of fruit flies in infested host fruit for identification.

***[195]***To maximize the ability to detect breeding populations, procedures for sampling fruit as part of a target fruit fly survey should take into consideration:

* ***[196]***factors related to the preferred hosts of the target fruit fly:
* ***[197]***the effect of fruit maturity on infestation,
* ***[198]***the signs or symptoms of infestation of fruit;
* ***[199]***the targeting of areas that are likely to be at high risk of having infested fruit:
* ***[200]***backyards and gardens,
* ***[201]***abandoned places of production,
* ***[202]***host fruit waste collection centres,
* ***[203]***fruit markets,
* ***[204]***host fruit packing, storage, processing and treatment facilities,
* ***[205]***sites with a high concentration of cultivated or wild hosts,
* ***[206]***entrance points into the FF-PFA, where appropriate; and
* ***[207]***the sample size and selection, including consideration of:
* ***[208]***the required level of statistical confidence,
* ***[209]***the availability of hosts in the survey area,
* ***[210]***the targeting of hosts with symptoms of fruit fly damage (e.g. fallen fruit, fruit rejected at packing facilities), where appropriate.

***[211]***3. Handling of samples and identification of species

***[212]***Host fruit samples and the contents of traps should be labelled, transported and held in a secure manner to avoid mixing up host fruit or specimens and to protect the physical integrity of the contents.

***[213]***Samples collected in the field from host fruit or from traps may be brought to a secure facility for fruit flies to be recovered and the species identified. Fruit samples may be dissected immediately or maintained until identifiable fruit fly life stages develop.

***[214]***Information about the sample should be recorded. For example:

* ***[215]***date and location of sample collection;
* ***[216]***type of sample (fruit or trap sample);
* ***[217]***type of trap and type of attractant, if applicable;
* ***[218]***condition of the sample (fresh or decayed);
* ***[219]***name and contact details of person collecting the sample; and
* ***[220]***any other observations.

***[221]***Diagnostic protocols adopted as annexes to ISPM 27 (*Diagnostic protocols for regulated pests*) are available for pest diagnosis.

***[222]***4. Quality assurance of trapping and fruit sampling

***[223]***The NPPO of the exporting country may establish a quality-assurance strategy for the survey to confirm and document that all trapping and fruit sampling protocols have been met. The key elements of the quality-assurance strategy may include verification of attractant effectiveness, placement and recovery of marked sterile flies, regular reviews of survey documentation, audits of trap placement and servicing and of fruit sampling, and confirmation of diagnostic competency.

***[224]***This annex is a prescriptive part of the standard.

***[225]***ANNEX 2: Corrective action plans

***[226]***1. General considerations

***[227]***If the target fruit fly is detected either in an FF-PFA or in host fruit from that area, the NPPO of the exporting country should implement a corrective action plan. However, no action is required if the detection is solely of marked sterile fruit flies.

***[228]***Once it is determined that the detection represents a breeding population, the objective of the corrective action plan should be to ensure eradication of the target fruit fly to enable reinstatement of the FF-PFA designation.

***[229]***The corrective action plan should consider the biology and ecology of the target fruit fly, the prevailing environmental conditions in the FF-PFA (e.g. climate, geography), and the distribution of the target fruit fly and its hosts within the FF-PFA.

***[230]***Before implementing the corrective action plan, the NPPO of the exporting country should ensure that the following elements are in place:

* ***[231]***a regulatory framework under which the corrective action plan can be implemented;
* ***[232]***technical criteria for the determination of a breeding population;
* ***[233]***specified time frames for the initial response;
* ***[234]***technical criteria for the selection of survey (trapping or fruit sampling) parameters and, application of corrective actions for eradication and establishment of regulatory measures;
* ***[235]***the availability of sufficient operational resources and expertise;
* ***[236]***pest diagnostic capability to identify the target fruit fly; and
* ***[237]***effective communication within the NPPO of the exporting country and with the NPPOs of importing countries, including sharing the contact details of all parties involved.

***[238]***2. Actions to implement the corrective action plan

***[239]***2.1 Determination of the pest status upon detection

***[240]***If the detection is of a population that is not able to establish (pest status “present: transient” according to ISPM 8) then no action may be necessary. However, if the presence of the pest poses an unacceptable risk to plant trade, a delimiting survey should be conducted immediately after the detection.

***[241]***If the detection of the target fruit fly could constitute a breeding population that is not transient (i.e. one of the other “present” categories described in ISPM 8), a delimiting survey should be conducted immediately after detection. The delimiting survey may include placement of additional traps and an increased frequency of trap examination and fruit sampling activities.

***[242]***The outcome of the delimiting survey will determine necessary corrective actions. In cases where an established population is present, the delimiting survey is also used to determine the size of the infested area for eradication of the target fruit fly.

***[243]***2.2 Suspension or withdrawal of the fruit fly pest free area designation

***[244]***If a breeding population has established (i.e. if any of the triggers specified in sections 7.1 or 7.3 of the core text of this standard have been reached), the FF-PFA designation of the affected area should be either suspended or withdrawn. The affected area – including the infested area and, where necessary, a buffer zone – may be the whole FF-PFA or part of it. In most cases, the affected area may be delimited by applying a suspension radius that depends on the biology and ecology of the target fruit fly. The same radius may apply for all FF-PFAs for a given target fruit fly unless scientific evidence supports a deviation.

