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I. INTRODUCTION

A. PURPOSE OF THE IPM PLAN

This document explains the concept of integrated pest management (IPM) and its application to the Tule Lake and Lower Klamath national wildlife refuges (NWRs). It is Department of Interior policy to implement IPM plans on all wildlife refuges in the United States, and this IPM Plan was, in part, prepared to satisfy that requirement. Another purpose of this Plan is to balance pest control practices with the goals of agricultural production and profitability, consistent with waterfowl management as called for in the Kuchel Act. This Plan also satisfies the settlement agreement that resulted from a Notice of Intent to File Suit brought against the U.S. Bureau of Reclamation (Reclamation) and U.S. Fish and Wildlife Service (Service) by the Oregon Natural Resource Council and the Northwest Coalition for Alternatives to Pesticides. The groups were concerned over the use of pesticides on the NWRs.

B. SCOPE

This Plan describes current agricultural practices, pest management, and pesticide use on the Tule Lake and Lower Klamath NWRs, provides an on-the-ground, how-to IPM manual for growers and refuge managers specific to the refuges, and a general source of information for the public on IPM. *This is not an enforcement document.* However, guidance provided by this plan may influence the content of leases and pesticide use proposals written for leased lands on Lower Klamath and Tule Lake NWR. This IPM Plan is expected to be updated as new information is developed on pest control and on the sump (wetland/cropland) rotation study currently underway on Tule Lake NWR.

This IPM Plan covers all federal lands that are leased (through the Reclamation leasing program) for agriculture purposes in 1996 on the Tule Lake and Lower Klamath NWRs.

Lower Klamath NWR	
Federal lands leased to growers by Reclamation	7,100 acres
Tule Lake NWR	
Federal lands leased to growers by Reclamation	15,500 acres

The IPM Plan addresses terrestrial pests found on Refuge lands that are leased for agriculture purposes. The Plan also addresses pests found on bank tops associated with the water delivery system, roadsides, and grasslands on the refuges. Pests are identified as all organisms that negatively impact agriculture operations and/or wildlife habitats, including plants, noxious weeds, insects, and rodents.

This IPM Plan is not intended to be a wildlife management plan for the refuges. It does not cover the full array of wildlife management issues that are normally in wildlife refuge management

plans. Fish and wildlife issues are covered only to the extent that they relate to IPM.

This Plan will be in compliance with the National Environmental Quality Act (NEPA). An Environmental Assessment (EA) document was prepared to address this Plan. The EA addresses the relevant environmental issues and analyzes a range of reasonable alternatives for how an integrated pest management program will be implemented on the Tule Lake and Lower Klamath National Wildlife Refuges leased lands.

II. PUBLIC INVOLVEMENT AND AGENCY INPUT

A public involvement program for the IPM Plan began in March 1995. The initial activities included: meeting with federal and local agency staff, growers, members of the agricultural community and the general public. Telephone interviews were conducted with representatives from two environmental groups. The purpose of the program was to identify the breadth and depth of issues facing growers, the environmental community, and refuge managers about an IPM Plan on Refuge leased lands.

New Horizon Technologies, Inc. (Contractor preparing this Plan) made numerous contacts to spread the word about the upcoming plan, and become familiar with pest issues. Contacts included tours of existing farming operations guided by local growers, meetings with Pest Control Advisors, tours with agricultural producers from local operations, discussions with University of California (U.C.) Davis Vegetable Crop specialists, meetings with the local agricultural commissioners and with growers at local California agricultural processing operations, and a meeting and tour with the local irrigation district staff and managers.

In addition, the Contractor met with local organizations, such as the Chamber of Commerce and the Planning Office to inform and seek information from members of the local community. Once a scoping meeting for the IPM Plan was planned, staff from Reclamation and the Service supplied a mailing list of affected growers who then received a letter notifying them of the scoping meeting. Other participants were contacted by the Contractor team and two large newspaper ads appeared in local papers. Issues identified at this scoping meeting partially served as the basis for the problem statements in the next section of this plan.

