

I. RECOMMENDATIONS AND IMPLEMENTATION

This sections presents **final recommendations** and **implementation strategies** for the IPM Plan. Based upon public comments received on the Draft IPM Plan, the Agencies revised the recommendation section for the final Plan. Some recommendations have been modified and/or deleted; most have been adopted in their original form. The recommendations give specific guidance to the Agencies for carrying out the Plan. Each recommendation has been compared to the goals of the Plan to assure goal compliance. *Recommendations have not been prioritized.*

There was great concern during the public scoping process that accountability was important to the success of the Plan and that once the IPM Plan was written, it might not be carried out. The Citizen Advisory Group was concerned that all essential and optional actions be clearly identified as such.

The Implementation Schedule lists each recommendation, the responsible party(ies) for carrying it out, the estimated cost of implementation, source of funding, target date for implementation and whether the recommendation is optional or essential. The implementation schedule is meant to be used during Agency budget processes so that recommendations can be incorporated into annual work plans, and so that the progress and success of the plan may be measured.

Implementing the IPM Plan will be contingent on adequate program funding. Funds for general program administration, and specific IPM actions need to be secured. Funding options include a combination of Reclamation and Service budget allocations and lease fees. Crop scouting would be the responsibility of the growers.

In 1996, area farmers paid \$1.9 million to farm leased land on the refuges. Importantly, there is *no direct relationship* between the Tule Lake and Lower Klamath leased-land revenues, Reclamation's Klamath Basin Area Office Project budget, and the Service's Klamath Basin National Wildlife Refuge Complex budgets. All fees from leasing Refuge lands go directly into the U.S. Treasury.

Funding will be most important in the initial years of IPM program implementation. As growers become familiar with the financial benefits of IPM, they may be more willing to directly fund IPM services. If IPM proves to be cost-effective on the Klamath wildlife refuges, it is likely to be viable on the region's other farmlands.

A. RECOMMENDATIONS -- ADMINISTRATIVE**1. Funding to Implement the IPM Plan Must Be Obtained**

Adequate and long-term funding of approximately \$250,000 annually must be obtained to successfully implement the IPM Plan. There are at least three possible options for funding. One is to use lease revenues to fund the program. Similar to current proposals for national parks, revenues generated within the project area should be directly allocated to pay for IPM program actions benefiting the Klamath Basin refuges. The direct allocation of lease-fee revenues will require changes in federal legislation, which would take Congressional authorization.

A second funding alternative is for the Agencies to request annual appropriations for the Klamath leased-lands IPM Plan in their normal budgeting processes. This alternative is less desirable because the IPM Plan will be competing with a huge number of high priority projects in an era of reduced funding for government agencies nationwide. A third alternative is for the Agencies to request a separate appropriation for IPM Plan implementation from Congress.

2. An IPM Coordinator Will be Given Authority to Carry Out the IPM Plan.

The IPM Coordinator will be a full-time Service employee with a strong educational and work experience background in agricultural management, IPM, and wildlife management.

The following is a brief list of responsibilities to be included in the job description, and performance standards.

- manage IPM program on Refuge lands, including all leased lands.
- coordinate directly with Reclamation designee to provide information on IPM techniques to be implemented as a part of future leasing.
- provide written guidance for crop scouting on lease lands.
- train and assist crop scouts as necessary to accomplish the desired objectives for IPM techniques used on the refuges.
- attend classes/training in negotiation and mediation skills.
- initiate the process for emergency Pesticide Use Proposals (PUP) approvals by the PUP Committee within 24 hours of an emergency.
- hold a minimum of one farm (refuge) tour annually to demonstrate IPM practices being used on the refuges.
- organize one or two coordination meetings annually with leased-land farmers to discuss previous (or current, as applicable) practices, concerns, approved list of pesticides, and particular IPM techniques that are successful in reducing dependence on chemicals. Reclamation should assist with these meetings. Recommend presentations by outside experts, pest control advisors (PCAs), and others highly regarded in the community.
- annually document all IPM techniques, with specific discussions on successes, failures, costs, benefits.
- maintain a collection of local insects for educational purposes.