***[245]***2.3 Application of control measures in the affected area

***[246]***Specific corrective actions to eradicate the target fruit fly from the affected area should be implemented immediately and adequately communicated to stakeholders. These actions may include one or more of the following:

* ***[247]***total harvest and destruction, treatment or removal of host fruit;
* ***[248]***destruction of infested host fruit;
* ***[249]***destruction of other plant material;
* ***[250]***soil treatment (chemical or physical);
* ***[251]***insecticide application, including selective insecticide bait treatments;
* ***[252]***biological controls;
* ***[253]***male annihilation technique;
* ***[254]***sterile fly release; or
* ***[255]***mass trapping.

***[256]***Measures should be immediately enforced to control the movement of regulated articles that can host the target fruit fly. These measures may include, as appropriate, fruit disinfestation and the operation of roadblocks to prevent the movement of infested fruit from the affected area to the rest of the FF-PFA. Other measures may be applied, such as increased surveys, supplementary trapping or phytosanitary treatment of host consignments from the affected area, to provide phytosanitary assurances of fruit fly freedom. Interim measures (e.g. phytosanitary treatments, systems approaches) may be agreed with importing countries before a breeding population occurs within the FF-PFA to minimize disruption to trade.

***[257]***Details about control measures for a breeding population within an FF-PFA are given in Annex 3.

***[258]***2.4 Criteria for reinstatement of the fruit fly pest free area designation and actions to be taken

***[259]***The criteria for determining that eradication from the affected area has been successful are specified in section 7.2 of the core text of this standard and should be included in the corrective action plan for the target fruit fly. The length of time before eradication may officially be declared successful depends on the biology and ecology of the species, the prevailing environmental conditions, and the effectiveness of the surveillance used to confirm area freedom. Once the criteria have been fulfilled, the NPPO of the exporting country should reinstate the FF-PFA designation and surveillance levels for the maintenance of the FF-PFA.

***[260]***2.5 Reporting of changes in the fruit fly pest free area

***[261]***The NPPOs of relevant importing countries, and entities authorized to undertake relevant activities on behalf of the NPPO of the exporting country (see ISPM 45), should be kept informed of changes in the FF-PFA, as appropriate, and pest reporting obligations should be observed (see ISPM 17).

***[262]***This annex is a prescriptive part of the standard.

***[263]***ANNEX 3: Control measures when a breeding population is detected within a fruit fly pest free area

***[264]***When a breeding population of the target fruit fly is detected within an FF-PFA, an eradication area (see Figure 1) and related control measures should be initiated. This is the case for both established populations and, where applicable (see section 2 of Annex 2), populations that are not able to establish. The objective should be to eradicate the population of the target fruit fly and restore the FF-PFA, protect the surrounding FF-PFA, and meet the phytosanitary import requirements of importing countries. In particular, control measures are needed because movements of regulated articles from and through an eradication area pose a potential risk of spreading the target fruit fly.

***[265]***1. Initiation of an eradication area

***[266]***The eradication area should be based on a technical evaluation. The designation of the affected area should be suspended. If control measures cannot be applied to initiate an eradication area, then the designation of the FF-PFA should be withdrawn in accordance with this standard.

***[267]***The eradication area should cover the infested area. In addition, where necessary, a buffer zone should be established as determined by delimiting surveys, taking into account the factors listed in section 5.1 of the core text of this standard.

***[268]***A circle delimiting the minimum size of the eradication area should be drawn, centred on the actual detected population of the target fruit fly and with a radius large enough to comply with the above considerations, as determined by the NPPO of the exporting country. In the case of several population detections, several (possibly overlapping) circles may be drawn accordingly, as illustrated in Figure 1.

***[269]***If necessary for the practical implementation of the eradication area, the NPPO of the exporting country may adjust the eradication area to correspond to administrative boundaries or topography.

***[270]***A map with geographical coordinates should be used for delimiting and enabling recognition of the eradication area. Signposts may be placed along boundaries and on roads to alert the public, and notices may be published to facilitate public awareness.

***[271]*Figure 1.** Example of delimiting circles and approximating polygons to determine the eradication area around three detected pest populations.

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***[327]****Notes:* Solid triangles (▲), centre of detected population; solid circles (●), geo-referenced coordinates; red dotted lines, delimiting circles (minimum size of eradication area); black lines, approximating polygons (eradication area adjusted to correspond to administrative boundaries or topography).

***[328]***2. Control measures

***[329]***Each stage of the production chain (e.g. growing, sorting, packing, transporting, distribution) may lead to the target fruit fly entering the FF-PFA from the eradication area. This is not the case, however, for any facilities located within the FF-PFA that handle only host fruit from the FF-PFA. Appropriate control measures should be applied to manage the pest risk to the surrounding FF-PFA and any importing countries.

***[330]***Control measures applied at each stage of the production chain are described in the following sections.

***[331]***2.1 Production

***[332]***During the production period within the eradication area, the NPPO of the exporting country may require the application of control measures to avoid infestation, such as mechanical and cultural controls (e.g. removal and destruction of host fruit, soil swamping and ploughing), chemical treatment of soil, fruit bagging, insecticide baits, bait stations, male annihilation technique, mass trapping, sterile insect technique and biological control.