Following the scoping meeting, an IPM Citizen Advisory Group and Agency Interdisciplinary Team (IDT) were formed to provide diverse input into the plan. The IPM Citizen Advisory Group is made up of representatives of the leased-land growers, citizens interested in waterfowl production and hunting on the refuge, pest control advisors, and environmental groups. Agency personnel also participated. The IDT is made up of Agency personnel having responsibility for chemical application control, wildlife management, and administration and management of leased lands on the refuges. In addition to meeting with these two groups, outreach activities of a less formal nature began with area citizens. **Table 1** lists the meetings held by the Citizen Advisory Group. Agency interdisciplinary staff have attended some, but not all, of the Advisory

Group meetings. Informal activities have included telephone conversations, meetings, and field tours with local citizens, growers, and environmental group leaders.

TABLE 1
Citizen Advisory Group Meetings

Date and Time	Location	Meeting Topic
June 21, 1996	Merrill - Pappy Gander's & Co.	Introductions, ground rules and potential additional members.
July 19, 1996	Intermountain Research & Extension Center, Tulelake, Ca.	Development of problem statements, IPM definition, weed problems, and potential barriers to IPM Plan implementation.
August 23, 1996	Tour of Leased Lands, and of the refuge berms. Work session at Intermountain.	Weed problems on the berms and how to address mutually agreeable weed control. Group reviewed and revised goals for the IPM Plan.
September 24, 1996	Intermountain Research & Extension Center, Tulelake, Ca.	Weed management of the berms. Presentation of the results of the growers survey.
November 8, 1996	Wildlife Refuge tour and work session at Intermountain Research	Wildlife tour, discussions of crop scouting, Malathion use on leased lands.
January 17, 1997	Intermountain Research & Extension Center, Tulelake, Ca.	Review draft IPM working papers.
June 18, 1997	Intermountain Research & Extension Center, Tulelake, Ca.	Review draft IPM Plan.

In addition to these activities, a survey to determine the priority pests by crop was mailed to all leased-land growers. For a detailed documentation of all public involvement activities for the IPM Plan, see project file entitled Public Involvement Activities at Klamath Basin Refuge Complex Office, Tulelake, California.

III. IPM PLAN ISSUE STATEMENTS AND GOALS

Once the public involvement process was established, and a consensus reached on a common definition of IPM, the participants in the planning process identified issues and goals pertaining to IPM and the leased lands. Problem statements and IPM goals were developed to focus work priorities on issues associated with pest management on Tule Lake and Lower Klamath NWRs. Goals were developed subsequent to issue statements to assure that identified problems were being addressed in the plan.

Issue statements and goals were initially drafted by reviewing notes from informal meetings with growers, federal agency staff, and members of conservation organizations. Project-related materials in agency files and reports, newspaper articles, telephone interviews with varied constituencies and researchers, and the scope of work described in the contract between the Service and the Contractor were reviewed and used as background material for problem statements and goals.

The draft statements and goals were presented, reviewed, discussed, and modified by the IPM Citizen's Advisory Group and the Agency IDT. It is important to present both the issues and goals so that plan recommendations and updates to this plan address identified issues, and are in conformance with goals. The issue statements and goals for this IPM Plan are presented below:

A. IPM ISSUES (As Identified by the Citizen's Advisory Group)

- Depending on the definition of IPM, farmers are concerned that implementing IPM may increase their financial risk from increased production cost and/or decreased value of crop produced.
- Current land management/farming practices may contribute to habitat degradation for endangered sucker species (sedimentation, eutrophication, potential toxicity of pesticides, dredging).
- Some agriculture service businesses may be concerned that implementing IPM may require a change in products and services and may reduce business opportunities.
- Land management practices have reduced many wildlife populations and species diversity on leased lands.
- Information on practical alternatives to pesticides is not widely available locally (few local demonstration projects, no action thresholds for many pests, local research does not support new pest management options.)
- Growers and agencies are motivated to select pesticides for different reasons (i.e., growers selecting for effective pest control, FWS selecting for wildlife/environmental safety).
- Reduced wildlife populations limit some recreation uses (hunters, bird watchers).
- Growers are concerned that IPM will allow uncontrolled spread of pests.
- Lack of historical data on fisheries limits management priorities.
- Many growers believe they are already implementing IPM or don't see the need for an IPM Plan.
- Some stakeholders believe that on a national wildlife refuge, only crops which provide a beneficial food source to wildlife or improve wildlife habitat should be grown.
- Lack of financial incentives for growers to experiment with new IPM practices and/or promote wildlife conservation.
- Poor water quality and low dissolved oxygen limit habitats for fisheries.
- Some stakeholders are concerned that the PUP process and IPM Plan will not be well integrated/coordinated.
- Pesticide use on refuges is not in compliance with Department of Interior, Fish and Wildlife Service policies.
- Wind erosion is a problem on leased lands, contributing to siltation of the sumps and loss of waterfowl and fisheries habitat.
- There is a mutual lack of appreciation for the knowledge and experience and efforts that the growers and agencies have.
- There is confusion about interpretations of federal statutes, policies, regulations and procedures as they relate to the Service leased lands and they are open to widely differing interpretations by stakeholders, which helps to create confusion and distrust.
- General concern by stakeholders that IPM Plan won't be implemented as agreed on.
- Lack of fall flooding creates a management problem for some growers.

B. IPM PLAN GOALS

Goal A: Provide land managers and users with practical pest management guidelines and options that minimize negative environmental impacts, are compatible with recreational uses, and protect and support wildlife habitat.

Goal B: Develop ways and means for providing land managers and users with sources of innovative and practical IPM information and implement cooperative practices so that land managers and users can access information about the most useful IPM tools and techniques that are based on local demonstrations and local conditions.

Goal C: Develop effective incentives to encourage and promote wildlife conservation and IPM implementation on refuge lands

Goal D: Develop an ongoing way for land managers and users with different views to communicate regularly and effectively in an atmosphere that builds trust and successful implementation of the IPM Plan over the long term.

Goal E: Ensure that the IPM Plan will be both flexible and responsive to ongoing scientific discoveries and new pests.

Goal F: Ensure that the IPM Plan implementation is effectively coordinated between responsible agencies.

Goal G: Develop long-term strategies to ensure the implementation effectiveness of the IPM Plan and to establish a process for updating and revising IPM approaches.

IV. CONSTRAINTS AND OPPORTUNITIES FOR IPM STRATEGIES

A. IPM AND MEETING REFUGE GOALS

IPM strategies are most easily implemented on private land where growers can make their own decisions about farming practices. IPM implementation on the refuges is complicated by the fact that the land is public, and subject to a variety of public laws and goals that may differ or even conflict with IPM strategies. An example of this is the practice of early cutting alfalfa: the practice may eliminate the spread of some pests, but has the potential of disturbing or destroying nesting birds.

In implementing IPM, alternatives will need to be evaluated, in part, using a criterion of limiting non-target impacts and downstream environmental degradation. Specifically, IPM alternatives should be evaluated for their potential impact to fish and wildlife habitat, nutrient loading to the refuges, pesticide drift and toxicity, cumulative effects on survival of species using the refuges, and food chain relationships.

Habitat loss or degradation is continual and needs to be reversed within the refuges, particularly Tule Lake NWR. Any activity that contributes to the degradation of aquatic habitat or decrease in habitat diversity should be avoided if the refuges are to function as such. The sump rotation project represents an integrated approach to addressing agriculture and wildlife. Sump rotation has potential to create and enhance wildlife habitat. Other things to consider for aquatic habitat are water level fluctuation, erosion reduction, nutrient retention on the farmlands and nutrient loading reduction.

B. CONSTRAINTS AND OPPORTUNITIES FOR AGRICULTURE

Certain existing constraints on agricultural practices were recognized during the preparation of this Plan. For instance, all pesticides used on Refuge leased lands are subject to the PUP process. Therefore, chemical recommendations were made considering this process and currently approved pesticides.