- produce a minimum of two newspaper articles discussing IPM techniques, successes, or any other aspect of IPM which will inform the public about IPM and associated activities implemented on the refuges.
- promote direct contact and opportunities through other forms of news media, such as radio and television.
- develop recommendations for field trials annually and report on field trial results.
- be actively involved in berm management and IPM Advisory Group.
- establish a close working relationship with local experiment stations and universities to promote research involving IPM and/or habitat management on the refuges.
- seek grants, matching fund programs, and other sources of funding for IPM field trials and/or projects on the Klamath Basin refuges.
- remain current on IPM techniques, chemical management, and toxicity of chemicals used on the refuges.

The IPM Coordinator will be supervised by the Klamath Basin Refuge manager or his/her designee. The IPM Coordinator will be delegated authority and responsibility to implement the IPM Program. All decisions that affect IPM implementation will involve the IPM Coordinator.

3. An Ongoing IPM Coordination Group Will be Established

The effective implementation of the IPM Plan will require the cooperation of, and good communication among, Refuge staff, Reclamation staff, growers, PCAs, agricultural researchers, and conservationists. One strategy to help facilitate this cooperation is to establish a Tule Lake/Lower Klamath IPM Coordination Group. This group will be charged with advising the Agencies on IPM issues and preparing a written annual evaluation of the progress being made on implementing the IPM Plan.

The Group would consist of equal representation from grower constituencies and conservationists along with a representative from the Intermountain Experiment Station, PCAs, and Agency representatives. It will meet at least quarterly to review current problems, new opportunities, and progress on implementing the IPM Plan. In addition, the Group would sponsor tours of IPM field trials and hold an annual meeting, bringing together IPM researchers, growers, and agency staff to share new information and techniques.

A crucial part of this recommendation would be to hold an annual meeting to educate, and to communicate IPM activities. Reclamation, the Service, and the IPM Advisory Group would design the meeting to showcase local IPM field trials, new IPM techniques, and the findings of other IPM researchers. This group would not have decision-making authority. Decision making authority rests with the Klamath Basin National Wildlife Refuge Complex Manager.

4. A Berm Management Subcommittee of the Coordination Group Will be Formed

The IPM Coordinator will take the lead for establishing the berm management team. The team will be a subcommittee of the IPM Coordination Group and will use first-year funding to inventory berms, determine priorities for stand establishment, team responsibilities and necessary resources to accomplish work (as described in the berm management section). The team should begin habitat manipulation activities during the summer of 1998 and will coordinate their efforts with work being done by the Intermountain Agriculture Experiment Station on berm management. This group would not have decision-making authority.

5. A Pesticide Subcommittee of the Coordination Group Will be Formed

The PUP process is separate and distinct from the IPM Plan process. A Pesticide subcommittee is recommended to better integrate the PUP review process with IPM strategies/methods and techniques on leased lands. This subcommittee of the IPM Coordination Group will consist of growers, Agency staff, conservation representatives, PCAs, and county agents.

The subcommittee will focus on reviewing new, less toxic (than current) chemicals and those that address pest resistance, for use on leased lands. The subcommittee could recommend chemical and biological controls that will need to be reviewed by the Agency PUP Committee. The subcommittee also will be charged with identifying any problems/conflicts with IPM strategies and the PUP process, and advising the IPM Coordinator of possible solutions. This subcommittee will be strictly advisory.

6. Lease Incentives Will be Offered for Testing New IPM Techniques

Growers leasing lands within the refuges would be offered the option of testing IPM weed control practices on berms, buffer strips, and other non-agricultural lands in exchange for "lease incentives." Innovative field trials that benefit wildlife, control weeds or crop pests would be eligible activities. Reclamation will investigate and develop lease language to implement this recommendation for instances where both the grower and Reclamation are interested.

