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Old World Bollworm Management Program

Puerto Rico

Environmental Assessment
September 2015

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I. Purpose and Need

Old world bollworm (OWB) (*Helicoverpa armigera* Hübner, 1809) is an invasive lepidopteran pest of the old world including Africa, Asia and Europe. The OWB has four distinct life stages (egg, larva, pupa, adult) which is typical of all moths. The adult OWB is a stout-bodied moth with a body length 14 to 19 millimeters (mm) (approx. 9/16 to 3/4 inches). Color is variable, but males are usually yellowish-brown, light yellow, or light brown, and females are orange-brown. Forewings have a black or dark brown kidney-shaped marking near the center. Hind wings are creamy white with a dark brown or dark gray band on the outer margin. The OWB is similar in appearance to other moths, making identification difficult.

OWB is a major insect pest of both field and horticultural crops in many parts of the world. The pest status of OWB is due in part to the broad host range of its larvae; its feeding preference for reproductive stages of plants; its high reproductive rate; its high mobility; and its ability to enter facultative diapause[1] and thus adapt to different climates (King, 1994; Zhou et al., 2000; Casimero et al., 2001; Shimizu and Fujisaki, 2002; CABI, 2007). These characteristics make OWB particularly well adapted to exploit transient habitats, such as man-made ecosystems. OWB can tolerate a variety of climates and may become established if suitable host plants are present. Worldwide, OWB has been reported on over 180 cultivated hosts and wild species in at least 45 plant families (Venette et al., 2003). The larvae feed mainly on the flowers and fruit of high value crops, and thus, high economic damage can be caused at low population densities (Cameron, 1989; CABI, 2007). The major plant families that OWB feeds on include: Gramineae (or Poaceae), that includes maize (corn), wheat and other small grains, rice, sorghum and sugarcane; Malvaceae, that includes cotton, okra and cacao; Leguminosae, that includes peas, beans and forage legumes; Solanaceae, that includes potatoes, tomatoes, bell peppers and tobacco; and Compositae, that includes sunflower, artichokes and chrysanthemums (King, 1994). In most places where it occurs, OWB is a severe economic pest (Venette et al., 2003).

OWB has been detected at U.S. ports of entry nearly 1,000 times since 1984 (USDA APHIS, 2014). In January 2013, OWB was first detected in Western-Hemisphere farm fields, feeding on Brazilian cotton and soybeans (Czepak et al., 2013; Tay et al., 2013). Subsequently, Puerto

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[1] Diapause is a suspension of development that can occur at any stage of insect development, depending on the species. Diapause that is facultative is triggered by environmental conditions, such as high temperatures or food shortage.

Rico had several confirmed OWB field samples in 2014 and into 2015. In addition to Puerto Rico, nearly all of the continental United States is at risk for infestation, with the states of: Alabama, Arizona, Arkansas, California, Georgia, Illinois, Iowa, Kansas, Louisiana, Michigan, Minnesota, Mississippi, Nebraska, New Mexico, North Carolina, Ohio, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Virginia and Wisconsin being at particular risk (Fowler and Latkin, 2001). The west coast and southeast are particularly at risk due to high host availability and moderate climates. Recent modelling efforts have suggested that a North American detection of OWB is likely to occur in the near future, which has been confirmed with the 20142015 detections in Puerto Rico and in 2015 in Florida (Kriticos *et al.*, 2015).

APHIS has the responsibility for taking actions to exclude, eradicate, and/or control plant pests under the Plant Protection Act of 2000 (7 United States Code (U.S.C.) 7701 et seq.). APHIS has a need to control OWB where it occurs in Puerto Rico. Infestation and establishment of OWB within areas where host plants occur would result in significant economic loss as well as potentially allowing its expansion to the continental United States. Failure to manage OWB populations to minimize expansion could result in significant economic impacts. Cotton is particularly susceptible due to length of maturity. Young OWB larvae (second and third instar) can cause up to 65 percent reductions in cotton yield (Ting, 1986). Costs to control OWB can be significant, with control of OWB in cotton averaging greater than $227/acre (Lammers and Macleod, 2007). In 1997, Australia had costs of control shown to be approximately 13 percent of crop values ($334.11 (2015 dollars) in damage on $2.36 billion (2015 dollars) of crops; Adamson et al., 1997). A full infestation of U.S. cotton by OWB could cost over $2.37 billion to control. OWB infestations may exceed $5 billion worldwide due to yield reduction and insecticide costs (Australian Genome Alliance, 2009). OWB is the target of almost 30 percent of all pesticides used worldwide and has developed resistance to a wide range of insecticides with populations having demonstrated resistance to organochlorines, organophosphates, carbamates, pyrethroids, spinosad and the microbial insecticide, *Bacillus thuringiensis* (Bt) (Joußen et al., 2012). The use of Bt to control OWB may also occur through the use of transgenic crops minimizing conventional insecticide applications. In the event of an OWB introduction to the mainland United States, the impact to the environment would come both from direct insect feeding and control measures. The purpose of the proposed action is to prevent further spread of OWB, and manage OWB where detected in Puerto Rico.

This environmental assessment (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.

II. Alternatives

Alternatives considered for this program include (1) no action, and (2) management of the OWB from Puerto Rico (preferred alternative).

A. No Action

Under the no action alternative APHIS would not provide funding or technical support to Puerto Rico for the OWB management program.

B. Preferred Alternative

APHIS, in cooperation with the Puerto Rico Department of Agriculture (PRDA), is proposing to implement a program to manage the OWB from the Municipalities of Mayagüez, Hormigueros, San Germán, Cabo Rojo, Lajas, Aguadilla, Isabela, Moca, San Sebastián, Aguada, Rincón, Añasco, Las Marias, Quebradillas, Camuy, Hatillo, Arecibo, Barceloneta, Florida, Lares, Utuado, Maricao, Adjuntas, Yauco, Sabana Grande, Guanica, Guayanilla, Aguadilla and Peñuelas, Jayuya, Villalba, Ponce, Manati, Juana Diaz, and Santa Isabel in Puerto Rico. To date, OWB has only been detected in the Municipalities of Cabo Rojo, Lajas, San Germán, Guanica, Guayanilla, Yauco, Maricao, Sabana Grande Juan Diaz, Santa Isabel, Manati and Isabela, but it is possible that OWB will be found in other municipalities (Appendix A). Management would consist of chemical treatments applied by producers to agricultural fields that contain OWB host material and have confirmed detections. Ground applications would be made to the various crops using insecticides that are recommended to producers and registered for use to control OWB (table 1).

Table 1. Proposed insecticides for use to control OWB in various agricultural crops.

