

U.S. Department of Interior
U.S. Fish and Wildlife Service
Integrated Pest Management:
Guidance for Preparing and Implementing
Integrated Pest Management Plans

What is the purpose of this guidance?

This guidance is for Fish and Wildlife Service (we, us, Service) stations that want to develop and implement an Integrated Pest Management (IPM) plan at sites we own or manage where pest management activities occur. This guidance serves as a tool to help us achieve the lowest risk, most targeted approach for managing pest species. As we update our pest management policies, this guidance will be issued as a handbook with the updated policies.

What are the applicable authorities?

As stated in 7 USC 136r-1, "Federal agencies shall use Integrated Pest Management techniques in carrying out pest management activities and shall promote Integrated Pest Management through procurement and regulatory policies, and other activities." President Carter's 1979 Presidential Memorandum directed all federal agencies to adopt IPM strategies wherever practical. Departmental and many of our own policies instruct us to adopt IPM strategies and plans, including 517 DM 1, 30 AM 12, 7 RM 14, and 620 FW 1.

What is a pest?

A pest is an organism that interferes with desired resource management goals, or any organism that may cause damage to a resource that you are trying to protect. Some questions to think about when managing pests are 1) Is it a pest that occurs at levels that prevent completion of management goals, 2) Is it a native or exotic species? 3) What conditions foster the pest? 4) What are the chances of successful pest management?

What is Integrated Pest Management?

The legal definition of IPM is "a sustainable approach to managing pests by combining biological, cultural, physical, and chemical tools in a way that minimizes economic, health, and environmental risks" (7 USC 136r-1). IPM is a long-standing, science-based, decision-making process that identifies and reduces risks from pests and pest management related strategies. It coordinates the use of pest biology, environmental information, and available technology to prevent unacceptable levels of pest damage by the most economical means, while posing the least possible risk to people, property, resources, and the environment. IPM provides an effective strategy for managing indoor (museums, living quarters, visitor centers, hatcheries) and outdoor (hatcheries, wetland management areas, refuges) pests. IPM serves as an umbrella to provide an effective, all encompassing, minimal-risk approach to protect resources and people from pests.

Some of the key components to a successful IPM program include the following:

- Understand your site management objectives and establish short and long term priorities.
- Prevent pest species from becoming a pest at your site—this is your first line of defense against any pest species.
- Identify and monitor current and potential pest species, their biology, and conditions conducive to support the pest(s) (air, water, food, shelter, temperature, and light).
- Understand the physical and biological factors that affect the number and distribution of pest and their natural enemies. Conserve natural enemies when implementing any pest management strategy.
- Establish “action thresholds” at which point an approved management strategy will be implemented to reduce the pest population.
- Review available tools and best management practices for the management of the identified pest(s). Tools can include: 1) no action, 2) physical (manual and mechanical), 3) cultural, 4) biological, and 5) chemical management strategies.
- Build partnerships and consensus with stakeholders—occupants, decision-makers, and technical experts (ongoing throughout the process).
- Obtain approval, define responsibilities, and implement selected best management strategies, in accordance with applicable laws, regulations, and policies.
- Evaluate results of management strategies; determine if objectives have been achieved; modify strategies if necessary.
- Document decisions and maintain records.
- Outreach and education.

Why should we implement Integrated Pest Management at our sites?

The reasons to implement IPM at our sites are numerous. By implementing IPM, we will:

- Reduce risks from pests and pest management related strategies to people, property, resources, and the environment.
- Save time and resources by understanding pest biology and conditions which favor the pest.
- Implement more effective pest management strategies.
- Increase scientific management of pest species rather than being reactive or managing pests on a calendar basis. Increase our accountability by monitoring our pest populations and documenting our management actions.
- Decrease liability from inadequately managing our pests.
- Increase coordination and partnerships for effective pest management; decrease or eliminate unnecessary pesticide use.
- Decrease pest resistance from repetitive pesticide use; increase safer use of pesticides and other management tools.
- Reach our short and long term site management objectives.

Is there a standard format for devising an IPM plan?

No, there is not a standard format for IPM plans. IPM plans have several key components, but because plans are site specific, you should design your plan to help meet your specific pest management objectives. To ensure a successful plan, you should develop your plan with the involvement of potential stakeholders, and you should incorporate a peer review process for your plan.

What are the key components of an IPM plan?

An IPM plan has several key components. The remainder of this guidance will outline these components. IPM plans are “living” documents that require periodic reviews and updating as new information on pest management becomes available.

- **Background.** Briefly discuss the need to manage pests at your station. This includes a generalized ecological perspective as well as state and federal mandates, executive orders, and Departmental and Service

directives and policies. Discuss the mandates of your site and how specific pest species are interfering with your site management objectives.