***[333]***2.2 Movement of regulated articles

***[334]***To prevent the spread of the target fruit fly, regulated articles (e.g. host fruit, soil, contaminated equipment and waste) being moved from, through or within the eradication area should be transported in a way that prevents infestation and contamination. This also pertains to moving regulated articles for phytosanitary certification.

***[335]***2.3 Packing, storage, processing and treatment facilities

***[336]***Facilities packing, storing, processing or treating fruit fly host fruit may be located within the eradication area or in the FF-PFA. Control measures to prevent the target fruit fly entering the FF-PFA from the eradication area should be considered for each type of facility. The NPPO of the exporting country should have a clear overview of all facilities located within the FF-PFA and eradication area. The NPPO should require that all facilities within the FF-PFA and eradication area are registered, audited and have appropriate control measures in place to do the following:

* ***[337]***maintain traceability of host fruit;
* ***[338]***prevent the target fruit fly from entering or escaping the facility;
* ***[339]***monitor regularly for the presence or absence of the target fruit fly in and around the facility;
* ***[340]***eliminate fruit flies if detected in and around the facility;
* ***[341]***prevent mixing of host fruit originating from areas of different pest status (e.g. by consignment segregation, insect proofing to prevent contamination); and
* ***[342]***securely dispose of rejected fruit.

***[343]***2.7 Sale inside the eradication area

***[344]***Host fruit sold within the eradication area may be at risk of infestation if exposed before being sold (e.g. placed on display in an open-air market) and may therefore need to be physically protected to avoid spread of the target fruit fly while on display and being stored. If at risk of infestation and not physically protected, the host material should not be moved outside the eradication area after being exposed.

***[345]***3. Documentation and record-keeping

***[346]***The control measures, including corrective actions, used in the eradication area should be adequately documented, reviewed and updated (see also ISPM 4) and these records should be retained for at least 24 months. Such documents should be made available to the NPPO of importing countries on request.

***[347]***4. Termination of control measures in the eradication area

***[348]***To be considered successful, eradication of the target fruit fly in the eradication area should meet the requirements for reinstatement of FF-PFA designation after an incursion is detected, in accordance with this standard (see section 7.2 of the core text of this standard).

***[349]***The control measures should remain in force until eradication is declared. If eradication is successful, the control measures in the eradication area may be terminated and the FF-PFA designation may be reinstated. If eradication is unsuccessful, the FF-PFA delimitation should be modified accordingly. The NPPOs of relevant importing countries should be notified.

***[350]***ATTACHMENTS

***[351]***Guidance material for further reading

***[352]***It is intended that Annex 3, Appendix 1 and Appendix 2 of ISPM 26 as adopted in 2015 are moved to guidance material so that they can be updated more easily. To ensure that this information is not lost in the interim period, it is provided as attachments to this standard. Once the information has been updated and made available as guidance material, these attachments will be removed from this standard.

***[353]***This attachment is for reference purposes only and is not a prescriptive part of this standard.

***[354]***ATTACHMENT 1: Phytosanitary procedures for fruit fly management (formerly Annex 3 of ISPM 26, adopted in 2015)

***[355]***This annex provides guidance for the application of phytosanitary procedures for fruit fly management.

***[356]***Various phytosanitary procedures are used for fruit fly suppression, containment, eradication and exclusion. These procedures may be applied to establish and maintain FF-PFAs (this standard), and to develop a systems approach for fruit flies, which may include the establishment and maintenance of fruit fly areas of low pest prevalence (FF-ALPPs) (ISPM 35 (*Systems approach for pest risk management of fruit flies (Tephritidae)*)).

***[357]***The phytosanitary procedures include mechanical and cultural controls, insecticide bait application technique (BAT), bait stations, male annihilation technique (MAT), mass trapping, sterile insect technique (SIT), biological control, and controls on the movement of regulated articles. Many of these procedures can be environmentally friendly alternatives to insecticide application for managing fruit flies.

***[358]***1. Objectives of Fruit Fly Management Strategies

***[359]***The four strategies used to manage target fruit fly populations are suppression, containment, eradication and exclusion. One or more of these strategies can be used depending on the circumstances and objectives. The corresponding phytosanitary procedures used for fruit fly management should take into account the phytosanitary import requirements of the importing country, fruit fly status in the target area, hosts, host phenology and host susceptibility, pest biology, and economic and technical feasibility of the available phytosanitary procedures, as relevant.

***[360]***1.1 Suppression

***[361]***Suppression strategies may be applied for purposes such as to:

* ***[362]***reduce a target fruit fly population to below an acceptable level
* ***[363]***establish an FF-ALPP (ISPM 22 (*Requirements for the establishment of areas of low pest prevalence*); ISPM 35)
* ***[364]***implement a corrective action in an FF-ALPP when the specified level of low pest prevalence has been exceeded (ISPM 22; ISPM 35)
* ***[365]***reduce a target fruit fly population in order to achieve a specified pest population level that can be used as part of a systems approach (ISPM 14 (*The use of integrated measures in a systems approach for pest risk management*); ISPM 35)
* ***[366]***precede, as part of a process, target fruit fly population eradication in order to establish an FF-PFA (ISPM 4).