Crop	**Chemical and Microbial/Biological Insecticides**					
	Methoxy -fenozide	**Indoxacarb**	**Spinetoram**	**Spinosad**	**NPV*+**	**Btk/ Bta*+**
Tomato/ pepper	X	X	X	X	X	X
Beans/ Pigeon Peas	X	X	X	X	X	X
Corn (Sweet)	X	X	X	X	X	X
Okra	X	X	X	X	X	X
Cotton	X		X	X	X	X
Squash	X	X	X	X		X
Sorghum	X	X	X	X	X	X

*Biological/Microbial insecticides: NPV = nuclear polyhedrosis virus; Btk = *Bacillus thuringiensis kurstaki*; Btc = *Bacillus thuringiensis aizawai*. + Certified organic by the Organic Materials Review Institute (OMRI).

All of the products proposed for use in the OWB program have larvicidal (kills the caterpillar stage of OWB) activity against lepidopteran pests with methoxyfenozide also having some ovicidal (kills the egg stage of OWB) activity. Application rates and intervals between applications vary between insecticides and crops with three products registered for organic use (Btk, Bta, NPV) (Table 2).

Table 2. Use rate information for OWB proposed insecticides.

Chemical	Chemical Class/Mode of Action	Use Rate Range (oz/ac)	Minimum Interval Time for Applications (days)
Methoxyfenozide	Diacylhydrazine/ insect growth regulator	4-16	5-14
Indoxacarb	Oxadiazone /sodium channel blocker	2.5-6	3-7
Spinetoram	Tetracyclic macrolide/ disruption of nicotinic/GABA-gated chloride channels	2.8-10	4
Spinosad	Macrocyclic lactone/activation nicotinic acetylcholine receptors	1.4-3	1-7
NPV*+	Naturally occurring baculovirus	10	2
Btk*+	Naturally occurring microbial endotoxin	4-32	3
Bta*+	Naturally occurring microbial endotoxin	2-96	1-14

*Biological/Microbial insecticides: NPV = nuclear polyhedrosis virus; Btk = *Bacillus thuringiensis kurstaki*; Bta = *Bacillus thuringiensis aizawai*. + Certified organic by the Organic Materials Review Institute (OMRI).

III. Affected Environment

This section discusses resources that could be impacted by the proposed action for the OWB management program. Included in this section are baseline summaries of these resources including the Municipalities of Mayagüez, Hormigueros, San Germán, Cabo Rojo, Lajas, Aguadilla, Isabela, Moca, San Sebastián, Aguada, Rincón, Añasco, Las Marias, Quebradillas, Camuy, Hatillo, Arecibo, Barceloneta, Florida, Lares, Utuado, Maricao, Adjuntas, Yauco, Sabana Grande, Guanica, Guayanilla, Aguadilla and Peñuelas, Jayuya, Villalba, Ponce, Manati, Juana Diaz, and Santa Isabel in Puerto Rico.

A. Land Characteristics and Agricultural Production

"Land characteristics" as defined in this EA include the physical features and soil resources within the affected municipalities. Elevation ranges from sea level to 4,400 feet above sea level. "Fifty-three percent (53%) of the island is mountainous, twenty-five percent (25%) is plains, twenty percent (20%) is hilly, one percent (1%) is plateaus, and one percent (1%) is composed of rivers, lakes and reservoirs" (Puerto Rico, 2015). The treatment area is located in the southwest corner of Puerto Rico, the main island of the commonwealth. Puerto Rico is a self-governing commonwealth divided into 8 senatorial districts, 40 representative districts, and 78 municipios (referred to as "municipalities" hereafter). Puerto Rico is home to 3,725,789 individuals as of 2010 (U.S. Census Bureau, 2014). Puerto Rico has approximately 602,459 acres (584,988 cuerda[2] (cda)) of farmland upon which non-native OWB host plants could grow. In 2012, Puerto Rico reported over $547 million in agricultural revenue, of which $271 million was from crop sales (USDA, 2012). USDA-APHIS has identified beans, rice, squash, pigeon pea, okra, sorghum (milo), tomato, pepper, cotton and corn as the host plants most likely for OWB infestation in Puerto Rico.

The agriculture of the Commonwealth is of importance to local foodstuffs and trade. In addition to local consumption, companies conduct field trials for use on the mainland United States and the world in general. Of crops grown, vegetable crops are some of the more important for local consumption. Puerto Rico had approximately 807 acres (784 cda) of tomatoes grown in 2012 (Puerto Rico, 2014). Pepper production was approximately 1,371 acres (1,332 cda). Puerto Rico harvested approximately 762 acres (742 cda) of pigeon peas in 2012. Puerto Rico grows both green and dry beans. In 2012, Puerto Rico harvested 291 acres (283 cda) of green beans along with 536 acres (520 cda) of dry beans. In addition to green and dry beans, soybeans are also an important crop. In 2012, production of soybeans was approximately 1,697 acres (1,648 cda). Corn production topped 1,074 acres (1,043 cda) in 2012. Production data for Puerto Rico data could not be located for sorghum, rice or cotton.

The focus municipalities lie within an area designated by the USDA, Natural Resources Conservation Service (NRCS) as Humid Mountains and Valleys, Semiarid Mountains and Valleys, and the Humid Coastal Plain. Humid Coastal Plain soils formed from sediments deposited over a broad coastal plain (USDA–NRCS, 2006). The largest portion of the

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[2] A cuerda is a traditional unit of land area, approximately 3,930 square meters. It is similar in size to an acre.

treatment area is the Humid Mountains and Valleys (approximately 45%), followed by the Humid Coastal Plains (33%), and with the Semiarid Mountains and Valleys and the Semiarid Coastal Plain having similar proportions (10% and 12% respectively). Forestlands dominate the Humid Mountains and Valleys comprising of 36% of the land area, with grasslands and crops both accounting for 23% of the area. Humid Mountains and Valleys range in elevation from 160 ft. to 4,400 ft. in elevation. This area is mainly pasture (43%) with small portions of crops grown (4%). Forests comprise around 30% of the Semiarid Mountains and Valleys. The Humid Coastal Plains have approximately 7% cropland, 24% grassland, and 29% forest. The Humid Coastal Plains has elevations from sea level to 2,300 ft. Elevation and the type of soil present largely predict difference between the semiarid plains and semiarid mountains and valleys of Puerto Rico. The Semiarid Coastal Plain ranges in elevation from sea level, up to 250 ft., whereas the Semiarid Mountains and Valleys range from 160 to 1,300 ft. The Semiarid Coastal Plain has both forests and croplands, which make up around 20% and 7% of the area respectively. Grasslands account for 35% of the Semiarid Coastal Plain, with grasses the primary vegetation for the entire area. The Semiarid Mountains and Valleys have about 43% grasslands, 30% forest, and 7% cropland. On the Semiarid Coastal Plain, the soils are mainly Mollisols and Vertisols. The Humid Mountains and Valleys land use region occupies the center of Puerto Rico with elevations ranging from 160 to 4,400 ft. The Humid Mountains and Valleys have approximately 23% cropland, 26% grassland, and 36% forest (USDA-NRCS, 2006).

