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Eradication of South American Cactus Moth, *Cactoblastis cactorum*, from 11 Parishes in Southeastern Louisiana

Environmental Assessment
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Table of Contents

I. Introduction

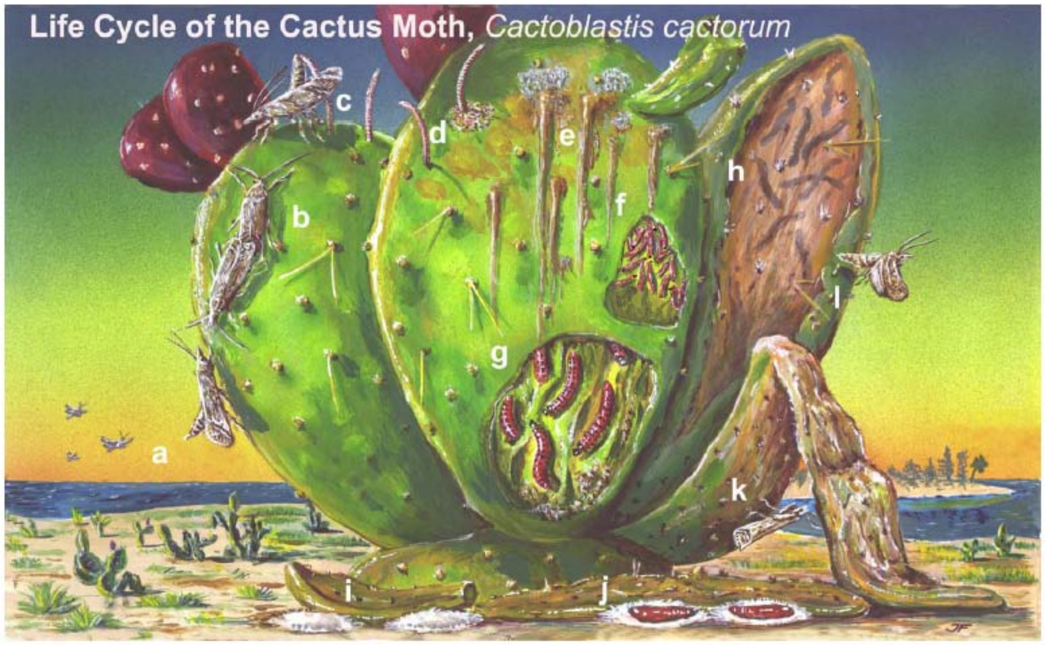
The U.S. Department of Agriculture (USDA), Animal and Plant Health Inspection Service (APHIS), is proposing to eradicate the South American cactus moth (*Cactoblastis cactorum* Berg) from 11 parishes in Southeastern Louisiana (Cameron, Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. Mary, Terrebonne, and Vermilion). By eradicating cactus moth from Lousiana, APHIS hopes to prevent its western spread into Texas, Arizona, and the country of Mexico.

A. Description of the South American Cactus Moth

The South American cactus moth is a grayish-brown moth with a wingspan of 22 to 35 millimeters (mm) (approximately 0.86 to 1.4 inches) belonging to the insect family Pyralidae. The first instar larvae are 2.5 mm long and are greenish-gray in color. Later instar larvae have a rich salmon orange to red color with blackish spots that form bands. Full-grown larvae are about 33 mm long before they pupate. The moth is a serious pest of *Opuntia* species (commonly referred to as prickly pear cactus), and an occasional pest of *Nopalea*, *Cylindropuntia*, and *Consolea* species, four closely related opuntioid cactus genera belonging to the plant family Cactaceae.

B. Life Cycle

Before sunrise, the female moth begins to release sex pheromone signaling to males her readiness to mate. Males respond and mating takes place for a short time. After an incubation period, the female deposits an egg stick, which resembles a cactus spine, consisting of an average of 70 to 90 eggs on a pad of the prickly pear. Eggs develop and hatch into larvae. The first instar larvae bore into the cactus pad and feed as a colony while tunneling through the cactus pad. Externally the damage is characterized by yellowing of plant tissue, with oozing of plant fluids and insect frass. Larvae feed and develop internally, eventually hollowing out the cactus pad and killing the plant. Mature larvae exit the cactus pad to form cocoons and pupate under debris on the ground at the base of the plant. After emergence, adult moths disperse to new areas. Typically, in the Southeastern United States, the moth undergoes three generations per year. Within a short period of time, the South American cactus moth can destroy whole stands of cactus. (See figure 1 for an illustration of the life cycle.)



a) Female moth releasing sex pheromone, (b) mating, (c) female depositing an egg stick, d) hatching, (e) external damage,(f) Shown here in cross-section, larval feeding, (g) internal development of larvae, (h) hollowing out the cactus pad, (i) mature larvae, (j) pupae, (k), adult moths.

Figure 1. Illustration of the life cycle of the South American cactus moth (Joel Floyd, USDA-APHIS-PPQ).

C. Damage Caused by South American Cactus Moth

The feeding larvae cause physical damage by hollowing out and destroying young cactus pads that have not become woody. The damage caused by the larvae enables disease-causing organisms to enter the plant, leading to secondary infections that can cause death to the entire plant. If not controlled, the South American cactus moth poses a serious threat to opuntioid cacti in the United States and Mexico. The Southwestern United States and Mexico are home to 114 native species of *Opuntia*, which are highly valued for their ecological and agricultural uses. The rooting characteristics of *Opuntia* spp. reduce wind and rain erosion, encouraging the growth of other plants in degraded areas. In addition, many species of birds, mammals, reptiles, and insects eat, nest in, or otherwise rely on *Opuntia* spp. for survival. *Opuntia* spp. are also important sources of food, medicine, cosmetics, and dye. In Mexico, *Opuntia* spp. are an important agricultural commodity, and it is estimated that 2 percent of the value and production of Mexico's agriculture comes from them. In the Southwestern United States, *Opuntia* spp. are only a minor agricultural crop, but are popular plants in the landscaping and ornamental nursery industries. *Opuntia* spp. can also be an important source of emergency forage for cattle grazing during drought periods. If the South American cactus moth were to spread to these areas, there would be significant ecological and economic damage.

D. History of the South American Cactus Moth

The South American cactus moth is native to the northern parts of Argentina, Uruguay, Paraguay, and the southern parts of Brazil. It was introduced from Argentina into Australia in the mid 1920s for the biological control of invasive and nonnative *Opuntia* species that had been introduced as natural fences for cattle. The moth was very effective in Australia where it cleared 25 million hectares invaded by *Opuntia stricta*, and is known as the best example of biological control of weeds in Australia.

Since then, it was intentionally introduced into the Caribbean Islands and Hawaii in the 1950s but by 1989, it had unexpectedly found its way into Florida, most likely by natural spread but possibly by movement of infested nursery stock.

By 2003, the South American cactus moth was established in Florida, Georgia, and along the Atlantic coast almost as far north as Charleston, South Carolina. Since arriving in Florida, the South American cactus moth has moved along both coasts, with an increasing rate of approximately 100 miles per year along the Gulf Coast (Simonson et al., 2005). At the end of 2003, it had spread as far west as Pensacola, Florida, near the Alabama State line. By July 2004, the moth was detected on Dauphin Island, Alabama. It was also discovered on two Mississippi barrier islands, Petit Bois and Horn Islands, in early 2008. Most recently, in May 2009, infested cacti were discovered in Louisiana along canals near the Village of Lafitte. Since May, additional surveys and trappings have been conducted in the area and additional infested plants have been discovered.

In August 2006, the moth was detected in Mexico on the island of Isla Mujeres, located 9 km from the mainland in the State of Quintana Roo, in Southeastern Mexico. In Isla Contoy, the cactus moth was detected in May 2007 and declared eradicated in February 2009. These populations have been eradicated and are no longer in Mexico.