7. PUP-Approved Pesticide Labels Will be Filed at Agency Offices

Pesticide labels for all pesticides and biologicals (e.g., *Bacillus thuringiensis*) used on the Refuges, along with the PUPs, will be kept on file at the Refuge office. This will be used as a reference for Service personnel, providing details about application rates, target pests and cautions.

8. Row Crops Grown For Certified Seeds Will Be Subject to the Same Restrictions and Pest Thresholds as Commercial Crops.

Most certified seed crops must have negligible infections of various viruses and fungi. To attain these very low rates of infection, seed crops are generally subject to high rates of pesticide applications. Currently, there are no row crops grown for certified seed on the refuges. Certified

seed crops will be allowed on the refuge lands as long as the crop is subject to the same chemical restrictions and pest thresholds as the commercial crop.

9. The IPM Coordinator Will Maintain Data Files on Field Trials.

As new field trials are completed, the IPM Coordinator will maintain complete records on all aspects of the field trials. In addition, the IPM Coordinator will gather any qualitative and quantitative information from Agency staff and files, local researchers, and growers on past field trials in the Basin in an effort to prevent duplication of energy and resources. This information will be available to any interested party.

10. Beneficial Aspects of Sump Rotation Will be Incorporated into the IPM Plan as Research Results Become Available

The sump rotation study offers a unique opportunity to augment the IPM Plan with an ongoing body of data about minimizing agricultural pests while maximizing habitat values. The possibility of introducing sump rotation onto Tule Lake Refuge's management 'tool kit' for pest control is one that should be pursued pending positive research results and funding for implementation. The ability to meet the Agency mandate for habitat enhancement can be furthered by the integration of the research results into both the IPM Plan and the ongoing management of the leased lands.

11. Baseline Data Should be Compiled

There is a lack of baseline data (or in some cases, a lack of compilation and analysis) for soil characteristics, soil leaching rates, erosion rates, nutrient bioavailability, water quality, wildlife populations, and fish populations that makes it difficult to prescribe techniques for both IPM and wildlife management. In addition, data that have been collected on fertilizer application rates, and types of fertilizer used on leased lands need to be reviewed. Baseline data experimental designs, and collection protocols need to be developed. These baseline data will establish a benchmark for comparison of the effects of IPM.

12. Alternative Pesticides Should Be Explored (Using Field Trials) By the Agencies/Growers To Help Prevent Pesticide Resistance Problems.

Pesticide rotations are important to assist in the reduction of pests, the reduction in the build-up of chemical resistance by certain pests, and the reduction in overall pesticide use on the refuges. The implementation of a pesticide rotation program may be slightly more difficult than the current system. It would require good recordkeeping on the part of growers; the Agencies should exchange new information on pesticides with the growers as they have it. Chemicals needed to control some priority pests such as onion maggot, thrips, aphids, and some potato pests, would be priority candidates for rotation.

Suggested alternative chemicals/biologicals which should be considered for use on the

refuges include:

TABLE 1
Alternative Chemicals/Biologicals for Possible Rotations
In Field Trials

Alfalfa Chemical/Biological: Sevin bait or Proxol 805P <i>B.t.k.</i>	Pest: pea aphids cutworm
Potatoes Chemical/Biological: Lorsban 15G BioTrek 22G Soil Guard 12G DiTera ES	Pest: cutworm white mold root rot nematodes
Sugarbeets Chemical/Biological: Sevin XLR <i>B.t.k.</i> Soil Guard	Pest: armyworms cutworm, armyworms
Onions Chemical/Biological: Permethrin Neem (Align, Neemix)	Pest: thrips thrips
Small Grains Chemical: Gaucho Provado Sulfur dusts & sprays Sevin XLR Plus	Pest: aphids aphids mites armyworms

13. IPM Outreach Activities Should be Developed

Educational outreach activities focused on IPM would be useful to growers, researchers and the Agencies. The activities could include development of written materials, information on any field trials, field tours, educational presentations or other IPM related activities. By sharing information, improvements to the timeliness, objectivity, and accuracy of information about pests and beneficial populations will occur.