B. Air Quality

The Clean Air Act (CAA) (42 U.S.C. §§ 7401 et seq.) is the primary Federal legislation that addresses air quality. In any given region or area of the United States, air quality is measured by the concentration of pollutants in the atmosphere, and is influenced by surface topography and prevailing meteorological conditions. The Environmental Protection Agency (EPA) established National Ambient Air Quality Standards (numerical concentration-based standards) for six criteria pollutants that affect human health and the environment (40 CFR § 50). These pollutants are common and accumulate in the atmosphere because of natural processes and normal levels of human activity. They include carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), small particulate matter, and lead (Pb).

Pollutant emission types are categorized as either primary or secondary (40 CFR § 50). Primary standards represent maximum levels of background air pollution that are considered safe for humans, including sensitive groups such as asthmatics, children, the elderly and people with heart disease. Secondary standards provide public welfare protection, including the protection of animals, vegetation, crops and other public resources (EPA, 2012a).

Particulate matter emissions can have different health effects depending on the particle size; therefore, EPA developed separate National Ambient Air Quality Standards for coarse particulate matter (PM_{10}) and fine particulate matter ($PM_{2.5}$) (40 CFR § 50). Fine particulate matter, also known as a primary pollutant, is emitted from sources such as diesel engines, power plants, and refineries as a fine dust or liquid mist (soot). This matter can become a secondary pollutant because of a chemical reaction between two primary pollutants by forming nitrate and sulfate compounds. Precursors of fine particulate matter include SO_2, nitrogen oxides (NO_x), volatile organic compounds (VOC), and ammonia. Metropolitan areas have greater levels of $PM_{2.5}$ than other areas of the country.

The EPA has delegated responsibility for ensuring compliance of the National Ambient Air Quality Standards to States and local agencies. According to EPA, scores municipalities typically fall in the "good" range and occasionally in the "moderate" range. Days designated as unhealthy for sensitive groups are relatively rare with only 4 of 13 municipalities reporting any unhealthy days. The number of unhealthy days ranged from zero to three (EPA, 2015a).

Of the proposed OWB treatment municipalities, only Adjuntas, Guayanilla, and Mayagüez municipalities have air quality data available. Adjuntas had 42 days with an Air Quality Index[3] (AQI), with 40 days of "Good", and two days with a "Moderate" AQI. The maximum AQI was 55. Guayanilla municipality had 27 days with an AQI, all of which were "Good". The maximum AQI recorded for Guayanilla was 46. Mayagüez had AQI readings for 9 days, all of which were "Good". The maximum AQI observed for Mayagüez was 43. Other portions of Puerto Rico had AQI readings for all 365 days in 2014, with AQI maximums as high as 253, "Very Unhealthy". Overall, air quality is good in the treatment area.

C. Water Quality

The EPA requires states and territories (referred to hereafter as "States") to submit a list of impaired waterways under section 303(d) of the Clean Water Act. States identify all waters where required pollution controls are

[3] The AQI is an index for reporting daily air quality. On this index, 0-50 is good, 51-100 is moderate, 101-150 is unhealthy for sensitive groups, 151-200 is unhealthy, 201-300 is very unhealthy, and 301-500 is hazardous.

insufficient to attain or maintain water quality standards, and establish priorities for development of total maximum daily loads (TMDLs) based on pollution severity and the sensitivity of water uses (40 CFR §130.7(b)(4)). States also provide a long-term plan for attaining TMDLs within 8 to 13 years from the first listing of a waterway or body as impaired (EPA, 2012b).

EPA policy allows states to remove water bodies from the list after they have developed a TMDL or after identified water quality problems are corrected. Occasionally, a water body is removed from the list because of a change in water quality standards or removal of designated uses. In order to remove waterways and bodies from the 303(d) lists, States must conduct a thorough analysis that clearly shows the designated use cannot be attained (EPA, 2012b).

A review of the section 303(d) data for treatment municipalities revealed that over 170 water bodies are listed as impaired. The causes of these impairments vary, but the top six contaminants are arsenic, fecal coliform, dissolved oxygen, turbidity, cyanide, and pesticides (Table 3).

Table 3. Causes of water quality impairment in Puerto Rico.

Pollution Type	**Count**
ARSENIC	2,473
FECAL COLIFORM	1,956
CYANIDE	1,099
DISSOLVED OXYGEN	912
TURBIDITY	743
SURFACTANTS	680
COPPER	659
PHOSPHORUS, TOTAL	453
LEAD	359
PESTICIDES	218
PH	193
MERCURY	174
TOTAL AMMONIA	122
THERMAL MODIFICATIONS	101
ENTEROCOCCUS BACTERIA	28
Total	**10,170**

Specific information regarding which pesticides are impacting waterways does not appear to be available, however their contribution is comparatively minor compared to many of the other contaminants.

D. Ecological Resources

Vegetation

Puerto Rico has a long history of human use, dating back well before the 1400's when the first contact was made with the indigenous Taínos. Currently the majority of Puerto Rico is, or has been, cultivated. The remnants of the pre-European forests are largely restricted at this time, and occur primarily in the hilly portions of the Island. The largest forest remnants occur in El Yunque National Forest, which is the only tropical forest in the USFS National Forest System. Remnants of forests are present on other portions of the island, but few are of significant age and often represent young seral stages that develop after the abandonment of agriculture. Forests are often composed of native and non-native tree species such as "mahogany, ebony, mamey, tree ferns, sierra palm, mango, Spanish cedar, sandalwood, and rosewood" (Mac *et al.*, 1998). Plants associated with forest environments include "orchids, jungle vines, and matojo grass" (Mac *et al.*, 1998). The leeward side of the island is semiarid with dry forest being composed of "acacia, royal palm, yucca, cacti, and dry grasses" (Mac *et al.*, 1998). Mangrove swamps are important and dominating features along much of the Puerto Rican coast (Mac *et al.*, 1998).

Wildlife

Ecologically, Puerto Rico is a diverse, tropical island that supports many species. Elevations range from sea level to 4,380 ft (1,340 m) at Cerro de Punta. Habitats on Puerto Rico support a wide variety of plant and animal species with a number of species being endemic. The island has 116 protected natural areas with 21 marine reserves (Gould et al., 2011). The Commonwealth of Puerto Rico manages the greatest percentage of protected areas, followed by the Federal government, and then non-government organizations. Some of these protected areas are in proximity to the Municipalities where OWB control efforts may take place. A majority of the protected areas occur in the Central and Liquillo Mountains, the wetland areas along the coastal plains and the island and cays of the archipelago (Gould et al., 2011). Many of the mammal species in Puerto Rico are introduced however there are also several marine mammal species that are endemic to the area such as manatees, whales and dolphins. Puerto Rico has approximately 350 bird species occupying a range of terrestrial and aquatic niches (eBird, 2015). Some bird species such as the Puerto Rican plain pigeon (*Columba inornata wetmorei*), yellow-shouldered blackbird (*Agelaius xanthomus*) are federally protected species. One of the more well recognized species in Puerto Rico is the endemic common coquí (*Eleutherodactylus coqui*), which is one of the approximately 90 herpetofauna that occupy the island. Puerto Rico also supports 2,800 plant species including over 250 species of trees.   Due to it's location Puerto Rico is also home to a variety of marine and freshwater species including 70 species of freshwater fish (Figueroa, 1996; Froese *et al.*, 2015).