***[367]***1.2 Containment

***[368]***Containment strategies may be applied for purposes such as to:

* ***[369]***prevent the spread of a target fruit fly from an infested area to an adjacent FF-PFA
* ***[370]***contain an incursion of a target fruit fly into non-infested areas
* ***[371]***protect, as a temporary measure, individual areas where target fruit flies have been eradicated as part of an ongoing eradication programme in a larger area.

***[372]***1.3 Eradication

***[373]***Eradication strategies may be applied for purposes such as to:

* ***[374]***eliminate a fruit fly population in order to establish an FF-PFA (ISPM 4)
* ***[375]***eliminate an incursion of a fruit fly species that is a quarantine pest before establishment can occur (this may be part of a corrective action plan in an FF-PFA if the target fruit fly species is detected).

***[376]***1.4 Exclusion

***[377]***Exclusion strategies may be applied to prevent the introduction of a fruit fly into an FF-PFA.

***[378]***2. Requirements for the Application of the Phytosanitary Procedures

***[379]***The following requirements should be considered when applying phytosanitary procedures for fruit fly management:

***[380]***2.1 Fruit fly identification capabilities

***[381]***Accurate identification of the target fruit fly species should be ensured so that the appropriate strategies and phytosanitary procedures can be selected and applied. NPPOs should have access to trained personnel to identify detected specimens of adult and, where possible, immature stages of the target fruit fly species in an expeditious manner (ISPM 6 (*Guidelines for surveillance*)).

***[382]***2.2 Knowledge of fruit fly biology

***[383]***The biology of the target fruit fly species should be known in order to determine the appropriate strategy to address its management and select the phytosanitary procedures that will be applied. Basic information on the target fruit fly species may include life cycle, hosts, host sequence, host distribution and abundance, dispersal capacity, geographical distribution and population dynamics. The climatic conditions may also affect the strategy adopted.

***[384]***2.3 Area delimitation

***[385]***The area in which the phytosanitary procedures will be applied should be delimited. Geographical characteristics and host distribution within this area should be known.

***[386]***2.4 Stakeholder participation

***[387]***Successful implementation of fruit fly phytosanitary procedures requires active and coordinated participation of interested and affected groups, including government, local communities and industry.

***[388]***2.5 Public awareness

***[389]***An ongoing public awareness programme should be put in place to inform interested and affected groups about the pest risk and phytosanitary procedures that will be implemented as part of the fruit fly management strategy. Such a programme is most important in areas where the risk of introduction of the target fruit fly species is high. For the success of the management programme it is important to have the support and participation of the public (especially the local community) within the management programme area and of individuals who travel to or through the area.

***[390]***2.6 Operational plans

***[391]***An official operational plan that specifies the required phytosanitary procedures should be developed. This operational plan may include specific requirements for the application of phytosanitary procedures and describe the roles and responsibilities of the interested and affected groups (ISPM 4; ISPM 22).

***[392]***3. Phytosanitary Procedures Used in Fruit Fly Management Strategies

***[393]***Fruit fly management strategies may involve the use of more than one phytosanitary procedure.

***[394]***Phytosanitary procedures may be applied in an area, at a place of production or at a production site; during the pre- or post-harvest period; at the packing house; or during shipment or distribution of the commodity. Pest free areas, pest free places of production and pest free production sites may require the establishment and maintenance of an appropriate buffer zone. Appropriate phytosanitary procedures may be applied in the buffer zone if necessary (this standard and ISPM 10 (*Requirements for the establishment of pest free places of production and pest free production sites*)).

***[395]***3.1 Mechanical and cultural controls

***[396]***Mechanical and cultural control procedures may be applied in order to reduce the level of fruit fly populations. These controls include phytosanitary procedures such as orchard and field sanitation, fruit stripping, pruning, host plant removal or netting, fruit bagging, host-free periods, use of resistant varieties, trap cropping, ploughing and ground swamping.

***[397]***The effectiveness of field sanitation increases when the collection and disposal of fallen fruit are focused on the preferred hosts and are done continuously on an area-wide basis. For good results, collection and disposal should be done before, during and after harvest.

***[398]***Fruit that remains on the host plants after harvest, fruit rejected because of poor quality during harvest and packing, and fruit on host plants present in the surrounding area should be collected and safely disposed of (e.g. by deep burial).

***[399]***Elimination or maintaining a low level of vegetation at the place of production will facilitate collection of fallen fruit. In addition, when vegetation is kept low fallen fruit with larvae may be more exposed to direct sunlight and natural enemies, which will contribute to fruit fly larvae mortality.

***[400]***Bagging of fruit and use of exclusion netting can prevent fruit fly infestation of the fruit. Where used, bagging or exclusion netting should be carried out before the fruit becomes susceptible to fruit fly infestation.

***[401]***The pupae of many fruit flies can be targeted by disturbing the soil medium in which they pupate. This can be done by ground swamping (causing pupae anoxia) or ploughing (causing physical damage, desiccation to the pupae and exposing them to natural enemies).

***[402]***3.2 Insecticide bait application technique

***[403]***BAT uses an appropriate insecticide mixed together with a food bait. Commonly used food baits include attractants such as hydrolysed protein, high-fructose syrup and molasses, used alone or in combination. This technique is an effective control of adult fruit fly populations and reduces the negative impacts on non-target insects and the environment.

