CAPS Pest Datasheets provide pest-specific information to support planning and completing early detection surveys.

Chilo partellus

Figure 1. Adult female *Chilo partellus* moth. Photo by Paul-Andre Calatayud, IRD-ICIPE, Nairobi. Used with permission.

Scientific Name

Chilo partellus (Swinhoe, 1886)

Synonyms:

Chilo zonellus (Swinhoe, 1884)
Crambus zonellus Swinhoe, 1885
Crambus partellus Swinhoe, 1885
Argyria lutulentalis Tams, 1932
Chilo lutulentalis Tams, 1932

Common Name

Spotted stem borer, spotted stemborer, maize and jowar borer, maize stem borer, durra stalk borer, spotted stalk borer, spotted sorghum stem borer, pink borer

Type of Pest

Moth, stem borer

Taxonomic Position

Class: Insecta, **Order:** Lepidoptera, **Family:** Crambidae

Reason for Inclusion in Manual

Priority pest for Corn Commodity Survey, 2017 - present

Pest Description

Eggs: Eggs are flat, scale-like, and cream colored (Whittle and Ferguson, 1988). They are laid in clusters of 10 to 80 (Harris, 1990) and darken in color as they develop (Fig. 2).

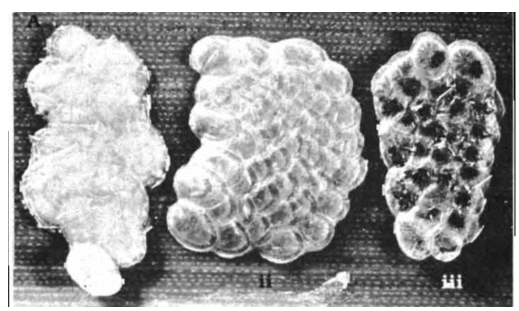

Figure 2. Stages of egg development: i. newly laid. ii. brownheads. iii. blackheads. Photo by Dr. K. V. Seshu Reddy. Used with permission.

Larvae: Caterpillars are cream-colored with four longitudinal stripes (Meijerman and Ulenberg, 1998) (Fig. 3). Diapausing larvae may not have stripes. Larvae have obvious dark brown spots on their backs (Meijerman and Ulenberg, 1998). The head capsule, prothoracic shield, and anal shield are brown. The crochets[1] on the prolegs[2] form a circle with three alternating lengths in some parts. Spiracles are black and oval-shaped (Meijerman and Ulenberg, 1998).

Figure 3. *Chilo partellus* larva. Photo by Paul-Andre Calatayud, IRD-ICIPE, Nairobi. Used with permission.

Pupae: The edges of abdominal segments 5, 6, and 7 have rough patches (Whittle and Ferguson, 1988) and the last segment of the abdomen has eight to nine prominent points (Whittle and Ferguson, 1988).

Adults: Adult moths are yellow to brown with a scattering of dark scales (Bleszynski, 1970) (Figs. 1 and 4). The forewing is 7–17 mm (0.25–0.67 in) long, with a thin, brown line along the upper (towards the head) margin of the wing (Bleszynski, 1970). The outer margin of the forewing has a row of small, dark dots (Whittle and Ferguson, 1988), but there are no metallic scales, which may be present in similar species. Hindwings are white to grey (Bleszynski, 1970). The head has well-developed ocelli[3]. The face appears cone-shaped with long labial palpi[4] which are 3–3.5 times as long as the diameter of the eye, with females having longer labial palpi than males (Bleszynski, 1970).

Figure 4. Adult *Chilo partellus* moth. Photo by G. Goergen, IITA. Used with permission.

Biology and Ecology

The lifecycle of *C. partellus* is completed in 35-40 days (Sithole et al., 1990). Eggs hatch about four to five days after laying (Harris, 1990). Early instar caterpillars feed on the leaf whorls of corn or sorghum. Late third-instar and early fourth-instar larvae tunnel into the stem of the plant where they feed and shelter (Berger, 1994; De Groote, 2002). The insect only feeds during the larval stage (Berger, 1989). Larval development takes two to four weeks. The insect pupates in the stem of the plant for 5 to 12 days (Harris, 1990). During the winter, caterpillars can diapause for up to six months in plant stems and debris (Harris, 1987; Maes, 1998). In low-lying areas of Africa where the winters are warm, larvae do not diapause and development occurs year-round (Kfir et al., 2002) with up to five generations possible each year (Harris, 1987).