IV. Environmental Impacts

Because the principal environmental concerns in the proposed program relate to use of chemical insecticides, this section will focus on the potential environmental consequences of those insecticides on human health and the environment.

A. No Action

Under the no action alternative there would be no additional APHIS involvement in the form of funding and coordination of insecticide treatments to control OWB. State agencies, grower groups, or individuals would need to fill these gaps.

1. Human Health

A likely option for most growers and homeowners are to control OWB through insecticide applications. Although some replacement with non-host plants or plants that can tolerate OWB damage and associated plant diseases is possible, this is not likely to be desired by most growers or homeowners due to time and financial constraints. The applications of control agents (in the absence of effective biological controls) are largely limited to pesticide applications that would be applied in response to observed damage to plants. The majority of these insecticide applications would be unsupervised and uncoordinated. Accordingly, greater insecticide amounts and higher frequency of application could be anticipated than would occur with a coordinated, cooperative program. In addition to direct toxic effects to humans from the insecticide applications, cumulative impacts of multiple exposures are more likely with the lack of coordinated treatments. Human exposure to insecticides and resulting adverse consequences from the no action alternative would be expected to exceed any adverse effects from a coordinated area wide program. The continuing spread of OWB will reduce the amount of locally available produce from crops that are susceptible to plant diseases spread by this pest.

2. Ecological and Environmental Quality

A direct impact to nontarget species relates to the damage and loss of plants that serve as hosts of OWB. Native terrestrial plants could serve as host plants with resulting impacts to those species.

A lack of a coordinated OWB management program would also see a spread of OWB to other areas with increased insecticide use to protect agricultural commodities as well as non-agricultural areas where OWB host material may occur. Increased insecticide use could increase the likelihood of adverse effects to nontarget wildlife and domestic animals, which could include some endangered or threatened species.

The primary impacts to environmental quality from the no action alternative are anticipated to be the results of uncoordinated use of insecticides. The expected increase in the use of insecticides with expansion of OWB could result in additional insecticide loading with commensurate adverse impacts to air, water and soil quality. These adverse impacts to environmental quality would be expected to exceed those of any proposed action because insecticide use would be expected to increase as OWB spread and other, more hazardous insecticides may be used.

B. Preferred Alternative

The proposed OWB management program consists primarily of surveys for OWB and insecticide treatments by producers in agricultural fields where OWB has been detected. Survey work will consist of the use of bucket traps that contain an insect pheromone designed to attract adult male OWB moths. The OWB pheromone is a synthetic version of a naturally occurring compound. It is a mixture of three straight chain hydrocarbons that are designed to volatilize into the atmosphere and attract male OWB to the traps where they can be collected and identified. The maximum number of traps will be 100 per square mile. Areas selected for survey will be targeted areas where OWB host plants occur as well as other sentinel sites. All chemical applications will occur using producer-owned ground equipment and no applications are proposed in natural areas or other non-agricultural areas.

Exposure to the general public is not expected except for the potential that the general population may consume commodities that have been treated for OWB. EPA sets residue tolerances to levels that are designed to be protective to humans. EPA uses available toxicity data and conservative assumptions regarding exposure, as well as safety factors where appropriate, to determine safe residue levels for each insecticide. Applications made in accordance with the label directions, including application rates, harvest and reentry intervals reduces public exposure so that it’s below tolerance limits and unlikely to be harmful to the public.

Methoxyfenozide

Methoxyfenozide is an insect growth regulator (IGR) that causes disruption of the moulting[4] process in insects by serving as a mimic for the insect hormone, 20-hyrodoxyecdysone. Activity appears to be specific to lepidopteran pests where it is consumed by the larva and inhibits further development of the insect. The formulated product, Intrepid®, is currently registered for use as a foliar treatment (applied to the leaves) on a variety of crops as well as non-agricultural uses.

1. Human Health

Methoxyfenozide, and the formulated product Intrepid®, have low acute oral, dermal, and inhalation risk to mammals. Available data regarding acute effects demonstrate no toxicity at a range of concentrations, including the highest concentration selected in the study (PMRA, 2004). Use of the concentrated formulation is not reported as irritating to the eyes or skin, and it is not considered a skin sensitizer during brief exposures (Dow AgroSciences, 2008). Methoxyfenozide is not considered to be carcinogenic, teratogenic, mutagenic, or neurotoxic based on results from multiple laboratory toxicity studies (PMRA, 2004). Effects on endocrine organs and hematological parameters, such as increased methemoglobin, have been noted in studies but only at very high doses from dietary exposures that are not expected from the proposed use in this program.

Published quantitative human health risk assessments for a range of methoxyfenozide-treated commodities show that all population subgroups, including infants, are at low risk from methoxyfenozide. Dietary risks were based on effects measured in a two-year chronic study using the no observed effect level (NOEL) (10.2 milligrams (mg)/kilogram (kg)/day) with an added uncertainty factor of 100 (EPA, 2009a).

2. Ecological and Environmental Quality

Methoxyfenozide toxicity to wild mammals and birds is low based on available data. In mammals, the active ingredient and formulated material are considered practically nontoxic from oral, dermal, and inhalation exposures (USDA–APHIS, 2011). Toxicity to pollinators is also low while effects to beneficial insects are variable, depending on the type of insect. Applications to agriculture fields are not expected to result in adverse effects to mammals or birds, or the habitat and prey that they depend on for reproduction (USDA–APHIS, 2011). Any effects to terrestrial invertebrates will be localized to the small application area, and

[4] Moulting is the process of formation of new cuticle, the external skeletal structure of an insect.

will only occur to specific sensitive species at the appropriate life stage, such as lepidopteran larvae.

Toxicity to fish after methoxyfenozide exposure is low with no lethal or sublethal effects noted at concentrations at or below water solubility (USDA–APHIS, 2011). Toxicity to aquatic invertebrates is more variable, with the freshwater midge being the most sensitive species to methoxyfenozide (EC_{50}[5] = 0.62 mg/L) and the toxicity to other test species ranging from 1.2 to 12.85 mg/liter (L) (EPA, 2015b). Chronic toxicity can be of concern in repeated applications due to the persistence of methoxyfenozide and its sublethal effects to aquatic invertebrates. The label for Intrepid® requires a 25-foot application buffer from aquatic habitats which will significantly reduce drift and risk of exposure (USDA–APHIS, 2011). The method of application proposed for use in this program and the label restrictions will result in aquatic residues that would not be expected to have direct or indirect impacts to fish or amphibians, as well as their habitat and prey items (USDA–APHIS, 2011).