II. Purpose and Need

The potential damage to native host cacti in the United States, if South American cactus moth were to spread, has raised concern among research communities, conservation groups, and the Mexican government. APHIS has responsibility for taking actions to exclude, eradicate, and/or control plant pests, including the South American cactus moth, under the Plant Protection Act (7 United States Code (U.S.C.) 7701 et seq.). Since 2003, USDA–APHIS–Plant Protection and Quarantine (PPQ) has been cooperating with USDA–Agricultural Research Service (ARS), and Mississippi State University, to develop a strategic plan to improve detection methods, and control and eradication efforts to establish a barrier along the United States Gulf Coast to contain the spread of the South American cactus moth westward.

The recent finds in 2009 in Louisiana have raised more concern of the westward expansion of the South American cactus moth. There is an increased desire to stop the South American cactus moth from reaching Texas, Arizona, and the country of Mexico. The program will utilize hand and machine removal, burning, and chemicals to get rid of infested material in hopes of eradicating it from this area. The intent is to reduce the population of cactus moth, and then utilize sterile insect technology (SIT) to assist with maintaining the barrier to western movement.

This EA has been prepared consistent with the National Environmental Policy Act of 1969 (NEPA) and APHIS' NEPA implementing procedures (7 Code of Federal Regulations (CFR) part 372) for the purpose of evaluating how the proposed action, if implemented, may affect the quality of the human environment. APHIS is providing a 30-day public comment period for response to this EA.

III. Affected Environment

Cactus infested with the South American cactus moth has been found in three parishes (Jefferson, Lafourche, and Terrebonne) in Louisiana although surveys have been conducted in more parishes within Southern Louisiana (see appendix A for maps of infested sites).

South American cactus moth could spread to surrounding areas thus increasing the eradication efforts to prevent the western spread into Texas, Arizona, and Mexico. The following 11 parishes are being surveyed and are possible locations of future finds: Cameron, Iberia, Jefferson, Lafourche, Orleans, Plaquemines, St. Bernard, St. Charles, St. Mary, Terrebonne, and Vermilion. Most of these parishes have low population densities of less than 125 people per square mile (U.S. Census Bureau, 2009). These 11 parishes are all within Louisiana's coastal zone. The southern half of Jefferson Parish, the southeastern section of St. Charles Parish, most of Terrebonne Parish, and most of St. Mary Parish are primarily marshland and are relatively uninhabited. The major industries in these areas are fishing, and include fin fish, crabs, shrimp, and crawfish.

South American cactus moth infested sites are located in the Barataria Bayous, Barataria Bay (Grand Terre Island), and Northwest section of Terrebonne Bay. Most of these areas are only accessible by boat. These areas are within the boundaries of the Barataria-Terrebonne National Estuary Program (BTNEP). The Barataria-Terrebonne Estuary System (BTES) is a biologically rich and productive ecosystem encompassing 4.1 million acres of uplands, swamps, marshes, bayous, bays, and barrier islands bounded on the west by the Atchafalaya River, and on the east by the Mississippi River. The marsh provides habitat for species such as the bald eagle (previously listed as an endangered species), commercially important fish and oysters, and abundant waterfowl and migratory birds. BTES produces half a billion pounds of fish and oysters annually, and provides recreational opportunities for residents and visitors. BTES also supplies 10 to 15 percent of the United States oil production.

There is considerable acreage across the 11-parish coastal zone planted in sugarcane and rice. Sugarcane fields are routinely burned at the end of harvest. A percentage of rice fields are flooded following harvest and filled with crawfish. Some areas of the marsh are burned by landowners to control vegetation. A burn plan is highly recommended by State and Federal agencies; however, no specific permits are needed unless the State Fire Marshal has imposed a burning ban due to drought or for other reasons.

Infested cacti have been found near Fort Livingston which is designated as an historic site. It is a 19th century coastal defense fort located on Grand Terre Island in Jefferson Parish, Louisiana. In 1955, Grand Terre was designated as a State Wildlife and Fisheries Reservation. In 1979, the Louisiana State legislature created the Fort Livingston State Commemorative Area. The remains of the fort are somewhat of a tourist attraction, although it is only accessible by boat and is closely monitored by the Coast Guard. The fort is located directly east across Barataria Bay from the U.S. Coast Guard Station on Grand Isle, Louisiana. Grand Terre Island was home to the Louisiana Department of Wildlife and Fisheries' Marine Laboratory. This facility has been abandoned and a new marine lab has been occupied on Grand Isle since Spring 2009. The fort is within a wave protection project being conducted by the Louisiana Department of Natural Resources. The project consists of a rock dike built to conserve the gulf shoreline of West Grand Terre Island and to protect Fort Livingston. As a result of tropical storm systems in 2002, the erosion rates along West Grand Terre Island greatly accelerated, requiring some type of protective barrier to be built.

Other national historical sites located in Plaquemines Parish include Fort De La Boulaye, Fort Jackson, and Fort St. Philip. No cacti have been found at these sites.

IV. Alternatives

This EA will analyze the environmental impacts anticipated from the eradication of South American cactus moth from 11 parishes in Louisiana. Two alternatives are being considered include (1) no action by APHIS to eradicate the South American cactus moth, and (2) the proposed action, to use survey, hand removal, machine removal, burning, scorching, chemical treatment, and SIT.

A. No Action

Under the no action alternative, APHIS would not provide any assistance in the eradication of South American cactus moth from southern Louisiana. Other entities, such as ARS and the State of Louisiana, could implement their own eradication program utilizing chemical and mechanical means. However, these entities could also elect not to eradicate South American cactus moth, thus allowing it to continue to spread into surrounding areas.

B. Proposed Action

Under the proposed action, the program would continue to survey and trap to determine the infested areas. Once an area has been determined to be infested, the above-ground plant material of the infested cacti will be either chopped onsite with a flail mower or cut off by hand and disposed of in a landfill. In areas of high vegetation, it might be necessary to burn the brush to make it easier to find the cacti. Chemical treatment will also be used on roots to prevent regrowth and on any plant material that has been chopped with a flail mower to prevent resprouting.

1. Survey and Trapping

Visual survey is conducted by driving on roads or traveling by boat on canals and observing cacti for presence of South American cactus moth egg sticks, larvae, or pupae. If suspect cacti are observed, pads are collected and sent to an identification laboratory to confirm the infestation. In addition, Pherocon 1C pheromone traps (figure 2) are placed on fence posts along roads (for easy access) to determine if South American cactus moth adults are present in the area. Traps are serviced once each week while moths are flying.

Figure 2. Pherocon 1C trap.

2. Flail Mower A flail mower uses banks of flails (or "knives") instead of blades. A flail is a short piece of metal that operates by beating the grass (flailing it) and breaking it off. Flail mowers are useful for tall strands of thick grass, weeds, and even small trees (figure 3). For this program, the flail mower will be mounted on a boom that is attached to an excavator (example given in figure 4). In the marsh, depending on the situation, the excavator will be mounted on a boat or barge, and the boom with flail mower head will be lowered onto individual cactus plants. Infested cacti that are not within reach of the boom will be removed by hand and taken to the mower for flailing. The only time the excavator will be driven onto the ground is on barrier islands or along roadways. On barrier islands, the excavator will be placed on a wood platform and removed cacti placed next to it for flailing. The excavator will not be driven on spoil banks along canals and bayous.

3. Hand Removal In accessible areas and in sensitive habitats, cacti will be cut off at the base and hauled by truck to the River Birch Landfill, 2000 S. Kenner Road, Avondale, Louisiana. The landfill is located 35 to 40 miles from the cactus removal area. The material will be removed from the infested area using plastic containers that will be covered at all times during transport. Where access must be made via boat, once the containers are on shore (at C and M Boat Launch) the material will be dumped into 30-yard long debris dumpsters and hauled to the landfill by truck. The dumpsters will also be covered at all times during transport. The infested cacti would be buried 4 to 6 feet deep within 4 to 5 hours of the material arriving at the landfill. Additional landfills may be used if the program expands into new parishes.