- **Site description(s).** Document the conditions at your site including habitat type, soil type, proximity to surface and ground water, wetlands, drainages, and potential sources of new infestations. For indoor sites, document the layout of your facility and internal conditions that may be contributing to your pest problem. Many factors such as soil composition, pH, temperature, timing, etc., will impact the success of your pest management strategies. Document if there are sensitive resources at the site, such as unique habitat areas, rare or listed species, or other species of concern that may limit pest management options. For example, if a rare plant community is known to be present at a particular site, and the species may not recover from burning, then that treatment option would be inappropriate at that site. Similarly, a broad spectrum herbicide would be inappropriate unless it was used as a spot treatment only on the pest in question and appropriate precautions were in place to eliminate drift, leaching, and runoff.
- **Objectives.** Make objectives attainable, time-specific, and measurable. Identify the specific pest(s) that require management and indicate what defines successful pest management at the site. For example, this may be a 90% reduction of an invasive plant species, a reduction in a cockroach population so they are no longer seen during the day, or in the case of agriculture, maintaining a pest below its economic threshold.
- **Consensus building and partnerships.** Partnerships and cooperation are key elements to implementing an effective IPM program. Look to others who may have experience with managing your pest(s). Identify partnerships you will use to help you meet your pest management objectives. Build consensus with potential stakeholders prior to deciding pest management strategies.
- **Pest biology.** Understanding the pest biology and ecology will provide insight into selecting the best pest management tools, timing considerations, and prevention methods. Know your pest species and its biology. Describe the biology and ecology of each pest species, including factors relevant to its growth, dispersal, reproductive or vegetative success, etc.
- **Monitoring and mapping.** Monitoring and mapping help identify the nature and extent of a pest problem. Monitoring and mapping are critical components of a successful IPM program and should occur prior to any pest management action. Mapping is essential to assess the location

occupied by the pest species each year and your plan's effectiveness in succeeding years. Early detection of a pest can save time and money. Clearly define monitoring and mapping protocols and who will be responsible for these activities. Identify the location of the pest, and identify its location within the context of the surrounding landscape. For agricultural pests, designate crop scouting methods and frequencies, and designate action thresholds above which unacceptable crop damage, adverse effects on wildlife, and/or sustainability or desired cooperative farming efforts would be threatened. Surveying for sources of the pest and conditions that perpetuate the pest (e.g., disturbance activities in the case of many weed species) may be valuable in determining prevention methods.

- **Action Thresholds.** An action threshold is the point at which you take action to reduce the pest population. Establish clear action thresholds before implementing management strategies to reduce the pest population. An action threshold is usually quantitative and species specific (generic examples used): 5 insects/leaf in a random sample of 20 plants per acre, 10 percent feeding damage to a plant, 5 flies in a bedroom, etc. Below the threshold level, no direct management action occurs to reduce the pest population; however, monitoring and other preventative tools will continue to be implemented.

- **Review of management options and tools.** Include a comprehensive review of known management options and their efficacy. When evaluating tools, it is helpful to look at them from a risk/benefit standpoint. Also, you must consider staff time and available funding when determining feasibility of various management methods. You should select those methods, or combination of methods, that are feasible, efficacious, and yet most protective of non-target resources, including wildlife, personnel, and the public. If costs of pest management exceed available funding, you may want to seek partners, volunteers, grants, or additional internal funding, if available. When weighing risk/benefit and cost, be sure to include the potential cost of not managing the pest species (loss of species diversity and habitat, loss of crop, etc.). You should consider the following management options for all pest species:
 - **No action.** Document the impact of the no action alternative based on your current pest management scheme.

 - **Prevention.** This is the most effective and least costly management option. Document methods to prevent new introductions or the spread of the pests to new sites. Identify routes of invasion and how these can be intercepted to reduce the chance

of invasion. Prevention may include source reduction, using pathogen-free or weed-free seeds or fill; exclusion methods (e.g., barriers) and/or sanitation methods, like wash stations, to prevent reintroductions by vehicles, personnel, horses, etc. Often invasive species are the first to invade newly disturbed sites; prevention should include a reporting plan whereby staff can report new occurrences of an invasive species and quickly respond by eliminating new satellite pest populations. *Note:* Some of these methods may fall under mechanical/physical or cultural methods as well.