Applications of methoxyfenozide are not expected to have any impacts to air quality due to low volatility and use rates. Some material will be present in the air during application as drift; however, this will be localized and will decrease rapidly. Methoxyfenozide is stable in water with an aquatic half-life typically greater than 1 year. It has moderate solubility and does not bind readily to soil; therefore, it may be susceptible to runoff into aquatic habitats. Label language requires a 25-foot application buffer from all aquatic habitats which will result in a greater than 85 percent reduction of methoxyfenozide to water resources (USDA–APHIS, 2011).

Spinosad

Spinosad is a broad spectrum insecticide that contains two active ingredients, spinosyn A and spinosyn D. Spinosyn is a metabolite of the soil-borne bacterium, *Saccharapolyspora spinosa*, which has demonstrated insecticidal activity (Thompson et al., 2000). Spinosad is registered as a reduced-risk pesticide by EPA–Office of Pesticide Programs, and is listed by the Organic Material Review Institute (OMRI) for use in organic production. It has insecticidal activity against some butterflies and moths (Lepidoptera), thrips (Thysanoptera), flies (Diptera), termites (Isoptera), wasps, ants, bees (Hymenoptera), and some beetles (Coleoptera) (Cleveland et al., 2002). Spinosad is proposed for use in two

[5] The EC_{50} is the median effective concentration. It is the statistically derived concentration of a substance (in this case, methoxyfenozide) in an environmental medium expected to produce a certain effect in 50 percent of test organisms in a given population under a defined set of conditions (IUPAC, 1997).

formulations, Success® and Entrust®, which control a wide variety of pests on multiple crops.

1. Human Health

Spinosad has low toxicity to mammals based on acute LD_{50}[6] values of 3,738 mg/kg and >2,000 mg/kg for male and female rats, respectively. The dermal and inhalation toxicity is also low, with a dermal LD_{50} value of >2,000 mg/kg in the rat, and an inhalation acute LC_{50}[7] value of >5.18 mg/L in the rabbit (EPA, 1998a). Based on longer term studies, spinosad has not been shown to be carcinogenic, mutagenic, neurotoxic or a reproductive toxicant. Metabolism studies revealed that spinosyn A and D have similar routes of excretion, and are metabolized in a similar manner with most of the material excreted within 48 hours.

Quantitative human health risk assessments conducted for similar use patterns as those proposed in this program suggest that risk to human health and associated subgroups is not expected to result in adverse effects (EPA, 2006). Exposure scenarios for multiple population subgroups in occupational and nonoccupational exposure scenarios were evaluated based on exposure from oral, dermal and inhalation doses and, in some cases, in aggregate to determine potential risk. Conservative assumptions regarding exposure from these scenarios and the reference doses estimated from the available toxicity data demonstrates low risk.

2. Ecological and Environmental Quality

Spinosad also has low toxicity to wild mammals and birds based on the available toxicity data (USDA–APHIS, 2011). Toxicity to terrestrial invertebrates has shown a range of sensitivities based on the test species and exposure route (Miles and Eelen, 2006; Kim et al., 2006). Spinosad has comparatively lower toxicity to predatory mites and other beneficial insects, such as predatory bugs (Hemiptera), flies, beetles and spiders (Miles and Eelen, 2006). Parasitic wasps appear to be more sensitive to spinosad when compared to predatory insects (Miles and Eelen, 2006; Williams et al., 2003). Spinosad is highly toxic to honey bees and bumble bees, based on oral and contact studies (EPA, 1998a; Morandin et al., 2005). Because applications for OWB could occur during bee activity, following label precautions will reduce the risk. The labels state that the product is toxic to bees for three hours following application, and instruct that applications should not be made to blooming, pollen-shedding, or nectar-producing parts of plants during bee foraging periods in order to reduce risks to honey bees (Mayes et al., 2003).

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[6] The LD_{50} is the median lethal dose of a substance (in this case, spinosad), or the amount required to kill 50 percent of a given test population within a certain period of time.
[7] Similar to the LD_{50}, the LC_{50} is the median lethal concentration of a substance required to kill 50 percent of a given test population within a certain period of time.

Spinosad is slightly toxic to fish, with carp (*Cyprinus carpio*) being the most sensitive of the species tested (LC_{50}=4.99 mg/L) and rainbow trout (*Oncorynchus mykiss*) being the least sensitive (LC_{50}=30 mg/L). Acute aquatic invertebrate toxicity is comparable to fish, based on toxicity values for freshwater cladocerans and the estuarine shrimp; however, spinosad is considered highly toxic to the eastern oyster (*Crassostrea virginica*), with an EC_{50} of 0.295 mg/L. Expected aquatic concentrations from spinosad use in this program in various waterbodies, including shallow static habitats, are not expected to result in direct risk to fish or any of their habitat or prey (USDA–APHIS, 2011).

Low exposure and the use pattern proposed for spinosad in this program suggest that there is low risk of direct or indirect adverse impacts to terrestrial and aquatic ecological resources. No indirect or direct impacts expected, such as loss of habitat or food items, that terrestrial and aquatic resources would depend on for shelter and food (USDA–APHIS, 2011).

Based on its chemical properties, spinosad is not considered to be a compound that would volatilize into the atmosphere (USDA–APHIS, 2011). Some impacts to air quality would be expected as drift during a ground application; however, it would be confined to the area of application and would quickly diminish as the droplets adhere to vegetation and soil. Spinosad impacts to ground and surface water quality are expected to be minimal based on the proposed use pattern and environmental fate of spinosad.

Spinosyn A is considered soluble at 89.4 mg/L, while spinosyn D is comparatively insoluble at 0.49 mg/L. In soil, spinosyn A has a relatively short half-life ranging from 9.4 to 17.3 days, while spinosyn D has a soil half-life of 14.5 days. Spinosyn A and D are not considered mobile as they readily bind to soil and would not be susceptible to runoff in water or movement into ground water. In field dissipation studies, the half-lives for spinosyn A were short with a reported range of 0.3 to 0.5 days. In aquatic environments, spinosyn A and D are considered stable to hydrolysis at all relevant pH values; however, photodegradation in water results in a half-life of less than a day for spinosyn A and D.