Furthermore, growers have crop contracts with buyers that require certain rotations or chemical restrictions. Reclamation leases also require crop rotations (2 years in grain and 1 year in row crop). Finally, growers must adhere to the goals of the wildlife refuges as they farm -- something they do not have to do on private land.

IPM seeks to *prevent* pest problems from developing. In doing so, long-term costs of pest control can be reduced. By using different or additional techniques, growers can overcome the problems posed by pest resistance to chemicals, take advantage of the natural enemies of pests, and reduce harmful effects of chemicals on the environment and humans. Given the economic track record of IPM and the possibility to use lease incentives as a mitigating measure to absorb short-term increased costs of experimental IPM techniques, farmers appear to face little long-term financial risk from a well designed and implemented IPM plan on leased lands.

V. HOW TO USE THIS DOCUMENT

Sections of this Plan may have different audiences. For the general reader, the introductory sections and executive summary provide the purpose and explanation of the concept of IPM. For those wishing to apply IPM to farming operations, a more technical section entitled “IPM Workbook” may be the most important. This removable section allows the land manager to identify pests and pest management strategies.

VI. INTEGRATED PEST MANAGEMENT

A. IPM DEFINITIONS AND CONCEPTS[1]

There are many definitions of integrated pest management (IPM). To proceed with an IPM Plan, a common definition or set of concepts was needed by principal participants in the planning process. This common set of concepts is presented below:

IPM treats pests as part of a crop production system that includes not only the crop and its pests, but also the crop's entire physical setting. A good IPM program coordinates pest management activities with each other and with production methods to reach cost-saving, long-lasting solutions to pest problems. The emphasis is on knowing about and preventing problems before they occur.

An IPM program may not eliminate use of pesticides, but attempts to use them as a last line of defense against pests, not as the first option for control. In practice, a grower will use several pest controls based on knowledge of the crop, pests, and pests' natural enemies to avoid crop loss and minimize harmful effects on natural resources.
A successful IPM program on the national wildlife refuge leased lands will involve control of pests by the following:

- ***Identifying*** *pests and their natural enemies;*
- ***Understanding*** *the physical and biological factors that affect the number and distribution of pests and their natural enemies;*
- ***Monitoring*** *pests and their natural enemies for damage and biological control;*
- *Determining if and when a treatment is needed to prevent economic damage;*
- *Follow-up to see how well control measures work and to see if further action is needed; and*
- *Using a* ***combination*** *of cultivation (and other cultural) practices, biological, and chemical pest controls to reduce reliance on pesticides.*

B. WHAT THIS WILL MEAN FOR GROWERS

IPM will mean that some growers on leased lands may deal with pests differently than they have in the past, while for others, who are already implementing IPM, few changes will be needed. IPM on the refuge will require growers to have detailed knowledge about options for pest prevention such as crop rotation, cover crops, late or early planting dates, crop variety selection, tillage practices, and water and fertilizer management, as well as biological and chemical

[1] Based on the U.C. Integrated Pest Management Project definition for tomatoes, 1990. The most current definition for a row crop.

controls. It may mean changes in current farming practices for some growers.

This plan is intended to give growers the information they will need. In addition, this plan recommends field trials for testing IPM methods that could benefit leased-land growers. These trials are for methods that have worked in other U.S. locations for pests on particular crops, but have not yet been sufficiently tested in the Klamath Basin. It is the aim of IPM to maintain profitability for agricultural producers by reducing costs and chemical use over time. IPM will give growers a high probability of controlling pests in the long-run, especially if certain chemicals become ineffective due to pesticide resistance.

C. WHAT THIS WILL MEAN FOR NATURAL RESOURCES

Over time, chemicals in soil and water will be reduced. In turn, the potential for waterfowl and other fish and wildlife to be affected by chemicals will decrease. Some IPM practices, such as buffer strips, may be directly beneficial to wildlife. Other practices will build soil health, tilth, and conservation of soil and water. Fish, wildlife, and plant habitats could improve. IPM will help ensure that growers can produce food side-by-side with fish and wildlife on refuges.