- **Mechanical/Physical Methods.** These methods employ mechanical tools for pest prevention or removal. These methods may include mowing, cutting, swathing, sheering girdling, digging, trapping, installing barriers, sealing, caulking, and heat and cold treatments. In the case of mosquito management, filling unneeded ditches and puddle sites near facilities and removing tires and other moisture—collecting debris are important.
- **Cultural Methods.** Cultural methods are a manipulation of the habitat to increase pest mortality by making the habitat less suitable to the pest. Many different cultural practices can help reduce pest impact such as mulching, winter cover crops, changing planting dates to minimize pest impact, burning, flooding, trap crops, crop rotations that include non-susceptible crops, moisture management, addition of beneficial insect habitat, reducing clutter, vacuuming, proper trash disposal, and other habitat alterations.
- **Biological Control Agents.** These agents are organisms which can be introduced to your sites, such as herbivores, predators, parasites, and hyperparasites. If applicable, ensure introduced agents are approved by the applicable authorities, such as the Animal and Plant Health Inspection Service.
- **Pesticides.** If choosing pesticides as part of your management strategy, you must comply with the applicable authorities pertaining to pesticide use, safety, storage, disposal, reporting, etc. If you are unaware of these authorities, please consult with your local Environmental Contaminant Specialist, Regional IPM Coordinator, or Regional Environmental Contaminants Coordinator. If pesticides do become part of your IPM strategy, then you must prepare pesticide use proposals (PUPs) and report annual pesticide usage data (there are some exceptions, consult your Regional IPM

Coordinator for more information). You may attach the PUPs as an appendix to your IPM plan.

Pesticide use in an IPM program is usually more successful when it is integrated with other management strategies. If you choose pesticides as one of your tools, you must review the pesticides available to manage the pest and discuss the risks and benefits of the pesticide(s) selected versus those not selected, including potential risks to non-target organisms. This discussion should focus on selecting the least risk, most efficacious product available. If you need assistance in evaluating toxicity, leaching potential, persistence, or other pesticide-related risks, please contact the local Environmental Contaminant Specialist or the Regional IPM Coordinator or Coordination Team. Please keep in mind that many factors affect the efficacy of pesticides, including the pH and hardness of your mixing water. Cost should not be the primary factor in selecting among pesticides. If the least costly pesticide is the most likely to cause harm to trust resources or humans, you should select an alternative product if one exists.

If a pesticide application occurs in areas that may be entered by Service staff, volunteers, or the public, you should adopt a posting plan (some pesticide labels have posting requirements as well). You should also post sign(s) before a pesticide application to limit entry to the site. It may be necessary to contact neighbors who may be chemically sensitive before spray events. The IPM plan, PUPs, pesticide labels, and material safety data sheets should be available to all staff members and their location should be well known.

- **Compliance with applicable authorities.** Before implementing any pest management strategy, ensure that you comply with applicable authorities such as the National Environmental Policy Act, Endangered Species Act, Federal Insecticide, Fungicide, and Rodenticide Act, and Occupational Safety and Health Administration regulations. Document what measures you take to comply with any applicable authorities. If you need more information, contact your Regional IPM Coordinator or Regional Environmental Contaminants Coordinator.
 - **National Environmental Policy Act Compliance.** The development of IPM plans and the implementation of field level IPM activities, including pesticide applications, are subject to the National Environmental Policy Act (NEPA). Compliance with NEPA requires the Service to make a determination whether the proposal

is covered under an existing categorical exclusion (CX) or requires the preparation of an environmental assessment (EA).

- The **use of a categorical exclusion** depends on whether the IPM plan or activities can be covered under an existing CX available to the Service found in 516 DM 2, Appendix 1 and in 516 DM 6, Appendix 1.4. Exceptions to the CXs (e.g., controversy over environmental effects, have significant adverse effects on public health or safety, etc.), that may preclude the use of the CX, are found in 516 DM 2, Appendix 2. The CXs and their exceptions should be reviewed prior to the development of an IPM plan and implementation of field-level IPM activities. In most cases, a CX will apply. The CX generally applicable for the preparation of the IPM plan usually will be 516 DM 6, Appendix 14B(2). If a refuge special use permit is required, the action may also be covered under the CX in 516 DM 6, Appendix 1.4C(5). Whenever a CX is used, an administrative record should be created to document the use of the CX using the NEPA Compliance Checklist, modified as appropriate (refer to D.O. No. 127).
- The level of NEPA compliance will vary for the preparation or revision of IPM plans on a case-by-case basis, depending on the level of impacts anticipated, whether an existing CX applies, or whether an exception of the CX applies. The more details contained in the IPM plan to ensure that IPM activities are carried out in an environmentally-sound manner with no potential for significant impacts on the local environment, the easier it will be to ensure that the implementation of field-level IPM activities can be covered under an existing CX.
- For technical assistance regarding NEPA compliance matters for IPM plans and field-level activities, consult the Regional Environmental (NEPA) Coordinator or the Washington Office (NEPA) Coordinator. All references cited above are found in the Service's NEPA Reference Handbook at www.fws.gov/r9/esnepa.
- **Endangered Species Act Compliance: Federally Listed, Proposed, and Candidate Species and Designated Critical Habitat (Listed Resources).** If you have listed resources at your site, ensure completion of the appropriate Section 7 compliance