Bacillus thuringiensis kurstaki **(Btk) and** ***Bacillus thuringiensis aizawia*** **(Bta)**

Btk and Bta are naturally derived soil bacteria that produce protein crystals which are endotoxins with activity against certain insects (EPA, 1998b). The endotoxin must be ingested by the insect and several physiological responses must occur for toxicity to occur. The crystal protein must be solubilized by the highly alkaline midgut (pH 10–11) in the insect where it is activated and binds to certain types of cells in the midgut. The toxin creates pores in the midgut which causes lysis, and results in starvation or septicemia in the insect (Whalon and Wingred, 2003). The formulations proposed for use have organic and nonorganic uses in various crops proposed for treatment. The toxicity profile to non-target organisms is comparable; thus, the summary of effects data is discussed for both Bta and Btk in this section.

1. Human Health

Mammalian toxicity studies testing the technical active ingredient and the formulated product of Btk and Bta have reported low acute oral, dermal and inhalation toxicity, and pathogenicity (EPA, 1998b; USDA–FS, 2004a). These laboratory studies have also been supported by epidemiology studies that revealed no direct human health effects from Btk applications. Results from laboratory and epidemiology studies indicate that Btk and Bta are not a carcinogenic, mutagenic or reproductive toxicants (EPA, 1998b; USDA–FS, 2004a). Btk and Bta are not considered eye or skin irritants and are nonsensitizing to the skin.

Human health risk assessments that quantify the potential risk to various population subgroups, including children, as well as workers under different agricultural and non-agricultural application scenarios have shown that Btk does not pose a risk to human health (USDA–FS, 2004a; EPA, 1998b; WHO, 1999). Btk has been used in large scale broadcast applications to control various lepidopteran pests in the United States, Canada and New Zealand. Epidemiology studies of these applications have been used to evaluate the effects related from these treatments to the general public, as well as workers making the applications. In general, no short- or long-term effects have been noted in the general population from these treatments. There have been some reports of skin sensitization in workers who handle the concentrated material; however, no pathogenicity was noted. These results support previous risk assessments that demonstrate the low risk of Btk applications to humans; however, the results from these studies do not represent the use patterns proposed for Btk/Bta in the OWB managment program. The effects measured in the epidemiology studies were from broadcast applications over large populated areas, compared to the OWB program where organic Btk/Bta applications may also occur in agricultural fields.

2. Ecological and Environmental Quality

Btk and Bta toxicity to wild mammals and birds is very low with no effects observed at a range of test concentrations (USDA–APHIS, 2011). Btk also has low toxicity to most terrestrial invertebrates, including beneficial insects; however, impacts to nontarget larval lepidopteran would be expected to occur in areas of treatment. Even within the lepidopteran group that contains butterflies and moths, sensitivities can be highly variable (Peacock et al., 1998). These impacts are reduced based on the use of ground applications which will reduce the amount of drift compared to aerial applications. Exposure is also reduced by making applications directly to host plant material. The lack of impacts to most invertebrates and the small areas of application will ensure that no impacts to bird and mammal food sources will occur.

Btk and Bta have low acute toxicity based on laboratory studies testing freshwater and saltwater species (EPA, 1998b). In all cases, the calculated LC_{50} value was above the highest test concentration used in the study (USDA–APHIS, 2011). Btk has low toxicity to *Daphnia magna* in 21-day studies with EC_{50} values between 5 and 50 mg/L, while other aquatic invertebrate groups, such as mayflies, stoneflies, copepods and mysid shrimp appear to be tolerant of Btk when exposed to concentrations well above those expected in the environment. Results from laboratory studies are supported by field data that suggest minimal effects to aquatic invertebrates from Btk use (USDA–APHIS, 2011). Based on the low toxicity to aquatic vertebrates and invertebrates, no direct effects are expected to these populations of organisms. This includes any indirect or food chain impacts as Btk uses are not expected to impact prey items that aquatic organisms use.

Btk/Bta is not expected to impact air quality in areas where it may be used. The spores are not considered to be volatile and they would only occur in the air during the time of any ground treatment. Ground applications directed towards vegetation ensure that any drift that could occur will be minimized and short-lived. Btk/Bta persistence in terrestrial environments is dependent upon light, moisture, and temperature. Increased exposure to light, higher temperature, and moisture decrease the viability of Btk/Bta. In addition, the persistence of Btk/Bta is dependent upon whether the emphasis is on the spores or the biologically active endotoxin. Reported half-lives for spores in water can range from a few days to greater than a month, while soil half-lives have been shown to be as long as 200 days (Menon and Mestral, 1985; Hendriksen and Hansen, 2002). The active endotoxin has a much shorter half-life than the spores due to sensitivity to ultraviolet light, and it breaks down rapidly on foliage with reported foliar half-lives ranging from a few hours to approximately 4 days (Behle et al., 1997; EPA, 1998b; WHO, 1999). Btk and Bta are not considered to be mobile and, therefore, would not be expected to occur in ground or surface water. In addition, the small areas of control and applications directly to foliage would reduce the potential for any horizontal or vertical transport through the soil to surface or ground water from the site of application.

Indoxacarb

Indoxacarb acts by blocking sodium channels in insects and is active through ingestion or contact. The effects to exposed insects after indoxacarb exposure include feeding cessation, followed by paralysis and death. Indoxacarb is used on a variety of agricultural crops to control various larval lepidopteran pests as well as some sucking insects and beetles.

1. Human Health

Indoxacarb has moderate acute toxicity to mammals in oral exposures but is considered practically non-toxic in dermal and inhalation exposures (EPA, 2000). Technical indoxacarb is a mild eye irritant and is a skin sensitizer but is not a dermal irritant. Indoxacarb is not considered carcinogenic, teratogenic or mutagenic and does not cause developmental or reproductive effects at relevant doses (EPA, 2000).

Applications will be restricted to foliar applications in the affected agricultural fields. Workers and applicators will be the population segment at greatest risk of exposure to indoxacarb applications. Precautionary label language and personal protective equipment requirements will reduce exposure and risk to this group of the population. Indoxacarb does not exhibit chemical fate properties that would suggest high mobility and transport to drinking water resources such as ground or surface water (EPA, 2005).

2. Ecological and Environmental Quality

Indoxacarb has low to moderate toxicity to wild mammals based on toxicity data collected for human health. Indoxacarb is moderately toxic to birds in acute oral and subacute dietary exposures. Indoxacarb is considered highly toxic to honey bees in contact exposures but has low toxicity in oral exposures. Risk to honey bees will be reduced based on label restrictions that prohibit applications to blooming crops or allowing the insecticide to drift when bees are actively feeding. Impacts to sensitive terrestrial invertebrates would be expected in treated fields; however, the selectivity of indoxacarb to certain invertebrate groups suggests that impacts would be reduced when compared to broad spectrum insecticides.

Indoxacarb is considered highly toxic to fish and aquatic invertebrates. Median lethality values for indoxacarb and associated metabolites are less than 0.5 parts per million (ppm) for freshwater and marine fish species. Exposure and risk of indoxacarb to aquatic environments will be reduced by following label restrictions regarding applications near water and the environmental fate profile of indoxacarb that indicates low water solubilty and a high binding potential to soil and water.