Agencies will develop and distribute information about IPM on the refuges to growers in the Klamath Basin as funding allows. Researchers will be encouraged to submit IPM field trial data for publication in local, regional, and national journals.

14. Private/Public Partnerships Will be Pursued to Carry Out IPM

Opportunities exist for partnerships on aspects of implementing the IPM Plan. For instance, the Tulelake Irrigation District may wish to participate in berm management. Local or regional conservation groups may be interested in participating in volunteer activities or working with the IPM Coordinator in seeking grants for aspects of IPM. The IPM Coordinator will determine a list of projects that could be carried out by volunteers (such as certain monitoring activities, and planting windbreaks) and contact these and other interested organizations.

15. The IPM Plan Will Be Reviewed Annually

The Plan will be reviewed by Reclamation, the Service, and the IPM Coordination Group on an annual basis to assure that goals and policies still reflect current policies and the interests of the Agencies. Each year, new information about the performance and effectiveness of IPM techniques tried on the leased lands (through field trials or other IPM techniques in this Plan) will be assembled by the IPM Coordinator and shared with all interested parties.

Based upon this annual review of IPM effectiveness, essential IPM techniques required in the lease agreements may be modified (added or dropped). In addition, any time new chemical or biological products are proposed for PUP approvals, IPM techniques may be required to be adopted before applications of pesticides will be allowed.

16. A Comprehensive IPM Plan Review Will Occur Every 5 Years

The Plan will be intensively reviewed every 5 years by the Agencies and the IPM Coordination Group to address trends and larger issues that may affect the IPM program in general. IPM budgets will also be reviewed for cost-effectiveness and contribution to the IPM Plan and land management objectives of the Klamath Basin National Wildlife Refuge Complex. Based upon this review, or when in the course of events, changes in the plan are dictated by new law or policy, new crops, new pests or new IPM techniques, the IPM Plan may be amended.

B. RECOMMENDATIONS - FIELD

17. Crop Scouting Will be Required as Part of New Lease Agreements.

The implementation of crop scouting is a requisite step of IPM. Crop scouting is essential to determine economic pest thresholds, beneficial organisms, and serves as a basis for treatment decisions. Many of the growers are currently using crop scouting as part of their management strategies. In the long term, crop-scouting costs will be offset by savings in pesticide use.

Beginning in 1999, as leases come up for bid, growers will be required as a condition of the lease, to have their crops scouted on a regular basis. Where action thresholds for specific pests/crops are known, scouting intervals recommended in this Plan should be followed. Copies of crop scout reports that identify thresholds reached, will be filed with the IPM Coordinator, who will be working with the crop scouts and growers. Collection of this data over time will

allow the growers and agency staffs to develop locally derived action thresholds for pests. Scouting protocols will be developed by the IPM Coordinator, working with the IPM Coordination Group.

18. Field Trials Will be Used to Test and Demonstrate IPM Techniques

IPM techniques and systems requiring field trials to demonstrate effectiveness prior to adoption for use on the refuges will be carried out on leased lands. Between one and five field trials a year will be conducted, coordinated by Reclamation and the IPM Coordinator and carried out by agriculture researchers and/or growers under an incentive program and/or on expired leases. Field trials will be carried out for each crop grown on the refuges, and on the berms to demonstrate and analyze effectiveness for pest control on refuge lands.

Successful, cost-effective techniques will be incorporated into the IPM Plan, required under lease conditions in future years, and implemented by refuge managers. This will require prioritization of field trials between crops, determination of trial sites, size and number of repetitions, and cost estimates. Growers may be offered reduced lease costs as an incentive to conduct field trials on certain portions of their leased croplands.

