Appendix 8

Monitoring Techniques

This appendix provides guidelines for three types of noxious weed management monitoring:

I. Permanent Photo Points
II. Vegetation Monitoring with Permanent Transects
III. Insect Biological Control Agents

Additional information on the monitoring techniques described in this appendix is available from university and government specialists. The information provided here provides a useful beginning point for developing successful weed management monitoring plans and programs.

I. Guidelines for Developing Permanent Photo Points

Permanent photo points are an easy and effective method to evaluate management actions and determine the progress of a weed control program. Comparing photographs of the same site taken over a period of years furnishes visual evidence of vegetation changes. Photo points should be established before initiating a control program in an area to ensure that there is a record of the resource situation prior to changes in management. Photographs, both close-up and general view, should be obtained at each evaluation site. IT IS VERY IMPORTANT TO ACCURATELY IDENTIFY EACH PHOTOGRAPH.

A. Equipment:
   1. Stakes (metal or fiberglass rod).
   2. Plot frame (3 X 3 or 5 X 5 foot metal orfiberglass frame).
   3. Photo identification label (see attached).
   4. 35 mm camera (ideally with a 28 mm wide-anglelens).
   5. Color slide film.
   6. Post (for marking location of the site) (metal orfiberglass).
   7. Post driver.
   8. Orange spray paint (for marking post).
   9. Compass or GPS unit.

B. Site Selection:

At least one permanent photo point should be located in each KEY area. Key areas are “critical” sites within the project area where the proposed management should have a significant impact. The number of key areas needed in a WMA will be influenced by soils, vegetation, topography, etc., and number of acres involved inthe

project. Key areas may be selected on the basis of environmental, social, and/or political criteria.

C. Procedures:

1. Mark the key area with a permanent “transect location” post (spray post with orange paint). Locate a typical area about 25 feet from the “transect location post”. Record the exact distance, compass heading and mark the plot with a stake. This will be the permanent “close up” photo print.
2. Number the site on the photo identification label. (See Attachment 1 at the end of *Appendix* 8.) Lo cate the identification label in the center of the plot. Focus on the identification label when taking the photographs.
3. Timing: Photographs should be taken when the weed is most visible (flowering) and at the same time each year.
4. Close-up Photographs: Place the square frame next to the stake. Place the photo identification label flat on the ground. The camera point, or location from which the photograph is taken, should be on the north side of the photo plot so there are no shadows across the photo. To take the photograph, stand over the photo plot with toes touching the edge of the frame. Include the photo label in the photograph.
5. General View Photographs: General view photographs present a broad view of a study site. The photo identification label is placed in an upright position so that it will appear in the foreground of the photograph. To take general view photographs, stand at the “transect location post”, include the photo label, a general view of the site, and some sky in the photographs.
6. Repeat Photographs: Photographs should be taken at the same time each year using the above procedures. BE SURE TO USE THE SAME 35 MM CAMERA, COLOR SLIDE FILM, AND FACE THE SAME DIRECTION EACH YEAR WHEN TAKING REPEAT PHOTOS.

D. Narrative: A narrative must accompany each photograph so the results can be interpreted. A sample narrative is attached for reference. The first 10 questions should be completed the first year. In subsequent years, questions 1, 3, 6, 7, 8, 11, and 12 should be completed. (Attachment B at the end of Appendix 8.)

E. Map: A map that shows the location of all project area photo points should be kept on file. It may be helpful to mark the site with a GPS unit.

II. Vegetation Monitoring with a Permanent Transect

Specific procedures for establishing transects and collecting the data can be found in individual Federal Agency Handbooks.

Permanent transects are an effective and accurate method to evaluate management actions and determine the progress of weed treatment projects. The purpose of a permanent transects is to monitor the treatment on the weed species and show over time the changes in vegetation. Use this method to establish long-term monitoring information.

Work with WMA federal and state agency cooperators to design a site specific monitoring program if this level of information is needed.

A. General Features

The location of permanent plots must be accurately marked on aerial photos and resource management maps. The location and number of permanent plots installed should be carefully considered. The purpose of a permanent plot is to monitor the treatment on the weed species and show, over time, the effectiveness of the method. Use this method only if you have the WMA objectives establish long-term monitoring. Select those sites where the proposed management should have a significant impact and represents the project area. These should be established before initiating a treatment program in an area to ensure that there is a record of the resource situation prior to changes in management. These will be used on tours to explain the before and after situation and for evaluating program effectiveness.