Figure 3. Example of a flail mower (Hurricane H70). Source: http://www.wikco.com/befh70.html (Accessed August 11, 2009.)

Figure 4. Drawing of an excavator.

4. Controlled Burning

Burning of marsh in Louisiana is conducted on a routine basis and designed to improve habitat by elimination of monoculture marsh grasses. The use of prescribed fires to control weeds and woody vegetation, improve forage health, manipulate wildlife habitat, and reduce fire-prone vegetation is well established. In this program, burning would be used as a support tool with the following expected benefits:

- removal of marsh grass and debris covering cacti—this would expose prickly pear to survey crews for examination and easier access for removal.
- removal of egg sticks by scorching; and
- elimination of pupae hidden within dead material at the base of cacti.

Fires will be set using a driptorch. A driptorch is a tool used in wildland firefighting, controlled burning, and other forestry applications to intentionally ignite fires. The driptorch consists of a canister for holding fuel with a handle attached to the side, a spout with a loop to prevent fire from entering the fuel canister, a breather valve to allow air into the canister while fuel is exiting through the spout, and a wick from which flaming fuel is dropped to the ground. The wick is ignited and allows the fire to be directed as needed. For storage or transport, the spout and wick can be secured upside down inside the canister. Typically, the fuel used is a mixture gasoline and diesel with a ratio of 30 percent to 70 percent, respectively. Sometimes heavier oils are used to increase adhesion of the liquid fuel to the vegetation, and increase burn time and heat.

A written prescribed burn plan will be developed well ahead of burning time. This plan will address the following:

- landowner and site information;
- description of burn area, including land use, present vegetation cover, and topography;
- objectives of the burn and planned timing to accomplish;
- acceptable weather conditions to safely complete the burn;
- primary and secondary firebreaks;
- hazards within and adjacent to the burn unit;
- equipment and personnel needs;
- precautions to prevent escapes and actions needed to suppress an escape;
- maps showing adjacent land uses. and hazards and the firing sequence; and
- contact information for local authorities, including the local fire department.

Consultation will be undertaken with the landowner, USDA, Natural Resource Conservation Service, Louisiana Department of Agriculture and Forestry, and the Louisiana State University AgCenter if burning is proposed.

5. Scorching

A 500,000 BTU propane torch will be used to singe egg sticks off cactus pads. This would be used to scorch pads in large patches of cacti, thus reducing South American cactus moth populations. This method does not reduce host material.

6. Chemical Use

The herbicide Surmount^{TM} (fluroxypyr ester (0.67 lb a.e./gallon) plus picloram (triisopropanolamine salt) (0.67 lb a.e./gallon) will be used at a rate of 3 to 4 pt/acre. Cactus plants are spot sprayed using a hand-held backpack wand sprayer or, in some cases, the herbicide may be painted on the cut stem of the cactus. Spot treatments of herbicide would be applied to the cut stem of the plant to ensure it does not resprout. It will also be applied to the cactus bits remaining after plants are flail mowed to prevent pieces from resprouting into new plants that would serve as host material for South American cactus moth.

7. Sterile Insect Release

Sterile insect technology (SIT) is used to establish a barrier to prevent the spread of cactus moth westward along the Gulf Coast. A dose of radiation is applied to mass reared adults to sterilize them. The moths are reared, sterilized, and shipped from an existing cactus moth SIT production facility operated by the Florida Department of Agriculture and Consumer Services, Division of Plant Industry. The sterile moths will be released in the field by hand approximately twice a week during the moths' three flight periods. Trapping is used to monitor the effectiveness of program operations and to determine precise locations for field releases of sterile moths.

V. Environmental Consequences

A. No Action

The South American cactus moth prefers to lay its eggs and feed on prickly pear cacti. From 2001 to 2005, the moth spread at a rate of almost 100 miles per year (Simonson et al., 2005; Solis et al., 2004). If allowed to continue to spread to the west, it will reach cactus-rich areas of Mexico and the Southwestern United States including Texas, Arizona, New Mexico, and California. There is a high risk of South American cactus moth spreading into Mexico from the United States where its establishment is very likely given the abundance of host material and the historical infestation in the Yucatan Peninsula (http://www/aphis.usde.gov/plant_health/plant_pest_info/cactoblastis/updates.shtml).

Prickly pear cactus has significant economic and agricultural values. It has been used for natural, urban, and agricultural landscapes. In Mexico, the cactus is a major agricultural product and an integral part of their culture (Simonson et al., 2005; Zimmermann, 2000; Soberon et al., 2001; Mahr, 2001). In the United States, prickly pear is valued as a specialty food crop and as emergency fodder during drought conditions, and it serves significant commercial value in the ornamental nursery and landscape industries.

The South American cactus moth can have negative impacts on the yield of cacti, including mortality and reduced plant size. It also decreases the value of products produced due to plant damage and control costs (Simonson et al., 2005). Prickly pear is used for a variety of products including food for humans, food for livestock, horticultural plantings, cochineal dyes, and medicine (Simonson et al., 2005; Stiling, 2002).

The South American cactus moth can have impacts on the environment as it can destroy native prickly pear species causing disruption to ecosystems and resulting in soil erosion. Throughout the United States, there are 28 species of prickly pear with 9 endemic to the United States. Mexico has 70 species at risk, with 51 species endemic to Mexico (Simonson et al., 2005; Stiling, 2002; Zimmermann, 2000).

Prickly pear cacti have been identified as nurse plants that help to facilitate establishment of other plants by providing cooler, moist areas for plants to sprout and grow. Prickly pear has also been used by many animals as a source of nesting and for food consumption (Simonson et al., 2005; Stiling, 2002). One prickly pear is on the Federal endangered species list, with several others either on State lists or considered species of concern.

B. Proposed Action

Under the proposed action, the program will use a combination of survey and trapping, hand removal, machine removal, scorching, burning, chemical applications, and SIT to eradicate South American cactus moth from the 11 parishes in Louisiana. The environmental impacts associated with each of these activities are described in detail below.

1. Survey and Trapping

The environmental impacts from the survey and trapping activities will be minimal. The visual surveys are conducted using boats on the canals or vehicles using existing roads. These types of activities are not uncommon in these areas and will cause limited disturbances to wildlife or humans in the area.

Pheromone-baited traps are placed on fence posts along existing roads and on sticks within the canals and will be monitored using vehicles and boats. These pheromone traps are specific to South American cactus moth so no other insect species will be attracted to the trap. Other insects may fly into the trap unexpectedly, but these will be few in number.

2. Flail Mower

Any environmental impact associated with the use of the flail mower will be localized and short term. The flail mower will be lowered onto individual plants so only plants that are in the immediate vicinity of the targeted cactus are likely to be chopped. Neighboring plants will repopulate any chopped areas over time.

The flail mower generates 96 decibels of noise—an average noise level for a power mower. Although noise at this level has been known to cause hearing loss in humans, this is only after constant exposure over a long time period; the flail mower will only produce noise for a short time in a given area. The mower will be turned on when cutting each individual cactus and will remain off when in transit from one location to another. This noise may cause some disturbance to wildlife, including birds in the area, as most of this area is uninhabited and ambient noise levels are low. However, each location will only be treated with the flail mower once, and any disturbance to wildlife will be only for the duration of each individual cutting and will not be significant.