19. Within 5 to 10 Years, Growers Can Expect New IPM Requirements in Lease Agreements

Cultural techniques and other IPM methods *which have been field tested in the Basin and determined to be appropriate locally* in preventing pest problems will be incorporated into lease agreements as they come up for renewal. The IPM Coordinator and the IPM Advisory Group will work together to make recommendations to the Agencies on incorporating new IPM requirements in lease agreements.

20. Alternative Crops Need to be Field Tested in the Klamath Basin.

Field testing is a critical element of IPM because it gives growers and agency staff the ability to test whether new crops are compatible with wildlife, whether new crops will require fewer chemical inputs, and whether they make economic sense from the growers' perspective. The best way to ensure that crops are viable in the Klamath Basin region is to experiment locally. This would serve to bolster grower acceptance and also help ensure that any new crops are economically viable. Any alternative crops grown on the lease lands will require approval by the IPM Coordinator.

21. Cover Crops Will be Encouraged to Reduce Erosion

The high organic matter soils of the refuges is a unique and valuable resource. However, every year, wind erosion removes some of the soil, decreasing the long-term sustainability of agriculture on the leased lands and degrading wildlife habitat from siltation of wetlands. To prevent the continued loss of this valuable natural resource, a program of planting native species for hedgerows and windbreaks along the borders, integrated with soil cover (either through crops or stubble) will be encouraged during the winter months. As leases come up for

bids, the planting of cover crops may be required in certain leases where these techniques are appropriate.

22. If Vole Control is Needed, Nonchemical Control Methods Will Be Used

In a 1-year test, voles were successfully controlled by two growers in the Tule Lake NWR leased lands using aluminum roof flashing and a bare buffer strip at a cost of \$49 to \$65 per acre. Assuming a 10 percent damage loss in potato fields from voles, and a yield of 400 sacks per acre, the loss would be approximately \$280/acre (if number 1 potatoes were sold for \$9 per 100 lbs [1995]). Physical barriers such as this proved to be a cost-effective method to control voles in row crops. If vole control is needed, nonchemical control methods will be used.

23. When Action Thresholds Are Set For Specific Pests/Crops on the Lease Lands, They Must Be the Primary Determinant For a Pesticide Application

Action thresholds describe pest population levels that trigger control measures if economic damage is to be avoided. This IPM Plan contains interim action thresholds for some pests while many others do not have action thresholds established. Action thresholds may be adjusted up or down according to field conditions such as crop age, crop stress, and weather conditions. *As scouting record information is collected each year for each crop grown in the Basin, locally established action thresholds will be determined.* Biological and cultural IPM methods will be used before pesticide spraying.

II. IMPLEMENTATION

The Implementation Schedule lists each recommendation, the responsible party (ies) for carrying it out, the estimated cost of implementation, source of funding, target date for implementation and whether the recommendation is essential. The implementation schedule is meant to be used during Agency budget processes so that recommendations can be incorporated into annual work plans, and so that the progress and success of the plan may be measured.

TABLE 2
Recommended Implementation Schedule

Note: Bolded text in the 'Who's Responsible' column denotes primary responsibility.

ADMINISTRATIVE RECOMMENDATIONS

Task	Who's Responsible	Estimated Amount of Funding	Start Date*	Remarks
1. Fund the IPM Plan	Service, Reclamation, Congressional delegation, with support from ag. service agencies, growers, and interested public	\$250,000 total annually; individual cost breakdowns listed separately below	As soon as IPM Plan is adopted	Funding options need to be explored by the agencies as soon as possible due to the time it takes to resolve these kinds of issues. Essential
2. IPM Coordinator will be Given Authority to Carry Out IPM Plan	Klamath Refuge Manager	Cost: \$110,000/year/total: Coordinator \$58-\$65,000, technician \$28,000, overhead \$18,000. Equipment \$38,000.	October 1997	Critical to IPM Plan implementation Essential \$38,000 for equipment is a one-time capital cost
3. Establish IPM Coordination Group	IPM Coordinator	Staff time	Year 1	IPM Coordinator will consult with growers, Agency staff, conservation groups in establishing this group.
4. Berm Management Subcommittee	IPM Coordinator, IPM Coordination Group, TID, Reclamation	\$80,000/year/total: four, 6-month seasonal employees \$60,000, equipment & supplies \$20,000	Year 1	IPM Coordinator will work closely with growers, ag researchers and others interested in solving the berm problems.
5. Pesticide Subcommittee	IPM Coordinator IPM Coordination Group, PUP Review Team	Staff time	On an as-needed basis but no less than twice a year	
6. Offer Lease Incentives for IPM Implementation	Reclamation with cooperation from growers	Variable, lease-fee credits	Year 1	This will help pass techniques on to growers
7. File PUP-Approved Pesticide Labels	IPM Coordinator	staff time	Year 1	Essential