[1] Crochets: sclerotized, hooklike structures, usually arranged in rows or circles.
[2] Proleg: fleshy, false leg located on the abdomen of Lepidopteran larvae.
[3] Ocelli: a simple eye located above and behind the adult compound eye.
[4] Labial palpi: a pair of small, segmented sensory structure arising from the labium (lower lip)
See LeptIntercept glossary for morphology terms: http://idtools.org/id/leps/lepintercept/glossary.html.

Female moths mate the first night after emergence and begin laying eggs on the leaves of host plants the second night (Berger, 1989). They continue laying eggs each night until they die, about five days after emergence. The number of egg cluster and number of eggs per cluster are highest on the first night and decrease each successive night (Berger, 1989). Egg batches contain about 10-80 eggs, and a female lays around 200-800 eggs over a lifetime (Harris, 1990). Adult moths are active at night; during the day, they rest on plants and debris (Harris, 1987).

The insect can spread naturally several different ways. Larvae balloon to different plants by releasing silk threads into the wind, which blows the insects to different plants (Berger, 1994). They can also crawl from plant to plant (Berger, 1994). Adult moths fly but typically stay near the site from which they emerge (Maes, 1998).

The number of generations per year varies depending on altitude, climate, and host availability. Warm climates are most conducive to establishment (Haile and Hofsvang, 2001). *Chilo partellus* thrives in low (less than 700 m/2300 ft) and moderate (700-900 m/2300-3000 ft) elevations with low to moderate humidity (Sithole et al., 1990). A recent CLIMEX model predicting global distribution based on climate, irrigation, and host plant presence found that irrigation of host plants makes dry regions suitable for *C. partellus* establishment (Yonow et al., 2017) allowing it to potentially expand outside of the known plant hardiness zones. After arriving in Africa, *C. partellus* expanded its range from warm, low elevation to higher elevations and displaced *Busseola fusca*, an native moth that is also a stem borer of maize and sorghum (Kfir, 1997).

Damage

When larvae first hatch from eggs, they move into and feed on the leaf whorls, causing spots called foliar lesions and scarring (Ajala and Saxena, 1994; Sithole et al., 1990) (Fig. 5). As the leaves expand, pinholes in a horizontal line show where larvae have fed (Whittle and Ferguson, 1988).

Figure 5. Feeding damage to corn leaves by *C. partellus* larvae. Photo by Paul-Andre Calatayud, IRD-ICIPE, Nairobi. Used with permission.

Later instar larvae tunnel into the stems of plants, where they feed and shelter, causing a condition called “dead heart” (Fig. 6). The “dead heart” results from the larvae cutting through meristematic tissues, which kills the central leaves of the plant (Berger, 1994; De Groote, 2002; Sithole et al., 1990). Younger plants are more susceptible to “dead heart” (Whittle and Ferguson, 1988), and it causes significant yield losses (Mohyuddin and Attique, 1978). Older larvae bore through the stems and fill the tunnels with frass (Whittle and Ferguson, 1988). Tunneling in the stems of corn plants is also correlated with yield reduction (Ajala and Saxena, 1994). Larvae can also consume the husks, kernels, and cores of corn ears (Whittle and Ferguson, 1988).

Pest Importance

Chilo partellus is an important stem borer of corn and sorghum in Asia and Africa (Maes, 1998; Mohyuddin and Attique, 1978; Reddy and Sum, 1991; Sithole et al., 1990).

Figure 6. Death of the corn tassel caused by *C. partellus*, often referred to as "deadheart". Photo from http://ethiopia.ipm-info.org/. Used with permission.

The level of crop damage and infestation can vary greatly depending on location, management practices, crop variety, and time of planting. As a result, reported yield loss can be highly variable Reddy and Walker, 1990. In east Africa, artificial infestations of corn resulted in estimated yield loss between 34 and 43%. In Kenya, natural infestations caused an estimated 36.9% yield loss (as reviewed in De Groote, 2002). Yield loss increases as the level of infestation increases (De Groote, 2002; Rahman et al., 2004). However, yield loss decreases the older the plant is when the infestation occurs (Alghali, 1986 Reddy and Sum, 1991). Larvae develop faster and have greater likelihood of survival when infesting young plants in the seedling or vegetation stages (Sithole et al., 1990). Infestations that occur 35 days after the crop emerges have little impact on yield (Sithole et al., 1990). Crop varieties that develop quickly are damaged less than long-season varieties (Van den Berg et al., 1990).