3. Hand Removal

There are limited environmental impacts associated with the hand removal of the cacti by cutting or digging. The actual cutting and digging of cactus will involve minimal impacts to the site as only the cactus will be removed. To prevent or minimize soil disturbance and erosion in areas along the canals and on barrier islands, only the tops of cactus will be removed and an herbicide will be applied on the root to prevent regrowth. Digging of the roots may occur if infested cacti are found on the mainland. Any increase in soil erosion from the digging of roots is expected to be minimal and of a local nature.

All cut cactus will be transported approximately 30 to 40 miles via boats and trucks using existing canals and roads to the River Birch Landfill. Prior to the removal from the cutting area, the cactus will be placed in covered plastic containers. When the cactus arrives at the port, it will be placed into covered 30-yard debris dumpsters limiting any escape of pest material. Once at the River Birch Landfill, the material will be buried 4 to 6 feet deep within 4 to 5 hours, preventing the continuation of the South American cactus moth life cycle.

4. Controlled Burning

All controlled burning will be conducted according to a prescribed burn plan, as previously described, and after consultation with the appropriate authorities. Burning is conducted on a routine basis and designed to improve habitat by elimination of monoculture marsh grasses throughout the area. The use of fire is intended to burn the brush and grasses surrounding the cactus to make it more identifiable; however, because the fire is not hot and intense enough, it is unlikely to result in destruction of the cacti. Only several hundred linear feet would be burned at a time, and the burn would not last more than a couple of hours. If this type of burn is conducted, it will be small in scope and would occur only where cacti are located. Plants that are burned are likely to grow back over time as neighboring plants expand into those areas. Animals in the area are likely to flee to surrounding areas until the habitat has recovered. To avoid any impacts to birds, burning will not take place in time periods when birds are nesting in the area.

Nymann and Chabreck (1995) looked at the benefits and problems associated with controlled burns in coastal marshes. Burning increases the nutrient content and allows for regrowth. However, promoting plant growth may be more complicated in sandy soils than in organic soils because sandy soils may not retain enough soil water (Nyman and Chabreck, 1995). Most wildlife, other than rabbits, found shelter from experimental dry burn; however, fires should be avoided in spring and summer when young wildlife may be present (Nyman and Chabreck, 1995). Most animal's immediate response to fire ranges from panic to calm movement from fires (Russell et al., 1999). Most animals, including amphibians who exhibit poor dispersal capabilities, were able to escape from the prescribed burn (Russell et al., 1999). Studies of bird populations showed that prescribed burns had relatively no effect on bird populations. In some cases, bird populations increased in subsequent years (Brennan et al., 2005; Blake, 2003).

The environmental impact of smoke can be minimized by keeping the burn area small (in this case only several hundred linear feet would be burned at a time). Consultation on the burn plan will occur with the landowner, USDA, Natural Resource Conservation Service, Louisiana Department of Agriculture and Forestry, and the Louisiana State University AgCenter.

5. Scorching

There are no impacts anticipated from the scorching of cactus pads. The propane torch would be used only to burn off egg sticks from the infested cactus pads as a means to reduce South American cactus moth populations.

6. Chemical Use

To analyze the potential impact from the use of Surmount™ (a combination of the herbicides picloram and fluroxypyr) in the proposed eradication program, a screening level risk assessment was conducted (see appendix B). The risk assessment concludes that the available toxicity data, when coupled with the likely exposure of nontarget species, suggests that nontarget impacts are not expected from the use of either herbicide. The toxicity information for both acute and chronic tests indicates low toxicity. Even when coupled with the very conservative exposure estimates used in the risk assessment, the direct and indirect risks of herbicide applications to terrestrial and aquatic nontarget species is expected to be below levels of concern.

The risk assessment focused on backpack applications but can also be used for treatments where the herbicide is painted on the cut stem of cactus. In this case, toxicity of the herbicides remains the same, but actual exposure in the field would be much less. Even so, herbicide would only be placed on the cut stem. Because all stems are to be cut to ground level, there is little opportunity for herbicide to leave the application site through runoff, and application rates would remain the same as those that were analyzed. Therefore, it seems reasonable to assume that the exposure of nontarget organisms will be similar to that which was analyzed in the risk assessment. Painting the herbicide onto the cut stems, therefore, is not believed to result in any additional risk to nontarget species, and is expected to be below levels of concern when this method of application is used.

The risk assessment also did not specifically analyze risk to human health from the proposed use of herbicides. However, it is clear from the toxicity information presented for mammalian nontarget species that the toxicity of the herbicides is low, and that there is little opportunity for herbicide applications to result in contamination of sites other than the target site (cactus stems cut off at ground level and the chopped remains of cactus plants that are treated after being mowed). Other than the applicators, the remote locations of most of the cacti that would be treated coupled with the very directed site-specific herbicide application (thus allowing for little or no incidental offsite movement of herbicide), will preclude humans from being exposed either directly or indirectly to the treated stems/remains of cacti. While there is the opportunity for applicator exposure, any exposure should be minimal as the applicators will all be certified pesticide applicators and will be applying the herbicide according to label directions, which are designed to maximize applicator safety. The risk to applicators is expected to be minimal.

7. Sterile Insect Release

There are virtually no environmental impacts associated with sterile insect releases (Robinson and Hendrichs, 2005). The mass-rearing, sterilization, and release of stile insects are generally associated with only a few environmental risks as long as safety standards and good field practices are followed (Dyck et al., 2005). Most environmental effects associated with SIT are associated with insecticides used to suppress population prior to using SIT, indirect effects related to land use planning, and importance of native species being eradicated (Dyck et al., 2005).

The eradication of cactus moth from Louisiana will not involve suppression of population with insecticides, nor will it change area-wide land uses, nor is cactus moth a native population in this area. Those environmental effects, as outlined in Dyck et al. (2005), are not anticipated with the proposed action.

Although the dose of radiation applied to the moths will result in 100 percent sterility of the females, the males will only be partially sterile. However, the offspring of the partially sterile male moths will be completely sterile (APHIS, 2009). This has been tested on cactus moth in field cages, and has been shown to be effective at reducing populations at release ratios as low as 5 sterile moths to 1 fertile moth (APHIS, 2009).

The only environmental effect anticipated from the use of SIT is the reduction in the number of cactus moth in the area as the fertile wild population mates with the sterile populations.

Releases of the moths will be done by hand. Trucks and boats will be used to allow personnel to reach the areas where sterile moths should be released. There should be limited disturbance of the area where the moths will be released.

VI. Other Considerations

A. Coastal Zone Management

The Permits/Mitigation Support Division of the Louisiana Department of Natural Resources is charged with implementing the Louisiana Coastal Resources Program (LCRP) under authority of the State and Local Coastal Resources Management Act, as amended (Act 361, La. R.S. 49:214.21 et seq). This law seeks to protect, develop, and, where feasible, restore or enhance the resources of the State's coastal zone. Its broad intent is to encourage multiple uses of resources and adequate economic growth while minimizing adverse effects of one resource use upon another without imposing undue restrictions on any user. Besides striving to balance conservation and resources, the guidelines and policies of LCRP also help to resolve user conflicts, encourage coastal zone recreational values, and determine the future course of coastal development and conservation. The guidelines are designed so that development in the coastal zone can be accomplished with the greatest benefit and the least amount of damage. The LCRP is an effort among Louisiana citizens, as well as State, Federal and local advisory and regulatory agencies.

The Coastal Use Permit is the basic regulatory tool of the Permits/Mitigation Support Division and is required for certain projects in the coastal zone, including but not limited to dredge and fill work, bulkhead construction, shoreline maintenance, and other development projects. The purpose of the Coastal Use Permit process is to make certain that any activity affecting the coastal zone is performed in accordance with guidelines established by the LCRP.

APHIS will coordinate with the Department of Natural Resources regarding the program to ensure that all activities are in compliance with the requirements of LCRP.