Task	Who's Responsible	Estimated Amount of Funding	Start Date*	Remarks
8. Allow Certified Seed Crops on Refuges if Subject to Same Thresholds as Commercial Crops	Reclamation	Minimal	Year 1	Essential
9. Maintain field trial data files	IPM Coordinator	Staff time	Year 1	
10. Implement Sump Rotation Elements as Research Results Becomes Available	Service and Reclamation	Multimillion dollar project	Annual review of sump rotation studies to determine whether research has proven beneficial to IPM and wildlife.	Essential
11. Baseline data Program	Special research teams , refuge biologists, UC Davis	\$20,000/year/total: for soil, water quality, wildlife, fisheries monitoring. Two seasonal biological technicians.	Year 1	This will provide baseline data for long-term management and evaluation; data will be filed at Service headquarters at Tule Lake. Data should be scientific quality and publishable.
12. Provide Alternative Pesticides for Rotations	PUP Review Committee , growers	Staff time	Annually	Field trials will be used to assess effectiveness of alternative pesticides and biologicals.
13. IPM Outreach Activities	Reclamation, Service , agriculture service agencies, volunteers	Staff time	Year 2	
14. Private/Public Partnerships	Refuge and Reclamation Managers , organization volunteers	Staff time	Year 2	
15. Review IPM Plan	Service , Reclamation, IPM Coordination Group	Staff and volunteer time	Annually	
16. Comprehensive IPM Plan Review	Service , Reclamation, IPM Coordination Group	Staff and volunteer time	Every five years	

FIELD RECOMMENDATIONS

Task	Who's Responsible	Estimated Amount of Funding	Start Date*	Remarks
17. Require Crop Scouting	Service and Reclamation in leases	Staff time to set up new lease clauses	Year 1	Essential
18. Conduct Field Trials to Test IPM	Agriculture researchers, growers, IPM Coordinator, IPM Coordination Group	\$40,000/year/total: Agriculture Experiment Station salaries and equipment	Year 1	Prioritize trials within 6 months of IPM start date. Establish scientific protocols and requirements for different levels of field trials. Essential
19. IPM Requirements in Lease Agreements	Reclamation, in leases	Staff time	No later than 5 to 10 years	Field tested locally and found appropriate for lease lands Essential
20. Testing of alternative crops	Agriculture researchers, growers, ag. extension, IPM Coordinator	growers' labor and equipment, lease fees if incentives provided, grants	Year 2	
21. Encourage Cover Crops	Reclamation in leases, in cooperation with growers	Leased-land fees, Natural Resource Conservation Service shelter belt program, growers	Year 2	Soil cover requirements could be included in leases. Credits could be given for windbreaks.
22. Nonchemical control methods for voles	Reclamation/ Growers	Staff time	Year 1	Essential
23. Action Thresholds must be the primary determinate before spraying decision is made.	Reclamation/ Growers/ IPM Coordinator	Staff time	Year 1	For known interim thresholds, add to lease requirements as they come up for bid. As new, local thresholds are established, these will also be added to lease requirements. Essential

* Start Date -- date when Agencies complete required administrative process (including NEPA Process) and begin the Plan implementation. Some elements of the Plan will be implemented sooner than others.