It is reported to be a pest of rice and sugar cane, but there is little crop loss data Reddy and Walker, 1990. In Bangladesh, 11-25% yield loss was reported in experimental rice fields with natural infestations (Rahman et al., 2004).

Known Hosts

Chilo partellus is a pest of monocots, with the greatest crop losses reported in corn and sorghum (Kfir et al., 2002; Reddy and Sum, 1991; Reddy and Walker, 1990).

Major hosts[1]

Sorghum bicolor (sorghum) and *Zea mays* (corn) (Bayram and Tonğa, 2016; Ben-Yakir et al., 2013; Chundurwar, 1989; Haile and Hofsvang, 2001; Kfir et al., 2002; Sithole et al., 1990)

[1] Host plants described as major, primary, or preferred in published literature and supported by direct evidence of economic or environmental damage.

Minor hosts[1]
Andropogon spp. (bluestem), *Coix lacryma-jobi* (Job's tears), *Cyperus* spp. (flatsedge), *Echinochloa pyramidalis* (antelope grass), *Echinochloa haploclada* (cockspur), *Eleusine coracana* (finger millet), *Eragrostis tef* (teff), *Hemarthria compressa* (whip grass), *Hyparrhenia rufa* (jaragua), *Oryza sativa* (rice), *Panicum maximum* (Guinea grass), *Pennisetum glaucum* (pearl millet), *Pennisetum purpureum* (elephant grass), *Saccharum officinarum* (sugarcane), *Setaria* spp. (bristlegrass), *Sorghum bicolor* subsp. *verticilliflorum*, (common wild sorghum), *Sorghum halepense* (Johnson grass), *Vossia cuspidata* (hippo grass), and *Vossia* spp. (hippo grass) (Bleszynski, 1970; Chundurwar, 1989; Haile and Hofsvang, 2001; Harris, 1987; Kfir et al., 2002; Sithole et al., 1990)

Pathogens or Associated Organisms Vectored

This species is not known to be associated with any pathogens or other organisms.

Known Distribution

Africa: Botswana, Cameroon, Comoros, Democratic Republic of Congo, Eritrea Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mozambique, Somalia, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Yemen, Zambia, and Zimbabwe; **Asia:** Afghanistan, Bangladesh, Cambodia, India, Indonesia, Laos, Nepal, Pakistan, Philippines, Sikkim, Sri Lanka, Thailand, and Vietnam; **Middle East:** Iran, Israel, Turkey, and Yemen (Bayram and Tonğa, 2016; Ben-Yakir et al., 2013; Berger, 1989; Chundurwar, 1989; Dejen et al., 2014; EPPO Global Database, 2018; Haile and Hofsvang, 2001; Harris, 1990; Kfir et al., 2002; Sithole et al., 1990).

Pathway

Chilo partellus larvae feed inside whorled leaves, tunnel into the stem of host plants, and diapause in stems. For these reasons, the most likely pathway of entry is through movement of infested host plant material.

Green corn ears may be imported into Guam and the Northern Mariana Islands from several countries where *C. partellus* is present, including Afghanistan, Israel, Turkey, and Yemen (USDA, 2018a). The green corn ears are subject to inspection and all the general requirements of 7 CFR 319.56-3[2] (USDA, 2018a). Shucked, immature corn ears may be imported into all continental U.S. ports from Kenya and Zambia (USDA, 2018a).

Live plants of *Zea* spp., *Coix* spp., *Sorghum* spp., *Oryza* spp., *Pennisetum glaucum*, and *Saccharum officinarum* are not authorized for importation into the United States (USDA, 2018b). Live *Andropogon* spp., *Echinochloa* spp., *Eleusine* spp., *Hemarthria* spp., *Hyparrhenia* spp., *Panicum* spp., *Pennisetum* spp. (except *Pennisetum glaucum*),

[1] Host plants with documented feeding and/or infestation, but no record of economic or environmental damage.
[2] The Code of Federal Regulations (CFR), published by the Office of the Federal Register and the Government Publishing Office, lists all current rules and regulations currently in federal administrative law.

Setaria spp., and *Vossia* spp. plants are allowed to be imported into the United States from Canada (USDA, 2018b).