***[404]***Insecticide bait applications should start in time to target maturing adults and to prevent the infestation of fruit. For fruit protection this may be up to three months before the beginning of the harvesting season for fruit intended for export or on detection of the first adult flies or larvae in the field or urban area. Maturing adults should be targeted as this is when protein demands are at their highest. The number of and intervals between applications will depend on the characteristics of the target fruit fly species (biology, abundance, behaviour, distribution, life cycle, etc.), host phenology and weather conditions.

***[405]***Insecticide baits can be applied from the ground or from the air.

***[406]***3.2.1 Ground application

***[407]***Ground application of insecticide bait is usually used for relatively small production areas, such as individual orchards, or in urban areas.

***[408]***The insecticide bait should generally be applied on or inside the middle to top part of the canopy of host and shelter plants, but specific application should relate to the height of the host plant. For low-growing host plants (e.g. cucurbits, tomatoes, peppers), the insecticide bait should be applied on taller plants surrounding the cultivated area that serve as shelter and a source of food. In FF-PFAs, as part of an emergency action plan to eliminate an outbreak, the insecticide bait can also be applied to non-host plants or other appropriate surfaces around the detection site.

***[409]***3.2.2 Aerial application

***[410]***Aerial application of insecticide bait may be used on large production areas and in areas where hosts are scattered in patches over large areas of land. Aerial spraying may be more cost-effective than ground spraying for large-scale programmes, and a more uniform coverage of bait in the target area may be achieved. In some countries, however, aerial spraying may be subject to restrictions due to environmental considerations.

***[411]***Once the treatment area is selected, it may be defined using a georeferencing device and recorded in digitized maps using GIS software in order to ensure the efficient application of bait sprays and reduce the environmental impact.

***[412]***To treat the target area, insecticide bait may not need to be applied as full coverage but only in some swathes, such as every second or third swathe. The altitude and speed of aerial application should be adjusted to conditions such as bait viscosity and nozzle specifications, wind velocity, temperature, cloud cover and topography of the terrain.

***[413]***3.3 Bait stations

***[414]***Lure and kill devices known as “bait stations” may be a more environmentally friendly control procedure for fruit fly suppression than BAT. Bait stations consist of an attractant and a killing agent that may be contained in a device or directly applied to an appropriate surface. Unlike traps, bait stations do not retain the attracted fruit flies.

***[415]***Bait stations are suitable for use in, for example, commercial fruit production operations, area-wide fruit fly management programmes, public areas and, in many cases, organic groves. Bait stations may be used in FF-PFAs for population suppression of localized and well-isolated outbreaks. In infested areas known to be fruit fly reservoirs and sources of incursions into FF-ALPPs and FF-PFAs, bait stations should be deployed at high densities.

***[416]***It is recommended that the attractant used in the bait station be female-biased, thereby directly reducing the overall fruit infestation.

***[417]***3.4 Male annihilation technique

***[418]***MAT involves the use of a high density of bait stations consisting of a male lure combined with an insecticide to reduce the male population of target fruit flies to such a low level that mating is unlikely to occur (FAO, 2017).

***[419]***MAT may be used for the control of those fruit fly species of the genera *Bactrocera* and *Dacus* that are attracted to male lures (cuelure or methyl eugenol). Methyl eugenol is more effective than cuelure for male annihilation of species attracted to these lures.

***[420]***3.5 Mass trapping

***[421]***Mass trapping uses trapping systems at a high density to suppress fruit fly populations. In general, mass trapping procedures are the same as for trapping used for survey purposes (Appendix 1 of this standard). Traps should be deployed at the place of production early in the season when the first adult flies move into the field and populations are still at low levels and should be serviced appropriately.

***[422]***Trap density should be based on such factors as fruit fly density, physiological stage of the fruit fly, efficacy of the attractant and killing agent, phenology of the host and host density. The timing, layout and deployment of traps should be based on the target fruit fly species and host ecological data.

***[423]***3.6 Sterile insect technique

***[424]***The SIT is a species-specific environmentally friendly technique that can provide effective control of target fruit fly populations (FAO, 2017).

***[425]***SIT is effective only at low population levels of the target species and may be used for:

* ***[426]***suppression, where SIT may be a stand-alone phytosanitary procedure or combined with other phytosanitary procedures to achieve and maintain low population levels
* ***[427]***containment, where SIT may be particularly effective in areas that are largely pest free (such as buffer zones) but that are subjected to regular pest entries from adjacent infested areas
* ***[428]***eradication, where SIT may be applied when population levels are low to eradicate the remaining population
* ***[429]***exclusion, where SIT may be applied in endangered areas that are subject to high pest pressure from neighbouring areas.

***[430]***3.6.1 Sterile fruit fly release

***[431]***Sterile fruit flies may be released from the ground or from the air. Release intervals should be adjusted according to the longevity of the insect. Sterile fruit flies are generally released once or twice per week but the frequency of release may be influenced by circumstances such as pupae supply, staggered adult fly emergence and unfavourable weather. To establish sterile fruit fly release density, the quality of the sterile fruit flies, the level of the wild population and the desired sterile: wild fruit fly ratio should be considered.

***[432]***After release of the sterile fruit flies, trapping and identification of the sterile and wild flies should be performed in order to evaluate the effectiveness of the release procedure and also to prevent unnecessary corrective actions. Released sterile flies should be recaptured in the same traps that are used for detection of the wild population as this provides feedback on whether the desired sterile fruit fly density and sterile: wild fly ratio were attained (FAO, 2017).