B. National Historic Preservation Act

Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended, requires Federal agencies or their applicants to take into account the effects of their undertakings on historic structural and archaeological properties. The Section 106 process must be completed prior to the spending of Federal funds or issuance of a Federal license or permit for the undertaking. The Section 106 process must be conducted as directed by Federal regulation (36 CFR part 800).

Under NHPA, the Louisiana Office of Cultural Development is given the role of the State Historic Preservation Office (SHPO). Within SHPO there are two offices that conduct Section 106 on a joint basis, the Division of Historic Preservation and the Division of Archaeology. The Division of Historic Preservation reviews the effects of Federal actions on aboveground structures.

Fort Livingston is designated as an historic site. It is a 19th century coastal defense fort located on Grand Terre Island in Jefferson Parish, Louisiana. There is infested cactus growing in and around the fort that needs to be removed.

Louisiana State Parks, Office of Cultural Development has jurisdiction over Fort Livingston. APHIS has consulted with Louisiana State Parks, and they are in support of our control efforts. An archeologist may need to be on site during cacti removal in case any artifacts are uncovered.

C. Threatened and Endangered Species

Section 7 of the Endangered Species Act and its implementing regulations require Federal agencies to ensure that their actions are not likely to jeopardize the continued existence of threatened or endangered species or result in the destruction or adverse modification of critical habitat. APHIS prepared a biological assessment and has determined that the proposed program will have no effect on the Gulf sturgeon, pallid sturgeon, or the green hawksbill, Kemp's ridley, leatherback, or loggerhead sea turtles. APHIS has also determined that the proposed program may affect, but is not likely to adversely affect, the Louisiana black bear and its critical habitat, piping plover and its critical habitat, and the brown pelican, and has requested concurrence with this determination from the U.S. Fish and Wildlife Service (FWS). No program activities that could affect federally listed species will be conducted until informal consultation with FWS has been completed.

VII. Agencies Consulted

U.S. Department of Agriculture
Animal Plant Health Inspection Service
Plant Protection and Quarantine
Emergency and Domestic Programs
4700 River Road, Unit 134
Riverdale, MD 20737

U.S. Department of Agriculture
Animal and Plant Health Inspection Service
Policy and Program Development
Environmental Services
4700 River Road, Unit 149
Riverdale, MD 20737

Louisiana State Parks
Office of Cultural Development
P.O. Box 44426
Baton Rouge, Louisiana 70804–4426

U.S. Army Corps of Engineers
Environmental Planning and Compliance
7400 Leake Ave
New Orleans, LA 70118

Louisiana Department of Agriculture and Forestry
Horticulture and Quarantine Programs
5825 Florida Blvd.
Baton Rouge, LA 70806

Louisiana Department of Agriculture and Forestry
Soil and Water Conservation
5825 Florida Blvd.
Baton Rouge, LA 70806

Louisiana Department of Natural Resources
Coastal Resources Coordinator
Coastal Management Division
Consistency Section
P.O. Box 44487
Baton Rouge, LA 70804–4487

Louisiana Department of Natural Resources
Permits, Mitigation, and Support Division Administrator
Coastal Management Division
Support Services
P.O. Box 44487
Baton Rouge, LA 70804–4487

LSU Agcenter
A547 Life Science Bldg Annex, Dept. of Entomology
Baton Rouge, LA 70803

Batataria-Terrebonne National Estuary Program
320 Audubon Dr.
N. Babington Hall, Room 105
Nicholls State Univ.
Thibodaux, LA 70301

U.S. Department of Agriculture
Natural Resources Conservation Service
3737 Government Street
Alexandria, Louisiana 71302

Office of Coastal Restoration and Management
Permits, Mitigation and Support Division
Department of Natural Resources
617 North 3rd Street
Baton Rouge, LA

VIII. References

APHIS—See United States Department of Agriculture, Animal and Plant Health Inspection Service.

Blake, J.G., 2005. Effects of prescribed burning on distribution and abundance of birds in a closed-canopy oak dominated forest, Missouri. Biological Conservation 121: 519-531.

Brennan, E.K., Smith, L.M., Haukos, D.A., and LaGrange, T.G., 2005. Short-term response of wetland birds to prescribed burning in rainwater basin wetlands. Wetlands, 25(3):667–674.

Dyck, V.A., Hendrichs, J., and Robinson, A.S. (eds.), 2005. Sterile Insect Technique, Principles and Practice in Area-Wide Integrated Pest MAangement, 499–524. IAEA, Springer.

Mahr, D.L., 2001. Cactoblastis cactorum (Lepidoptera:Pyralidae) in North America: A workshop of assessment and planning. The Florida Entomologist, 84 (4):465–473.

Nymann, J.A., and Chabreck, R.H., 1995. Fire in coastal marshes: history and recent concerns. Pages 131–141 in Susan I. Cerulean and R. Todd Engstrom, eds. Fire in westlands: a management perspective. Proceedings of the Tall Timbers Fire Ecology Conference, No. 19. Tall Timbers Research Station, Tallahassee, FL.

Robinson, A.S., and Hendrichs, J., 2005. Prospects for the future development and application of the sterile insect technique. IN: Dyck, V.A., Hendrichs, J., and Robinson, A.S. (eds.), 2005. Sterile Insect Technique, Principles and Practice in Area-Wide Integrated Pest MAangement, 727–760. IAEA, Springer.

Russell, K.R., Van Lear, D.H., and Guynn, D.C., 1999. Prescribed fire effects on Herpetofauna: review and management implications. Wildlife Society Bulletin, 27 (2):374–384.

Simonson, S.E., Stohlgren, T.J., Tyler, L., Gregg, W.P., Muir, R., and Garrett, L.J., 2005. Preliminary assessmentof the potential impacts and risks of the invasive cactus moth, *Cactoblastis cactorum* Berg, in the U.S. and Mexico. Final Report to the International Atomic Energy Agency, April 25, 2005.

Soberon, J., Golubov, J., and Sarukhan, J., 2001. The Importance of *Opuntia* in Mexico and Routes of Invasion and Impact of *Cactoblastis cactorum* (Lepidoptera:Pyralidae). The Florida Entomologist, 84 (4):486–492.

Solis, M.A., Hight, S.D., and Gordon, D.R., 2004. Tracking the cactus moth, *Cactoblastis cactorum* Berg., as it flies and eats its way westward in the U.S.. News of the Lepidopterists Society, 46(1).

Stiling, P., 2002. Potential non-target effects of a biological control agent, prickly pear moth, *Cactoblastis cactorum* (Berg) (Lepidoptera:Pyralidae), in North America, and possible management actions. Biological Invasions 4:273–281.

U.S. Census Bureau, 2009. State and county quickfacts. Data derived from population estimates, census of population and housing, small area income and poverty estimates, state and county housing unit estimates, county business patterns, nonemployer statistics, economic census, survey of business owners, building permits, consolidated federal funds report. [Online.] Available: http://quickfacts.census.gov/qfd/maps/louisiana_map.html. [2009, Aug. 18.]

U.S. Department of Agriculture, Animal and Plant Health Inspection Service, 2009. USDA 2009 strategic plan for control of the cactus moth, *Cactoblastis cactorum*. Riverdale, MD. 19 pages.