Indoxacarb impacts to air quality are not anticipated based on the use pattern and chemical fate data that suggests a low potential for volatilization (EPA, 2005). Drift will occur during application; however, the use of ground equipment and drift reduction recommendations on the label will minimize off-site transport. Indoxacarb has low water solubility and a high binding affinity for soil and sediment, suggesting that it will not migrate to ground water. Transport to surface water would occur primarily as bound material reducing the potential for impacts to water quality. Indoxacarb half-lives vary from 3 to 693 days under aerobic conditions and 147 to 233 days under anaerobic conditions (EPA, 2000).

Spinetoram

Spinetoram is a spinosyn-based insecticide that is an analogue of spinosad. Spinosyn is a metabolite of the soil-borne bacterium, *S. spinosa*, and is registered as a reduced-risk pesticide by EPA–Office of Pesticide Programs. Spinetoram has a variety of agricultural and non-agricultural uses and is effective against various insect pests including moth larvae, thrips, red imported fire ants and some beetles, psyllids and flies (EPA, 2009b).

1. Human Health

Spinetoram is considered practically non-toxic to mammals in oral, dermal and inhalation exposures (EPA, 2009b). It is not considered an eye or skin irritant but is considered a dermal sensitizer. In long term studies spinetoram was shown not to be teratogenic or carcinogenic and is not a mutagen. Some developmental effects have been observed at higher levels in the parents; however, no impacts were observed to offspring, suggesting that spinetoram is not a developmental toxicant.

Exposure is expected to be greatest for applicators and workers in treated fields; however, the low mammalian toxicity and label requirements regarding personal protective equipment suggest wide margins of safety for this subgroup of the population. Risk to the general public is also low based on the favorable toxicity profile and lack of significant exposure from treated commodities, or in surface or groundwater that could be used for drinking water. Spinetoram does not exhibit properties that suggest it would be mobile and contaminate ground water. The strong binding affinity of spinetoram to soil and sediment suggests it would be present in any runoff as bound material.

2. Ecological and Environmental Quality

Spinetoram toxicity to terrestrial vertebrates such as wild mammals and birds is low. Median lethality values for birds in acute oral and dietary studies are higher than the highest test concentration tested for surrogate species (EPA, 2009b). Spinetoram would be expected to impact sensitive terrestrial invertebrates where applications occur. Direct impacts to sensitive terrestrial invertebrates would primarily be restricted to the agricultural fields where applications are proposed. Adherence to label requirements regarding the protection of pollinators such as honey bees will reduce exposure. Current label language for the protection of honey bees prohibits applications to blooming, pollen shedding or nectar producing parts of the plant if bees are foraging. Indirect impacts to terrestrial vertebrates that eat insects will be reduced because applications are occurring in highly disturbed agricultural fields, and many of the terrestrial vertebrates that would consume insects would forage outside of the treated fields. In addition, spinetoram would not impact all terrestrial invertebrates in treated fields that would provide prey items for those animals that spend a greater time foraging in agricultural fields.

Spinetoram has moderate toxicity to fish with median lethality values greater than 2 ppm (EPA, 2015b). Spinetoram is toxic to some freshwater and marine invertebrates. Available aquatic toxicity for a metabolite suggests equal or greater toxicity than the spinetoram. Exposure and risk to fish and aquatic invertebrates will be reduced by adherence to label restrictions regarding applications near water as well as spray drift reduction requirements.

Spinetoram impacts to environmental quality are expected to be minimal. Spinetoram does not exhibit chemical properties that suggest it would volatilize into the atmosphere, and any impacts to air quality would be localized to the treated fields during the time of application when drift may occur. Label requirements regarding drift reduction will reduce any potential impacts to air quality. Spinetoram is not expected to have significant impacts to water quality. Spinetoram has low water solubility (11.3 mg/L) and binds tightly to soil, suggesting low mobility and low risk of contamination of surface and ground water. Persistence in soil varies with half-lives ranging from 18 to 88 days. Aerobic half-lives in the presence of water are shorter than under anerobic conditions (EPA, 2009b).

NPV

Nuclear Polyhydrosis Virus (NPV) is a naturally occurring baculovirus that is naturally pathogenic and specific to larval lepidopteran insects. It is used primarily in forestry applications where it is specific to gypsy moth and the Douglas fir tussock moth but also has activity against some moths such as the OWB.

1. Human Health

NPV is considered practically non-toxic to mammals in acute oral, dermal and inhalation exposures, and has not been shown to be pathogenic (USDA–FS, 2004b). NPV is not a skin irritant but can be an eye irritant. Available studies regarding subchronic and chronic effects show a lack of toxicity and pathogenicity in mammal studies. NPV is not considered to be mutagenic, teratogenic or carcinogenic (USDA–FS, 2004b).

Exposure and risk to workers and the general public is low based on the favorable toxicity profile for NPV. Workers would be at the greatest risk from NPV applications. However, available data suggests that applications made following label requirements would not result in any adverse impacts to this group of the population. Contamination of surface or ground water from the proposed applications is also not a concern based on the use pattern and fate of NPV in the environment. In the event that some NPV could move to drinking water resources, the risks would be negligible to all populations segments.

2. Ecological and Environmental Quality

NPV also has low toxicity to most terrestrial and all aquatic non-target organisms based on available data. NPV is practically non-toxic and non-pathogenic to wild mammals based on mammalian toxicity data used to support human health effects. Conventional toxicity data for NPV are not available; however, there have been dosing studies to determine lethality and pathogenicity to various avian species. Available avian studies using NPV show a lack of toxicity and pathogenicity to birds based on available data. In a summary of effects data to support registration for a formulation of NPV for gypsy moth control, feeding studies using NPV demonstrated no lethal or sublethal effects to birds such as mallards, bobwhite quail, black capped chickadees, house sparrows and other resident songbirds (USDA–FS, 2004b). Risk to non-target terrestrial invertebrates is also expected to be negligible. Baculoviruses, similar to the one proposed for OWB, are characterized by their specificity to certain insects (Chou et al., 1996). For example, several non-target terrestrial invertebrate studies using NPV specific to Gyspy moth have demonstrated a lack of effects to most arthropods including non-target Lepidoptera (Rastall et al., 2003; Wang et al., 2000; Barber et al., 1993).