***[433]***Ground release may be used when aerial release is neither cost-effective nor efficient (i.e. discontinuous distribution or relatively small area), or where additional releases are required to provide a higher density of fruit flies for a particular reason (e.g. in areas where a specified level of low pest prevalence is exceeded).

***[434]***Aerial release is more cost-effective than ground release for large-scale programmes and it provides a more uniform sterile fruit fly distribution than ground release, which may clump sterile fruit flies in localized sites or along release routes. Once the release area is selected, it may be defined using a georeferencing device and recorded in digitized maps using GIS software: this will help ensure the efficient distribution of sterile flies. The most common methods for aerial release are chilled adult and paper bag systems (FAO, 2017).

***[435]***To determine the release altitude, several factors should be considered, including wind velocity, temperature, cloud cover, topography of the terrain, vegetation cover, and whether the target area is urban or rural. Release altitudes range from 200 to 600 m above ground level. However, lower release altitudes should be preferred, especially in areas subjected to strong winds (to prevent excessive sterile fruit fly or bag drift) and in areas where predation by birds is high and frequent. Release in the early morning, when winds and temperature are moderate, is preferable.

***[436]***3.6.2 Sterile fruit fly quality control

***[437]***Routine and periodic quality control tests should be carried out to determine the effect of mass rearing, irradiation, handling, shipment duration, holding and release on the performance of the sterile fruit flies, according to desired quality parameters (FAO/IAEA/USDA, 2014).

***[438]***3.7 Biological control

***[439]***Classic biological control may be used to reduce fruit fly populations. For further suppression, inundative release may be used. During inundative release, large numbers of natural enemies, typically parasitoids, are mass reared and released during critical periods to reduce pest populations. The use of biological control by inundation is limited to those biological control agents for which mass-rearing technology is available. The mass-reared natural enemies should be of high quality so that suppression of the target fruit fly population can be effectively achieved. The release of the biological control agents should be directed towards marginal and difficult to access areas that have high host density and that are known to be fruit fly reservoirs and sources of infestation for commercial fruit production or urban areas.

***[440]***3.8 Controls on the movement of regulated articles

***[441]***For FF-PFAs, and under certain circumstances for FF-ALPPs, controls on the movement of regulated articles should be implemented to prevent the entry or spread of target fruit fly species (see details in Annex 1 of this standard).

***[442]***4. Materials Used in the Phytosanitary Procedures

***[443]***The materials used in the phytosanitary procedures should perform effectively and reliably at an acceptable level for an appropriate period of time. The devices and equipment should maintain their integrity for the intended duration that they are deployed in the field. The attractants and chemicals should be certified or bio-assayed for an acceptable level of performance.

***[444]***5. Verification and Documentation

***[445]***The NPPO should verify the effectiveness of the chosen strategies (suppression, containment, eradication and exclusion) and relevant phytosanitary procedures. The main phytosanitary procedure used for verification is adult and larval surveillance, as described in ISPM 6.

***[446]***NPPOs should ensure that records of information supporting all stages of the suppression, containment, eradication and exclusion strategies are kept for at least 24 months.

***[447]***6. References

***[448]*FAO/IAEA** (International Atomic Energy Agency)**. 2017.** *Guideline for packing, shipping, holding and release of sterile flies in area-wide fruit fly control programmes*, Second edition, by Zavala-López J.L. and Enkerlin W.R. (eds.). Rome, Italy. 140 pp.

***[449]*FAO/IAEA** (International Atomic Energy Agency)**/USDA** (United States Department of Agriculture)**.** 2014. *Product quality control for sterile mass-reared and released tephritid fruit flies*. Version 6.0. Vienna, IAEA. 164 pp.

***[450]***This attachment is for reference purposes only and is not a prescriptive part of the standard.

***[451]***ATTACHMENT 2: Fruit fly trapping (formerly Appendix 1 of ISPM 26, adopted in 2011)

***[452]***This appendix provides detailed information for trapping procedures for fruit fly species (Tephritidae) of economic importance under different pest statuses. Specific traps, in combination with attractants and killing and preserving agents, should be used depending on the technical feasibility, the species of fruit fly and the pest status of the area, which can be an infested area, an FF-ALPP, or an FF-PFA. It describes the most widely used traps, including materials such as trapping devices and attractants, and trap densities, as well as procedures including evaluation, data recording and analysis.

***[453]***Additional information about fruit fly trapping is available in the following publication of the Food and Agriculture Organization of the United Nations (FAO) and the International Atomic Energy Agency (IAEA) (in English only):

***[454]*FAO/IAEA** (International Atomic Energy Agency). 2018. *Trapping guidelines for area-wide fruit fly programmes*, 2nd edn, eds W.R. Enkerlin & J. Reyes-Flores. Rome, FAO. 65 pp. Available at <https://www.iaea.org/about/insect-pest-control-section> (last accessed 1 October 2018).

***[455]***Diagnostic protocols adopted as annexes to ISPM 27 (*Diagnostic protocols for regulated pests*) may be useful tools to diagnose the adult fruit fly specimens.