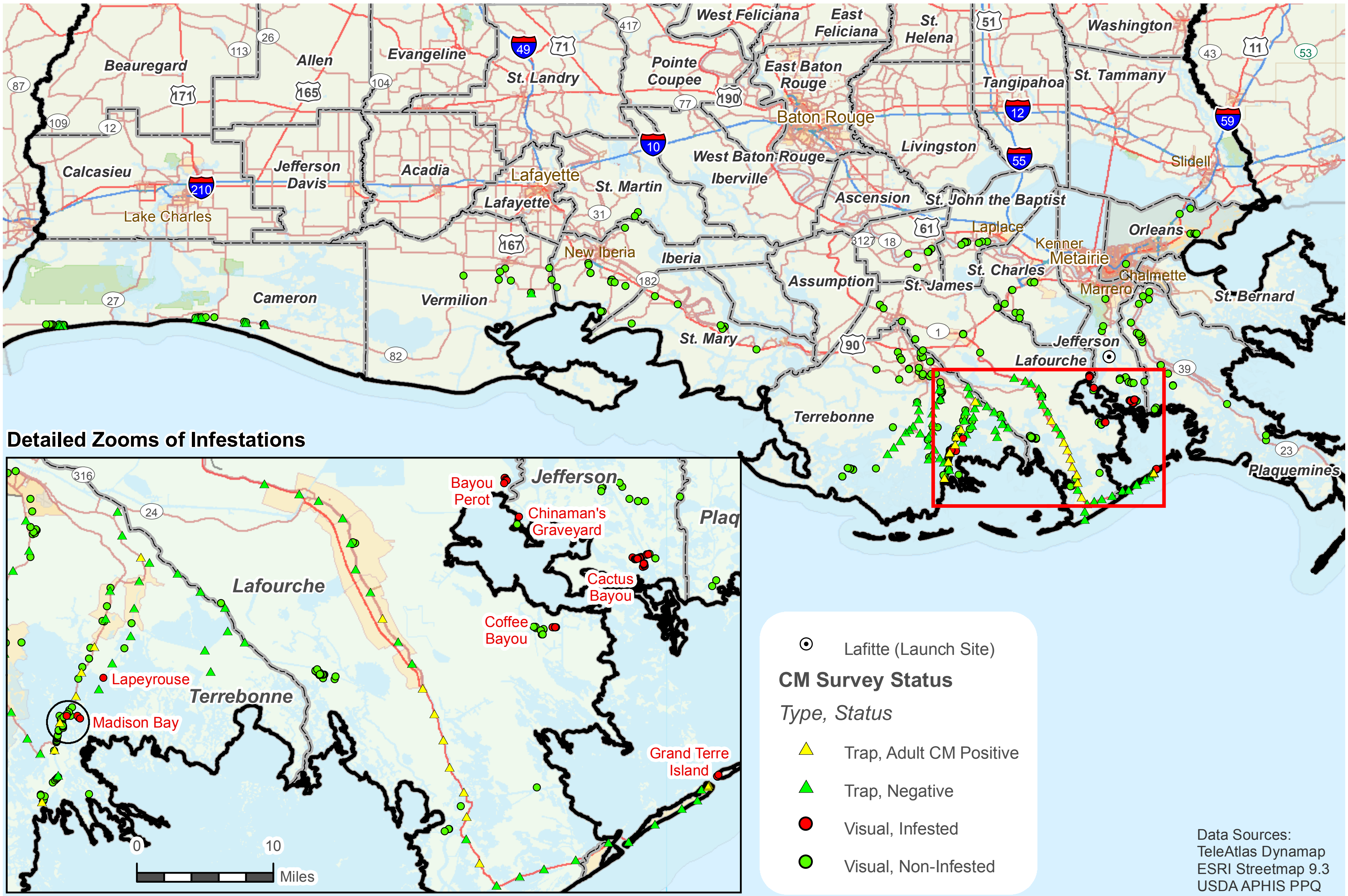
Zimmermann, H.G., Moran, V.C., and Hoffmann, J.H., 2000. The renowned cactus moth, *Cactoblastus cactorum*: its natural history and threat to native *Opuntia* floras in Mexico and the United States of America. Diversity and Distributions, 6:259–269.

Appendix A. Cactus Moth Survey in Louisiana

USDA
United States Department of Agriculture

Overview of Cactus Moth Surveys in Louisiana
August 28, 2009

APHIS
Animal and Plant Health Inspection Service



USDA-APHIS-PPQ
2150 Centre Ave.
Fort Collins, Co 80526

Miles
0 10 20 30 40

Coordinate System:
Geographic, WGS 1984

Date Printed: August 28, 2009
Time Printed: 12:18 hrs MST

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Appendix B. Screening Level Ecological Risk Assessment

Screening Level Ecological Risk Assessment for the Proposed Use of Surmount™ to Control Cactus that are Host for the South American Cactus Moth, *Cactoblastis cactorum*

Introduction

The purpose of this ecological risk assessment is to provide a screening level evaluation of potential ecological impacts related to the use of Surmount ™ for control of *Opuntia* sp. cactus plants which serve as a host for the invasive South American cactus moth, *Cactoblastis cactorum*. Risk to nontarget species was estimated using a deterministic approach where conservative estimates of exposure were calculated and then compared to the most sensitive toxicity endpoint.

Surmount ™ is a pre-pack herbicide formulation containing the active ingredients picloram and fluroxypyr methylheptyl ester (MHE) and is proposed for use as a backpack application to plants at a formulated rate of 3.0 to 4.0 pints/acre. Surmount contains 13.2% picloram and 10.6% fluroxypyr MHE. Other ingredients in the formulation include dipropylene glycol monomethyl ether at 14.9% and naphthalene at 2% with the remaining ingredients (59.2%) not reported on the material safety data sheet (Dow, 2007).

Picloram/Fluroxypyr

<u>Terrestrial</u>

<u>Terrestrial Exposure to Picloram/Fluroxypyr</u>

Estimates of residues on terrestrial food items were determined using the EPA Office of Pesticide Programs (OPP) terrestrial residue model T-REX (EPA, 2005). The model provides median and upper bound estimates of residues to different food items based on the assumption of a direct application. The product in this program will be applied at a rate of 3.0 to 4.0 pts/acre which results in a maximum application rate for picloram and fluroxypyr MHE of 0.594 and 0.48 lb/ac, respectively. The maximum application rate was used as input into the model to determine residues on a variety of food items. The estimated residues are conservative since the method of application for this program will be made using backpack sprayers where applications can be directed towards individual plants. Based on the low toxicity of each herbicide to birds and mammals described below the herbicide with the highest rate of application was chosen for modeling purposes since it would result in the highest residues. A range of avian body weights and feeding guilds were used to estimate daily food consumption rates (table 1).

Table 1. Food Consumption Rates for Different Avian Size Classes.

Avian Class	Body Weight (g)	Ingestion (dry) (g bw/day)	Ingestion (wet) (g/day)	% body wgt Consumed	(kg-diet/day)
Small	20	5	23	114	2.28E-02
Mid	100	13	65	65	6.49E-02
Large	1000	58	291	29	2.91E-01

Body weight specific doses can be estimated for different feeding classes using the estimates of food consumption for each avian class and the upper bound residues estimated from T-REX on a variety of food items (table 2). Listed food item categories are standard output using the T-REX model.

Table 2. Estimated Environmental Concentrations for Different Avian Classes.

Dose-based EECs (mg/kg-bw)	Avian Classes and Body Weights		
	small 20 g	mid 100 g	large 1000 g
Short Grass	162.36	92.59	41.45
Tall Grass	74.42	42.43	19.00
Broadleaf plants/sm Insects	91.33	52.08	23.32
Fruits/pods/seeds/lg insects	10.15	5.79	2.59

A similar approach of estimating class and body weight specific doses can also be done for different wild mammals (table 3). Ingestion rates based on body weight and the percent of body weight consumed can be estimated for mammalian herbivores, insectivores and granivores.

Table 3. Ingestion Rates for Different Mammalian Weights and Feeding Classes.

Mammalian Class	Body Weight (g)	Ingestion (dry) (g bwt/day)	Ingestion (wet) (g/day)	% body wgt consumed	(kg-diet/day)
	15	3	14	95	1.43E-02
Herbivores/	35	5	23	66	2.31E-02
Insectivores	1000	31	153	15	1.53E-01
	15	3	3	21	3.18E-03
Granivores	35	5	5	15	5.13E-03
	1000	31	34	3	3.40E-02

The different mammalian feeding groups and body weights can then be used to estimate exposure values using the upper bound residue values from T-REX (table 4).