Available effects data for NPV suggests very low toxicity and lack of pathogenicity for fish. Kreutzweiser et al. (1997) exposed rainbow trout fingerlings for 21days to high doses of NPV and monitored for lethality and sublethal impacts. No effects on mortality, growth, feeding rates or behavior were noted, and necropsies of exposed fish revealed no internal impacts to organs or infectivity of NPV. USDA- FS (2004b) summarizes another fish study conducted by Moore (1997) where bluegill sunfish and brown trout were exposed to 7.5×10^{8} 10^{12} polyhedral inclusion bodies (PIB)/gram of fish for four days and then monitored for another 30 days. There was no statistical difference between controls and treated fish when comparing mortality, behavior and histopathological evaluation of the gills, stomach, liver and intestines. Hicks et al. (1981) intubated rainbow trout with 3.0×10^{6} PIB/gram of fish and evaluated subsets of fish on multiple days up to 30 days post treatment with no observable effects. In another study by the same author, fish were exposed to waterborne NPV concentrations of 2.4×10^{4} PIB/ml and monitored for seven days. No effects were observed in either exposure test when comparing mortality, weights and histopathology evaluation of the gills, kidney and stomach between control and NPV-exposed fish.

NPV applications will have negligible impacts to soil, water and air quality. Applications will only occur in already established agricultural fields using ground equipment. NPV is not anticipated to impact air quality other than at the time of application; however, these impacts will be negligible, localized and short in duration. Any NPV that may occur from drift during application will not impact air quality as it relates to human health. NPV is not anticipated to impact soil or water quality based on its low toxicity and applications to agricultural fields.

C. Cumulative Effects

Cumulative impacts are those impacts on the environment that result from the incremental impact of a proposed action when added to other past, present and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. The insecticides proposed for use in the OWB are currently registered for various uses in Puerto Rico. In addition, APHIS currently has a fruit fly program in Cabo Rojo to eradicate the Mediterranean fruit fly, *Ceratitis capitata*. Spinosad and malathion baits are proposed for use which would also add to environmental loading of insecticides within Cabo Rojo. Additional loading to the environment from the insecticides proposed for use against OWB is expected under the preferred alternative; however, cumulative impacts are expected to be incrementally negligible. In general, the proposed products represent insecticide classes that pose a reduced risk to human health and the environment when compared to older, broad spectrum insecticides, such as organophophate and carbamate insecticides. In addition, the use rates are typically lower for newer insecticides when compared to some of the other older, broad spectrum insecticides. The cumulative impacts from the selection of the preferred alternative would be expected to be less than those from the selection of the no action alternative. Spread of OWB to other areas in Puerto Rico without an response program would result in increased crop losses as well as increased insecticide use to treat infested fields. The potential for effects to human health and the environment would be greater with increased insecticide use that may not be supervised or coordinated with state and Federal agencies.

D. Threatened and Endangered Species

Section 7 of the Endangered Species Act (ESA) and its implementing regulations require Federal agencies to ensure 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. The federally listed Puerto Rican plain pigeon (*Columba inornata wetmorei*), yellow-shouldered blackbird (*Agelaius xanthomus*), and Puerto Rican crested toad (*Peltophryne lemur*) may occur in proximity to agriculture fields where there is the potential for exposure from OWB treatments either within the treatment areas, or in off-site areas as a result of drift or runoff. APHIS submitted a biological assessment to the U.S. Fish and Wildlife Service and received concurrence on its effects determinations in a letter dated September 3, 2015.

F. Migratory Birds

The Migratory Bird Treaty Act of 1918 (16 United States Code (U.S.C.) 703–712) established a Federal prohibition, unless permitted by regulations, to pursue, hunt, take, capture, kill, attempt to take, capture or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, ship, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird or any part, nest, or egg of any such bird.

Executive Order 13186, “Responsibilities of Federal Agencies to Protect Migratory Birds,” directs Federal agencies taking actions with a measurable negative effect on migratory bird populations to develop and implement a memorandum of understanding (MOU) with the FWS which promotes the conservation of migratory bird populations. On August 2, 2012, an MOU between APHIS and the FWS was signed to facilitate the implementation of this Executive Order.

More than 350 bird species have been found in Puerto Rico (eBird, 2015). About 120 bird species regularly nest in Puerto Rico, including native and introduced birds (Fatbirder, 2015). Puerto Rico's diversity of habitats, including rain forests, dry forests, elfin-woods forests, mountains, cliffs, mangroves, wetlands, ponds, and salt flats enable it to harbor many bird species, many of which are protected under the MBTA.

Proposed insecticide applications will occur in agricultural fields where birds may nest and forage. The fields are highly disturbed areas that are actively managed for agricultural production. The proposed insecticides have low toxicity and risk to birds and would not be expected to result in direct risk to birds that consume insects. There would be some loss of invertebrate prey items for birds that forage in these areas, and impacts will depend on the specific insecticide used because some insecticides are more selective than others. The loss of prey items for insect-feeding birds will be localized to treated areas within the fields that may receive an insecticide treatment. Birds would typically have a foraging range larger than a treated field and would have access to invertebrates within treated fields that are not sensitive to chemical treatment.

G. Other Considerations

Executive Order (EO) 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," focuses Federal attention on the environmental and human health conditions of minority and low-income communities, and promotes community access to public information and public participation in matters relating to human health and the environment. This EO requires Federal agencies to conduct their programs, policies, and activities that substantially affect human health or the environment in a manner so as not to exclude persons and populations from participation in or benefiting from such programs. It also enforces existing statutes to prevent minority and low-income communities from being subjected to disproportionately high or adverse human health or environmental effects. The human health and environmental effects from the proposed applications are expected to be minimal and are not expected to have disproportionate adverse effects to any minority or low-income family. The use pattern and available data regarding risk for each of the proposed insecticides suggests that minority and low income populations will not be at a disproportionate risk.

EO 13045, "Protection of Children from Environmental Health Risks and Safety Risks," acknowledges that children, as compared to adults, may suffer disproportionately from environmental health and safety risks because of developmental stage, greater metabolic activity levels, and behavior patterns. This EO (to the extent permitted by law and consistent with the agency's mission) requires each Federal agency to identify, assess, and address environmental health risks and safety risks that may disproportionately affect children. Use patterns for insecticides in the OWB management program area and available insecticide risk assessment data suggest that children will not be at risk from OWB program activities.

Executive Order 13175, “Consultation and Coordination with Indian Tribal Governments” was issued to ensure that there would be “meaningful consultation and collaboration with tribal officials in the development of Federal policies that have tribal implications….” No Federally recognized tribes are known in the proposed action area.

Consistent with the National Historic Preservation Act of 1966, APHIS has examined the proposed action in light of its impacts to national historic properties. Treatments for OWB are not anticipated on historic properties. However, in cases where there may be these types of treatments they would be coordinated with the State Historic Preservation Officer and other appropriate contacts.

V. Listing of Agencies and Persons Consulted

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

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

U.S. Fish and Wildlife Service
Caribbean Ecological Services Office
Post Office Box 491
Carr 301, KM 5.1, Bo Corozo
Boqueron, Puerto Rico 00622-0491

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Appendix A. Old World Bollworm Detections in Puerto Rico