***[456]***1. Pest Status and Survey Types

***[457]***There are five pest statuses where surveys may be applied:

***[458]***A. Pest present without control. The pest is present but not subject to any control measures.

***[459]***B. Pest present under suppression. The pest is present and subject to control measures. Includes FF-ALPP.

***[460]***C. Pest present under eradication. The pest is present and subject to control measures. Includes
FF-ALPP.

***[461]***D. Pest absent and FF-PFA being maintained. The pest is absent (e.g. eradicated, no pest records, no longer present) and measures to maintain pest absence are being applied.

***[462]***E. Pest transient. Pest under surveillance and actionable, under eradication.

***[463]***The three types of surveys and corresponding objectives are:

* ***[464]*monitoring surveys**, conducted to verify the characteristics of the pest population
* ***[465]*delimiting** s**urveys**, conducted to establish the boundaries of an area considered to be infested by or free from the pest
* ***[466]*detection surveys**, conducted to determine if the pest is present in an area.

***[467]***Monitoring surveys are necessary to verify the characteristics of the pest population before the initiation or during the application of suppression and eradication measures to verify the population levels and to evaluate the efficacy of the control measures. These surveys are necessary for situations A, B and C. Delimiting surveys are conducted to determine the boundaries of an area considered to be infested by or free from the pest such as boundaries of an established FF-ALPP (situation B) (Annex 1 of ISPM 35) and as part of a corrective action plan when the pest exceeds the established low pest prevalence level or in an FF-PFA (situation E) as part of a corrective action plan when a detection occurs. Detection surveys are conducted to determine if the pest is present in an area, that is, to demonstrate pest absence (situation D) and to detect a possible entry of the pest into the FF-PFA (pest transient, actionable) (ISPM 8 (*Determination of pest status in an area*)).

***[468]***Additional information on how or when specific types of surveys should be applied can be found in other standards dealing with specific topics such as pest status, eradication, pest free areas or areas of low pest prevalence.

***[469]***2. Trapping Scenarios

***[470]***As the pest status may change over time, the type of survey needed may also change:

* ***[471]***Pest present. Starting from an established population with no control (situation A), phytosanitary measures may be applied, and potentially lead to an FF-ALPP (situation B and C) or an FF-PFA (situation D).
* ***[472]***Pest absent. Starting from an FF-PFA (situation D), either the pest status is maintained or a detection occurs (situation E), where measures aimed at restoring the FF-PFA would be applied.

***[473]***3. Trapping Materials

***[474]***The effective use of traps relies on the proper combination of trap, attractant and killing agent to attract, capture, kill and preserve the target fruit fly species for effective identification, counting and data analysis. Traps for fruit fly surveys use the following materials, as appropriate:

* ***[475]***a trapping device
* ***[476]***attractants (pheromones, male lures and food attractants)
* ***[477]***killing agents in wet and dry traps (with physical or chemical action)
* ***[478]***preservation agents (wet or dry traps).

***[479]***3.1 Attractants

***[480]***Some fruit fly species of economic importance and the attractants commonly used to capture them are presented in Table 1. The presence or absence of a species from this table does not indicate that pest risk analysis has been performed and in no way is presence or absence indicative of the regulatory status of a fruit fly species.

***[481]*Table 1.** A number of fruit fly species of economic importance and commonly used attractants

| ***[482]*Species** | ***[483]*Attractant** |
| --- | --- |
| ***[484]****Anastrepha fraterculus* (Wiedemann)4 | ***[485]***Protein attractant (PA) |
| ***[486]****Anastrepha grandis* (Macquart) | ***[487]***PA |
| ***[488]****Anastrepha ludens* (Loew) | ***[489]***PA, 2C-11  |
| ***[490]****Anastrepha obliqua* (Macquart) | ***[491]***PA, 2C-11  |
| ***[492]****Anastrepha serpentina* (Wiedemann)  | ***[493]***PA |
| ***[494]****Anastrepha striata* (Schiner) | ***[495]***PA |
| ***[496]****Anastrepha suspensa* (Loew) | ***[497]***PA, 2C-11 |
| ***[498]****Bactrocera carambolae* (Drew & Hancock) | ***[499]***Methyl eugenol (ME) |
| ***[500]****Bactrocera caryeae* (Kapoor) | ***[501]***ME |
| ***[502]****Bactrocera correcta* (Bezzi) | ***[503]***ME |
| ***[504]****Bactrocera dorsalis* (Hendel)4 | ***[505]***ME, 3C2 |
| ***[506]****Bactrocera kandiensis* (Drew & Hancock)***[507]****Bactrocera musae* (Tryon) | ***[508]***ME***[509]***ME |
| ***[510]****Bactrocera occipitalis* (Bezzi)  | ***[511]***ME |
| ***[512]****Bactrocera umbrosa* (Fabricius) | ***[513]***ME |
| ***[514]****Bactrocera zonata* (Saunders) | ***[515]***ME, 3C2, ammonium acetate (AA) |
| ***[516]****Bactrocera cucurbitae* (Coquillett) | ***[517]***Cuelure (CUE), 3C2, AA |
| ***[518]****Bactrocera neohumeralis* (Hardy) | ***[519]***CUE |
| ***[520]****Bactrocera tau* (Walker) | ***[521]***CUE |
| ***[522]****Bactrocera tryoni* (Froggatt) | ***[523]***CUE |
| ***[524]****Bactrocera minax* (Enderlein) | ***[525]***PA |
| ***[526]****Bactrocera cucumis* (French) | ***[527]***PA |
| ***[528]****Bactrocera jarvisi* (Tryon) | ***[529]***PA, zingerone |
| ***[530]****Bactrocera latifrons* (Hendel) | ***[531]***PA |
| ***[532]****Bactrocera oleae* (Gmelin) | ***[533]***PA, ammonium bicarbonate (AC), spiroketal (SK) |
| ***[534]****Bactrocera tsuneonis* (Miyake) | ***[535]***PA |
| ***[536]****Ceratitis capitata* (Wiedemann) | ***[537]***Trimedlure (TML), Capilure (CE), PA, 3C2, 2C-23 |
| ***[538]****Ceratitis cosyra* (Walker) | ***[539]***PA, 3C2, 2C-23 |
| ***[540]****Ceratitis rosa* (Karsch) | ***[541]***TML, PA, 3C2, 2C-23 |
| ***[542]****Dacus ciliatus* (Loew) | ***[543]***PA, 3C2, AA |
| ***[544]****Myiopardalis pardalina* (Bigot) | ***[545]***PA |
| ***[546]****Rhagoletis cerasi* (Linnaeus) | ***[547]***Ammonium salts (AS), AA, AC |
| ***[548]****Rhagoletis cingulata* (Loew) | ***[549]***AS, AA, AC |
| ***[550]****Rhagoletis indifferens* (Curran) | ***[551]***AA, AC |
| ***[552]****Rhagoletis pomonella* (Walsh) | ***[553]***Butyl hexanoate, AS |
| ***[554]****Toxotrypana curvicauda* (Gerstaecker) | ***[555]***2-Methyl-vinylpyrazine |

