8.5 Biological Control Program

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The Biological Control Program at Hanford was established during 1998 in response to increasing incidents of radioactive contamination spread by biological vectors (DOE/RL-98-77). A biological vector is a plant or animal species that is involved in the transport of radioactive contamination. A common Hanford example is the Russian thistle or tumbleweed (*Salsola kali*), which has a taproot that can transport radionuclides from below the ground surface into aboveground plant tissue, making it available for dispersal across the site by wind or other means.

Biological control (or often simply "control") is any activity to prevent, limit, clean up, or remediate the impact to the environment, or human health and safety, from contaminated or undesirable plants or animals. The radiological component includes activities to control the spread of radioactive contamination. The non-radiological component includes activities to control pests (e.g., noxious weeds, arthropods, insects) that may affect the workplace and to assure compliance with federal, state, and local laws. The Biological Control Program is responsible for integration of (1) expanded radiological surveillance, (2) control of plants and animals, (3) cleanup of legacy and new contamination, and (4) restoration of sites affected by radioactive contamination spread by plants and animals.

Industrial weeds, noxious weeds, and pests are controlled by similar methods. Weeds on industrial sites at Hanford are not only a nuisance but can be fire hazards and can reduce the efficiency of men and machines working in the area. Occasionally, the objective of a weed control program at industrial sites is to totally eliminate vegetation in the affected area. On the Hanford Site, the control of weeds occurs at tank farms, radioactive waste pumping installations, industrial sites, power transmission lines and stations, buildings, storage and work areas, and along fence lines. Pest control prevents, limits, or removes undesirable animals through the application of chemical, cultural, or mechanical methods.

Biological control may include preventive measures or measures in response to existing contamination spread. Activities to prevent the spread of contamination include radiological surveys of the ground, vegetation, and flying insects; preventive controls, such as herbicide spraying; and the placement of engineered biological barriers. If contamination has already spread, typical response measures may include posting the area with radiation signs, stabilizing the contamination to keep it from spreading farther, and cleaning up and removing the contamination to an approved disposal location.

In some cases, remediation is necessary following cleanup and removal. Remediation is a common activity on the Hanford Site but has specific meanings and limitations when applied to biological control. Remediation may include soil removal and replacement, revegetation of the soil surface, or placement of engineered barriers to stop biological intrusion (biological barriers). Such remediation is typically performed where there is a potential for surface contamination or infestation problems to recur, with the objective of preventing recurrence.

8.5.1 Biological Control

There were no incidents of offsite contamination by plants or animals during 2002, and all reported cases of new contamination on the site were cleaned up or scheduled for cleanup. In all areas of biological control, access to contaminated sites by professional control and cleanup crews improved during 2002. Facilities were able to request cleanup support without waiting to obtain contracts or set up work orders. Professionals were able to identify and treat problem areas without waiting for facility management to request or approve assistance.

During 2002, flying insects were routinely monitored on the Hanford Site and one contaminated housefly was

captured at an inactive liquid waste transfer facility in the 200-West Area. The source of the contamination was identified and sealed, and no recurrences have occurred; trapping continues at that location.

During 2002, 16 incidents of contaminated vegetation were identified. This is a decrease of ~81% compared to the peak year of 1999, and a decrease of ~52% compared to 2001. During 2002, ~4,613 hectares (~11,400 acres) were treated with chemical herbicides such as Krovar®, Tordon 22K®, or Sahara® to control undesirable vegetation. This is approximately the same amount treated during 2001, but nearly triple the 1,600 hectares (4,000 acres) treated during 1998, just before the program was initiated. Herbicide effectiveness during 2002 was ~90% compared to ~85% during 2001. Approximately 40 hectares (~100 acres), including ~3.2 kilometers (~2 miles) of posted roadways, were cleaned of windblown tumbleweeds and the roads opened. On the Hanford Site, ~809 hectares (~2,000 acres) that were burned by the 2000 range fire were re-seeded with vegetation to prevent the growth of tumbleweeds.

During 2002, there were 16,675 animal control responses. There were 10 contaminated animals detected, showing a decrease of ~78% compared to the peak year of 1998, but the same as in 2001. The control of rodents within and around the perimeters of the Hanford Site operations facilities used ~750 trap and bait stations. There were decreased areas for animals to hide and live because of increased effectiveness of vegetation control.

During 2002, recurring radioactive contamination events caused by deep-rooted vegetation or burrowing animals were treated with Biobarrier® to preclude invasion of waste sites by such biota. Biobarrier®, an engineered fabric impregnated with nodules of mitotic inhibitor to stop root penetration, was put down at 11 sites (~6,549 square meters [~70,500 square feet]). Demonstrations have shown this barrier to be an effective tool in preventing the spread of contamination.