documentation before implementing any pest management strategy. You may attach this as an appendix to your plan. If a determination of no effect is made, then Section 7 consultation is complete. A no effect determination must be supported by documentation that supports the conclusion. The obligations under Section 7 must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered, (2) this action is subsequently modified in a manner that was not considered in this review, (3) a new species is listed or critical habitat is determined that may be affected by the identified action, or (4) if the amount of incidental take anticipated in a biological opinion is exceeded. For more information, please contact the appropriate Service Endangered Species staff or National Marine Fisheries Service (NOAA Fisheries).

- **Occupational Safety and Health Administration Regulations.** When preparing for pest management activities, ensure that employees are aware of the requirements for Personal Protective Equipment and safety procedures set forth by the Occupational Safety and Health Administration (29 CFR 1910) and by Service policies in Service Manual sections 240-242.

- **Selected pest management strategies and prioritization.** Identify the management strategies you will employ to manage your pest(s) based on the analysis of the available tools and their associated benefits and risks. Also, document who is responsible for implementing and monitoring the success of your pest management strategies. The timing of pest management implementation will be site and species specific. If you have multiple sites with the same pest, you should prioritize your sites based on your management objectives. For example, most IPM plans propose the following pest management prioritization scheme: (1) prevention of new infestations, (2) management of pests at new “satellite” sites, (3) perimeter management of large pest colonies, and (4) management of the large colony.

This scheme would be particularly applicable when total elimination of pest species does not appear feasible in the short term and when the pest of concern does not disperse readily over long distances. For those species whose seeds disperse widely and readily, treatment of the largest infestation might be of the highest priority. Treatment of pest species in riparian areas would typically employ another strategy—treatment of the most upstream riparian pest population first, then those further

downstream. Another consideration in prioritizing sites for management might be based on abundance of highly valued native species. Treatment of the most highly valued sites first may best mitigate threats to native biodiversity.

- **Best management practices.** Best management practices (BMPs) can mitigate impacts to non-target organisms. Identify BMPs such as buffers you will implement around drainages, wetlands, waters, or other sensitive sites. Identify how you will use timing of pest management strategies to reduce risks to non-target species. If using pesticides, you may decide to use a dye to reduce spraying of non-target site, as well as reduce unnecessary spray overlaps. Discuss the use of specific equipment or methods that will prevent or reduce the risks to non-target organisms.
- **Site restoration.** Consider whether the site requires any restoration activities following pest management efforts. If the pest occurs primarily on disturbed sites or has developed dense stands in natural sites, then revegetation may be critical to assure long-term pest management, particularly for management of invasive plant species with large seed banks. If the site will need revegetation, describe the proposed reseeding or replanting efforts. Merely treating a site to eliminate an invasive species without any revegetation planning could be ineffective and would likely result in increased costs and resources over time.
- **Record-keeping.** A record-keeping system is essential to establish trends and patterns in pest outbreaks. Information recorded at every inspection or treatment should include pest identification, population size, distribution, recommendations for future prevention, and complete information about the action taken, including the use of any pesticide.
- **Education and outreach.** This is a critical component of a plan because a successful IPM program depends on the coordinated actions of many people. Indicate how staff, volunteers, cooperators, and the public will be informed about pest problems, including how to identify the pests, how the pests may cause harm, needed reporting, and cooperative management methods. If public outreach would be valuable, identify how the public and/or volunteers will be trained or educated to assist in pest management efforts.
- **Monitoring success.** To ensure a successful IPM program, you must evaluate the results of your chosen management strategies, ascertain if you achieved your pest management objectives, and modify the strategies if necessary.

References. In addition to the guidelines above, there are numerous IPM references accessible on the Internet. Other good sources of information are universities and your local county extension agents.

<http://parks.state.co.us/cnap/publications.html> "Creating An Integrated Weed Management Plan"

<http://tncweeds.ucdavis.edu/>

<http://tncweeds.ucdavis.edu/products.html> "Weed Plan Template and Model Sample"

<http://www.science.org.au/nova/041/041key.htm>

http://edis.ifas.ufl.edu/BODY_LH080

<http://www.ipmcenters.org/>

<http://www.ipmcenters.org/IPMRoadMap.pdf>