***[556]***1 Two-component (2C-1) synthetic food attractant (ammonium acetate and putrescine), mainly for female captures.

***[557]***2 Three-component (3C) synthetic food attractant (ammonium acetate, putrescine, trimethylamine), mainly for female captures.

***[558]***3 Two-component (2C-2) synthetic food attractant (ammonium acetate and trimethylamine), mainly for female captures.

***[559]***4 Taxonomic status of some listed members of the *Bactrocera dorsalis* complex and of *Anastrepha fraterculus* is uncertain.

***[560]***3.1.1 Male-specific attractants

***[561]***The most widely used attractants are pheromones or male lures that are male-specific. The male lure trimedlure (TML) captures species of the genus *Ceratitis* (including *C. capitata* and *C. rosa*). The male lure methyl eugenol (ME) captures a large number of species of the genus *Bactrocera* (including *B. carambolae, B. dorsalis, B. musae,* and *B. zonata*). The pheromone spiroketal captures *B. oleae*. The male lure cuelure (CUE) captures a large number of other *Bactrocera* species, including *B. cucurbitae* and *B. tryoni*. Male lures are generally highly volatile and can be used with a variety of traps (examples are listed in Table 2a). Controlled-release formulations exist for TML, CUE and ME, providing a longer-lasting attractant for field use. It is important to be aware that some inherent environmental conditions may affect the longevity of pheromone and male lures.

***[562]***3.1.2 Female-biased attractants

***[563]***Female-specific pheromones are not usually commercially available (except, for example, 2-methyl-vinylpyrazine). Therefore, the female-biased attractants (natural, synthetic, liquid or dry) that are commonly used are based on food or host odours (Table 2b). Historically, liquid protein attractants (PAs) have been used to capture a wide range of fruit fly species. Liquid PAs capture both females and males. These liquid PAs are generally less sensitive than the male lures. In addition, liquid PAs capture high numbers of non-target insects and require more frequent servicing.

***[564]***Several food-based synthetic attractants have been developed using ammonia and its derivatives. These may reduce the number of non-target insects captured. For example, for capturing *C. capitata* a synthetic food attractant consisting of three components (ammonium acetate, putrescine and trimethylamine) is used. For capturing *Anastrepha* species the trimethylamine component may be removed. A synthetic attractant lasts approximately four to ten weeks, depending on climatic conditions. It captures few non-target insects and significantly fewer male than female fruit flies, making this attractant suited for use in sterile fruit fly release programmes. New synthetic food attractant technologies are available, including the long-lasting three-component and two-component mixtures contained in the same patch, as well as the three component mixture incorporated in a single cone-shaped plug.

***[565]***Because food-foraging female and male fruit flies respond to synthetic food attractants at the sexually immature adult stage, these attractant types are capable of detecting female fruit flies earlier and at lower population levels than liquid PAs.

***[566]***This attachment is for reference purposes only and is not a prescriptive part of the standard.

***[567]***ATTACHMENT 3: Fruit sampling (formerly Appendix 2 of ISPM 26, adopted in 2006)

***[568]***Information about fruit sampling is available in *Fruit sampling guidelines for area-wide fruit fly programmes*, published in 2017 by FAO and the International Atomic Energy Agency (IAEA) (in English only) and available at: <https://www.iaea.org/about/insect-pest-control-section>.

***[569]***IPPC Diagnostic protocols adopted as annexes to ISPM 27 (*Diagnostic protocols for regulated pests*) may be useful tools to diagnose the larvae of fruit fly specimens.