Table 4. Estimated Environmental Concentrations for Different Mammalian Classes.

Dose-Based EECs (mg/kg-bw)	Mammalian Classes and Body weight					
	Herbivores/ insectivores			Granivores		
	15 g	35 g	1000 g	15 g	35 g	1000 g
Short Grass	135.92	93.94	21.78			
Tall Grass	62.30	43.06	9.98			
Broadleaf plants/sm Insects	76.46	52.84	12.25			
Fruits/pods/seeds/lg insects	8.50	5.87	1.36	1.89	1.30	0.30

Terrestrial Effects of Picloram/Fluroxypyr

Surrogate acute and chronic toxicity studies with birds show that picloram is practically non-toxic to quail, ring-necked pheasants and mallards with LD_{50} values that exceed 2,000 mg/kg and LC_{50} values exceeding 5,000 ppm (EPA, 2009). For those studies reporting no observable effect concentrations (NOEC) the values were reported as the highest test concentration tested suggesting no acute sublethal impacts were noted during the duration of the study. Chronic toxicity studies with birds do not appear to be available. Fluroxypyr also appears to have low toxicity to birds based on surrogate bobwhite quail and mallard data (EPA, 2009). Acute oral and dietary toxicity values are greater than highest reported test concentrations with LD_{50} values exceeding 2,000 mg/kg and LC_{50} values greater than 5,000 ppm. Chronic toxicity data also suggests low toxicity with NOEC values greater than 500 ppm (EPA, 2009).

The toxicity of picloram and fluroxypyr to wild mammals would also be expected to be low based on surrogate toxicity data for mammals exposed to Surmount™ (Dow, 2007). Acute oral and dermal toxicity is low with LD_{50} concentrations greater than 5,000 mg/kg while inhalation toxicity is also low with LC_{50} values greater than 5.56 mg/L. These tests would include exposure to both active ingredients as well as other ingredients contained in the formulation. Several sub-chronic and chronic toxicity studies exist for each active ingredient. Fluroxypyr sub-chronic and chronic NOEL values range from a low of 100 mg/kg/day in development and carcinogenicity toxicology studies to the highest test concentration tested, 1000 ppm, in other chronic studies. Picloram has low chronic toxicity to mammals based on the range of NOEC and LOEC values. Picloram sub-chronic and chronic toxicity also varies depending on the study with rat NOEL values ranging from 20 mg/kg/day in a six month feeding study to 1000 mg/kg/day in reproductive toxicity studies (EPA, 2005).

Terrestrial Risk Characterization of Picloram/Fluroxypyr

Risk to terrestrial receptors was estimated by comparing exposure residues to the lowest toxicity value. The residue value divided by the toxicity value can be used to estimate a risk quotient (RQ) for each avian and mammal age and feeding class. For birds risk was characterized using the lowest reported LD_{50} value (>2000 mg/kg) and comparing that to the avian doses estimated for each representative bird weight. EPA Office of Pesticide Program has established levels of concern for acute terrestrial risk to federally listed as well as non-listed vertebrates (EPA, 2004). The levels of concern for listed species (0.1) and non-listed species (0.5) are used to assume that if the RQ is above a level of concern there is a presumption of risk to that group of animals. For chronic risk the level of concern is one and is based on long term residues and NOEC values from chronic studies. For picloram risk was low for all bird weights and food types assuming direct application (table 5). The risk is actually much less for birds since the toxicity values are greater than the highest test concentration tested. Based on the low acute avian toxicity and the lack of chronic exposure to birds the chronic risk is expected to be very low.

Table 5. Estimated Risk Quotient Values for Select Avian Classes.

Dose-based RQs (Dose-based EEC/adjusted LD_{50})	Avian Acute RQs		
	20 g	100 g	1000 g
Short Grass	<0.01	<0.03	<0.12
Tall Grass	<0.00	<0.01	<0.05
Broadleaf plants/sm insects	<0.01	<0.01	<0.07
Fruits/pods/seeds/lg insects	<0.00	<0.00	<0.01

The acute and chronic risk to different sized mammals feeding on a variety of food items was low for acute exposures. Using the >2000 mg/kg dose for rats the risk was presumed to be minimal for acute exposures since all of the RQ values were below 0.03 (table 6). Chronic risk quotient values based on the 20 mg/kg/day NOEL showed exceedance of one for certain sized mammals feeding on certain food items. There is a presumption of risk to some mammals feeding on short and tall grass as well as broadleaf plants. This is a very conservative estimate of risk since it assumes chronic exposure to picloram which has a reported foliar dissipation half-life of eight days suggesting that chronic exposure will not occur. In addition this assessment assumes that all food items will be directly treated with herbicide which will not be the case since backpack sprayers directing applications to individual *Opuntia* sp. will minimize applications to non-target plants. Also this assessment assumes that all mammals will feed exclusively on contaminated prey which is also not expected due to the method of application. Based on the multiple conservative assumptions in this assessment chronic risk to wild mammals is not expected.

Table 6. Estimated Risk Quotient Values for Select Wild Mammal Classes.

Dose-based RQs (Dose-based EEC/LD_{50} or NOAEL)	15 g mammal		35 g mammal		1000 g mammal	
	Acute	Chronic	Acute	Chronic	Acute	Chronic
Short Grass	<0.03	3.09	<0.03	2.64	<0.01	1.42
Tall Grass	<0.01	1.42	<0.01	1.21	<0.01	0.65
Broadleaf plants/sm insects	<0.02	1.74	<0.01	1.49	<0.01	0.80
Fruits/pods/lg insects	<0.00	0.19	<0.00	0.17	<0.00	0.09
Seeds (granivore)	<0.00	0.04	<0.00	0.04	<0.00	0.02

Indirect risk to birds and mammals can also occur through the loss of habitat or prey items. Surmount™ is expected to be toxic to some terrestrial plants based on its mode of action however the method of application proposed in this program will minimize nontarget plant impacts. Applications will be directed to individual plants minimizing off-site transport suggesting that herbicide-related impacts to habitat and food provided by terrestrial plants will be minimal. Indirect effects to vertebrates through the loss of invertebrate prey are also not expected since both herbicides have low toxicity to terrestrial invertebrates (EPA, 2009). Indirect effects to birds and mammals that depend on aquatic prey for food is also not expected based on the low aquatic toxicity of both products which is described below. In addition both herbicides are not expected to bioconcentrate in aquatic biota based on available environmental fate and metabolism studies (EPA, 1998; SERA, 2007)

Aquatic

Aquatic Exposure to Picloram/Fluroxypyr

Aquatic residues for picloram and fluroxypyr were made using very conservative assumptions that include broadcast application over an acre, compared to the proposed spot treatments in this program, and that all of the material is directly applied into a one foot body of water that is one acre in size. The formulated material, Surmount™, contains both picloram and fluroxypyr MHE at concentrations of 1.19 lb/gal and 0.96 lb/gal, respectively. The product in this program will be applied anywhere from 3.0 to 4.0 pts/acre which results in a maximum application rate for picloram and fluroxypyr of 0.594 and 0.48 lb/ac, respectively. This amount of material deposited directly into a one foot body of water results in picloram and fluroxypyr concentrations of approximately 0.22 and 0.18 mg/L, respectively. These are unrealistic exposure estimates since they assume an application inconsistent with the label and no dissipation of either product.

Aquatic Effects of Picloram/Fluroxypyr

Based on available acute and chronic picloram toxicity data for fish the rainbow trout appears to be the more sensitive species when compared to warmwater fish species such as the bluegill and fathead minnow (table 7) (SERA, 2004; EPA, 1995). Concentrations that resulted in decreased shell growth for the eastern oyster were reported as ranging from 10 to 18 mg/L and for this assessment the lower toxicity value was selected.