Complete a detailed, large scale, permanent plot description map for each plot with notes on:

1. Location of the general area of the plot.
2. How to locate the transects.
3. A photo of the transects which includes reference background features.
4. Compass bearing of the transects and bearing to a reference point and distance or GPS location.
5. Bearing of the transects from the photo stake.
6. Location of stakes on the transects.

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III. Insect Biological Control Agent Monitoring

Make sure all release sites are permanently marked with a metal or fiberglass stake and accurately mapped. If possible use GPS unit and enter into weed database or mapping database.

A. Evaluate release sites by answering the following questions:
   1. Did the agent becomes established?
   2. Are its numbers increasing or declining?
   3. Is the population of the target weed increasingor declining?
   4. Have biological control agent predators moved intothe area (such as ants, etc.).

B. Sample the site.
   1. Determine how the populations of the biocontrolagent and the target pest change.
   2. Observe the amount and type of damageactually inflicted on the target host.
   3. The best method of sampling depends on:
      a. How the agent utilizes its host.
      b. The density of the agent at the time ofsampling.
      c. The life cycle of both agent and host.
      d. The desired accuracy of the data to be obtained.
      e. The amount of effort, labor and money which can be expended on taking the samples.

C. Monitoring can be conducted in three ways:
   1. Actively sampling the study area.
   2. Attracting desired specimens to a trap.
   3. Using a passive trap which collects whatever comes by.

D. Active Sampling.
   1. Observation — The simplest, although also the least statistically reliable method of sampling, observation provides limited amounts of information. From this method you can learn:
      a. that both the target organism and the agentare present.
      b. what the agent is doing during the time that it is being observed.
      c. the type and amount of damage inflicted on the host.
      d. how this damage has physically affected thehost.
   2. Daubenmyer/Ring Samples — When specific areas are to be sampled with exact results needed, squares, rectangles or rings of known area can be used. Daubenmyer plant sampling frames of specific size can be placed on the ground and all plant material within counted, measured, identified, clipped, sorted and/or weighed to determine the plant composition, canopy cover and biomass of the area.

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3. Sweep Net Sampling — Similar to observations, sweep net sampling is conducted when the agent is attracted to, or is in the vicinity of, the host. With weed agents, this period is generally restricted to intervals when the agent is feeding or when the adult bioagent is laying eggs.
4. Dissections — When bioagents attack within the host, plant host material can be collected and dissected. This provides information on:
   a. the infestation rate of the host population.
   b. the number of agents per given host.
   c. stage of development of both agent and host.
   d. species composition of agents whennumerous agents are involved.
   e. location within the host where the agent resides.
   f. the amount damage being inflicted by the agents.
5. Before and After Photographs — This is one of the simplest methods for recording results when working with biocontrol agents of weeds. This method does not provide information on density of the target host, etc., but does display the end results.
6. For more specific sampling methods, contact USDA-ARS, USDA-APHIS, state or federal agency biological control coordinators.

NOXIOUS WEED PHOTOPOINT

Photopoint No. _____

Location: _____

Photographer: _____

Date: _____

Time of Day: _____

Weed Species: _____

Establishment Date: _____

Notes: _____

_____

_____

Attachment B

PHOTOGRAPH NARRATIVE
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1. Photograph Identification Number _____

2. Date of photograph _____

3. Grazing use (estimate utilization)
   <33%
   33-66%
   >66%

4. Soil surface texture
   sandy
   loamy
   clay
   other

5. Soil organic matter (optional) — %
   A soil sample can be sent to the soil testing lab to determine organic matter if desired.

6. Herbicide application _____

   Rate (gal./acre) _____

   Surfactant: yes_____ no _____

   Type of applicator: aerial_____ handgun _____
   boom_____ backpack _____

   Applicator:_____county _____federal agency
   _____ state agency _____commercial
   _____ private (landowner)

7. Biological Control Releases

   Agent name: _____

   Target Weed species: _____

   Date of release: _____

   Number of agents released: _____

8. Other Control Methods

Explain: (be specific on technique, date, repeat treatments:

_____

9. Stage of growth of most important weeds at application (list weed species)

rosette (or shoot)				
early bolt				
pre bloom				
flowering				
post bloom				
fall re-growth				

10. Degree of infestation (what percent of total vegetation on the site is weed species)(list weed species)

<1%				
1-5%				
5-25%				
>25%				

11. Size of infestation (treated acres). _____

12. This is a key area because:

_____

_____

13. Percent weed control. (list weed species)

<10%				
10-30%				
30-60%				
60-90%				
>90%				

14. Describe follow-up management (i.e. spottreatments, grazing management, etc.)

_____

_____

_____

_____