8.5.2 Noxious Weed Control Program

Ten plant species are on a high priority list for control at the Hanford Site. These species are listed below with a summary of the 2002 control activities. These species are targeted because of their ability to rapidly invade an area, ability to dominate a natural habitat, lack of natural predators, inability to be used by wildlife or domestic animals, or ability to cause chemical or physical harm to animals and habitat. Because they are designated as noxious weeds by the Washington State Department of Agriculture, they are specifically targeted for control by chemical, physical, or cultural (i.e., introducing natural insect predators) means.

Yellow Starthistle (*Centaurea solstitialis*). Yellow starthistle represents the most rapidly expanding weed infestation in the western United States. Hanford is at a critical point in the infestation cycle. Over 12,355 hectares (5,000 acres) have been infested, and a seed bank has been established in the soil. Many additional acres have scattered starthistle infestation. Applications of aerial herbicides during 1998 and 1999 have continued to be effective, dramatically reducing the acreage of yellow starthistle infestation requiring treatment during 2002. Seeds were found to have germinated in scattered locations where the populations were previously controlled. These plants were controlled by herbicide application, or hand-pulled and destroyed. Biological control organisms, primarily the parasitic insects *Eustenopus villosus* and *Bangasternus orientalis*, were common in starthistle located during 2002.

Rush Skeletonweed (*Chondrilla juncea*). Rush skeletonweed is widely scattered over large areas on the Hanford Site. Many areas of dense rush skeletonweed infestation have largely been eliminated. Nevertheless, considerable skeletonweed remains as scattered individuals. Populations of skeletonweed have increased on some areas burned in the 24 Command Wildland Fire in June 2000.

During 2002, control of rush skeletonweed concentrated on the area south of the Hanford town site. As in most years, some populations were highly affected by the biological control agents, skeletonweed gall midge (*Cystiphora schmidti*), skeletonweed gall mite (*Eriophyes chondrillae*), and rush skeletonweed rust (*Puccinia chondrillina*), and flowering was eliminated. Other populations were less affected, and some were not significantly impacted by the biological control agents.

Medusahead (*Taeniatherum asperum*). Several individual plants of medusahead were discovered on the 200 Areas plateau during the winter of 2002. Seed heads with remaining seeds were collected and burned. Monitoring

and eradication efforts will continue during 2003 as the plants mature to the point they can be distinguished from neighboring grass species.

Babysbreath (*Gypsophila paniculata*). Efforts to control babysbreath during 2002 concentrated on the main infestation at the Hanford town site. Although babysbreath is resistant to control by herbicides, the invasion on the Hanford Site is relatively small. Control by physical removal while the population is limited is the practical alternative, although the herbicide Roundup® can help with control.

Dalmatian Toadflax (*Linaria genistifolia dalmatica*). Control of dalmatian toadflax focused on a small population at 100-B/C Area. The species at Hanford has yielded to past control efforts. Seedlings of the long-lived perennial plant will be eliminated as they are identified.

Spotted Knapweed (*C. maculosa*). Most populations of spotted knapweed on the Hanford Site have been reduced to scattered individuals, or seedlings germinating from the long-lived seeds. Cooperative work with neighboring landowners continues to eliminate spotted knapweed near the Hanford Site.

Diffuse Knapweed (*C. diffusa*). Aerial applications for control of diffuse knapweed have been effective in the past. Spot treatment of scattered individuals continues. The population of diffuse knapweed near the high water mark of the Columbia River has not actively been controlled by herbicides due to the biological sensitivity of the area. Biological controls, such as banded gall fly (*Urophora affinis*), bronze knapweed root-borer (*Spenopterce jugoslavica*), and lesser knapweed flower weevil (*Larinus minutus*), have been established and are monitored to observe effectiveness in controlling the weed.

Russian Knapweed (*Acroptilon repens*). Biological controls for Russian knapweed are limited, and success in the arid climate of Hanford has been poor. Chemicals and techniques are being developed that promise to be effective with this difficult to control species.

Saltcedar (*Tamarix* spp.). Several individual plants of saltcedar are found on the Hanford Site. Most are remaining from ornamental plantings near homes in the early part of the previous century. A few populations are the result of natural seed dispersal. Most individuals south and west of the Columbia River have been eliminated. Those remaining alive continue to be treated with herbicide, and will be monitored until they no longer show signs of life.

Purple Loosestrife (*Lythrum salicaria*). Low density populations of purple loosestrife have become established along the south and west bank of the Columbia River. Portions of the riverbank and sloughs are monitored for purple loosestrife and identified individuals chemically treated with Rodeo® or physically removed.