Table 7. Aquatic Toxicity Profile for Picloram.

Test Species	Test Duration	Toxicity Value (mg/L)
Rainbow trout	96 hour LC_{50}	5.5
Bluegill sunfish	96 hour LC_{50}	14.5
Rainbow Trout	day NOEC/LOEC	0.55/0.88
Fathead Minnow	35 day NOEC/LOEC	7.19/11.9
Daphnia magna	48 hour EC_{50}	34.4
Daphnia magna	21-day Reproductive NOEC/LOEC	11.8/18.1
Mysid	96 hour LC_{50}	306
Eastern Oyster	96 hour EC_{50}	10
Selenastrum capricornutum	5-day EC_{50}/NOEC	234/18.5

Fluroxypyr MHE is considered to be toxic to aquatic biota based on the limited ecological toxicity data for fish and aquatic invertebrates (table 8) (Wan et al., 1984; EPA, 2008, 2009). Fluroxypyr MHE is not the form of the herbicide that would be available to aquatic organisms. The reported half life for the ester is less than six hours in multiple soil types and water (Lehmann and Miller, 1989). In addition if the ester was to be introduced directly into water it has very low solubility and would partition rapidly into sediments where it would be susceptible to degradation. The acid has a much lower toxicity to aquatic invertebrates and fish when compared to the ester (EPA, 2008; EPA, 2009).

Table 8. Aquatic Toxicity Profile for Fluroxypyr Methylheptyl Ester and Its Associated Acid.

Test Species	Test Duration	Toxicity Value (mg/L)
Fluroxypyr MHE		
Bluegill	96 hour LC_{50}	> 0.63
Atlantic silverside	96 hour LC_{50}	>0.19
Rainbow Trout	96 hour LC_{50}	12 – 17 mg/L
Daphnia magna	21-day Reproductive NOEC/LOEC	0.06/0.11
Grass shrimp	96 hour LC_{50}	0.13
Eastern oyster	96 hour EC_{50}	0.068
Fluroxypyr acid		
Rainbow trout	96 hour LC_{50}	> 100
Bluegill sunfish	96 hour LC_{50}/NOEC	14.3/7.28
Carp	96 hour LC_{50}	> 100
Daphnia magna	48 hour EC_{50}	> 100
Daphnia magna	21-day Reproductive NOEC	> 100
Grass Shrimp	96 hour LC_{50}	>120
Eastern Oyster	96 hour EC_{50}/NOEC	51/16
Lemna gibba	11-day EC_{50}	7.7
Selenastrum capricornutum	5-day EC_{50}/NOEC	2.4/0.94

Aquatic Risk Characterization of Picloram/Fluroxypyr

Estimates of risk (RQ) to aquatic organisms were calculated by comparing the exposure concentrations to available aquatic toxicity data. As a means of comparison these values were compared to levels of concern that EPA OPP has established for listed and non-listed species (EPA, 2004). In aquatic environments, EPA has established acute levels of concern for listed (0.05) and for non-listed (0.5) aquatic species. In cases where the estimated risk exceeds one of the levels of concern there is a presumption of risk to that group of organisms. Comparison of the estimated aquatic residue value for picloram (0.22 mg/L) to the lowest acute aquatic toxicity value (5.5 mg/L) results in a risk quotient value of 0.04 which is below levels of concern for listed aquatic species. A lack of direct risk is also seen when comparing the estimated acute aquatic residue to the lowest chronic NOEC value (0.55) which results in a risk quotient value of 0.4. The calculated chronic risk value is below the chronic levels of concern for aquatic species that has been defined by EPA–OPP (1.0). Indirect risk through the loss of prey items for fish and amphibians is also not expected since all aquatic toxicity values are well below very conservative residue estimates.

Aquatic risk calculations for fluroxypyr will focus on the risk to the acid since the ester would not be expected to occur in aquatic environments. Based on the calculated aquatic residue from a direct application to water (0.18 mg/L) and the lowest acute toxicity value (NOEC = 7.28) the calculated risk quotient (0.02) is below acute levels of concern for direct risk to listed aquatic organisms (0.05). Risk to aquatic invertebrates ranges from 0.011 based on the NOEC for the eastern oyster to <0.0015 for the grass shrimp. Based on the low risk to aquatic invertebrates indirect risk for fish and amphibians through loss of prey is not expected. Direct risks to the ester, if present, would also be below levels of concern for fish with a maximum risk quotient value of (0.015) based on the range of trout toxicity values. The other two toxicity values reported for the ester were reported as greater than the highest test concentration due to solubility limits during testing and do not represent actual toxicity.

Conclusion

The available toxicity data suggests that non-target impacts are not expected from the use of either herbicide. There is uncertainty in this assessment primarily related to the available effects data for both herbicides. With the exception of the acute mammalian studies all of the toxicity values are based on one of the technical active ingredients and do not include the other ingredients present in the formulation. Also not all taxa are represented in the available toxicity data. For example amphibian and reptile data do not appear to be available for either product. Current pesticide registration requirements for environmental testing do not require these types of tests and instead EPA–OPP relies on the sensitivities in fish representing potential effects to amphibians and birds to represent sensitivity to reptiles. To address this uncertainty in this risk assessment the exposure estimates were extremely conservative with the intent to account for some of the uncertainty associated with a lack of more ecologically relevant toxicity data. Based on more realistic exposure scenarios the sensitivity of reptiles and amphibians would have to be much greater to exceed concerns which to date has not been observed with other pesticide effects data.

Based on the conservative estimates of exposure and available toxicity data, the direct and indirect risks of herbicide applications to terrestrial and aquatic nontarget species is expected to be below levels of concern.

References

Dow AgroSciences, 2007. Material safety data sheet for Surmount™. 2 pp. [Online.] Available: www.greenbook.net.

Lehmann, R.G., and Miller, J.R., 1989. Soil catalysed hydrolysis of fluroxypyr-methylheptyl ester. Weed Research. 29:385–389.

SERA—See Syracuse Environmental Research Associates, Inc.

Syracuse Environmental Research Associates, Inc., 2007. Picloram: Human health and ecological risk assessment: final report. Submitted to USDA–Forest Service. SERA TR 052–04–04a. 231 pp.

Syracuse Environmental Research Associates, Inc., 2004. Picloram: Revised human health and ecological risk assessment: final report. Submitted to USDA–Forest Service. SERA TR 03–43–16–01b. 133 pp.

U.S. Environmental Protection Agency, Office of Pesticide Programs, 2009. OPP one-liner database. [Online.] Available: http://www.ipmcenters.org/Ecotox/results.cfm.

U.S. Environmental Protection Agency, Office of Research and Development, 2008. [Online.] Available: http://cfpub.epa.gov/ecotox/.

U.S. Environmental Protection Agency, Office of Pesticide Programs, 2005. User's guide T-REX Version 1.2.3 (*T*errestrial *R*esidue *EX*posure model).

U.S. Environmental Protection Agency, Office of Pesticide Programs, 2004. Technical overview of ecological risk assessment. [Online.] Available: http://www.epa.gov/oppefed1/ecorisk_ders/

U.S. Environmental Protection Agency, Office of Pesticide Programs, 1998. Fluroxypyr: pesticide fact sheet. 13 pp.

U.S. Environmental Protection Agency, Office of Pesticide Programs, 1995. Reregistration eligibility decision: picloram. EPA 738–R95–019. 284 pp.

Wan, M.T., Watts, R.G., and Moul, D.J., 1992. Effects of different dilution water types on the acute toxicity to juvenile Pacific salmon and rainbow trout of Fluroxypyr formulated product XRM–5084. Bull. Environ. Contam. Toxicol. 49:914–921.