No *C. partellus* interceptions at U.S. ports of entry are recorded. However, in the past 10 years live *Chilo* spp. larvae were intercepted 37 times in baggage, general cargo, and permit cargo on items for consumption from Asia and sub-Saharan Africa (PestID, 2018).

Potential Distribution within the United States

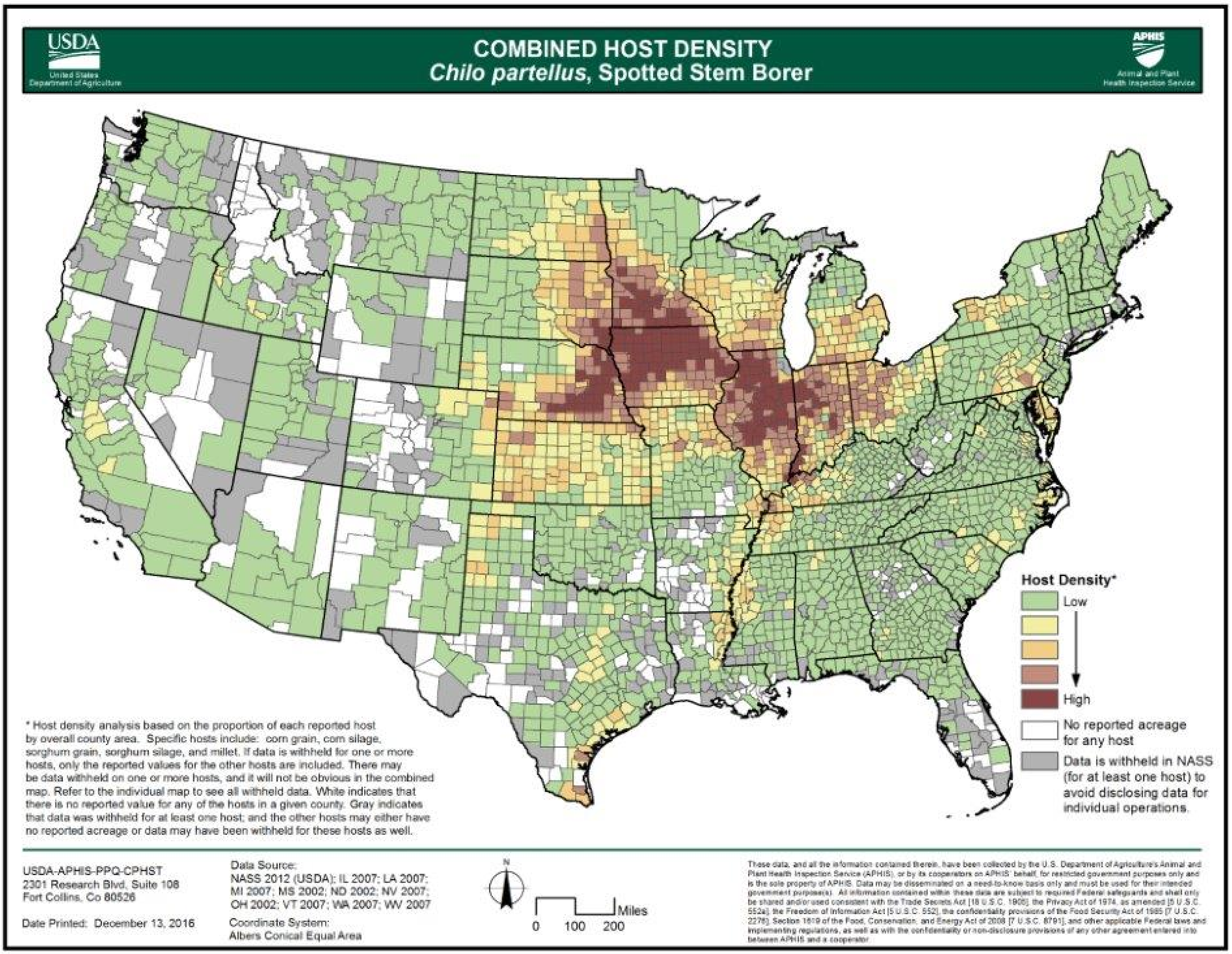

Figure 7. Combined Host Density Map for economically important hosts of *Chilo partellus* within the continental United States. Values represent low to high combined host acreage (corn, sorghum, and foxtail millet). Map courtesy of USDA-APHIS-PPQ-S&T.

A recent combined host density map for *C. partellus* developed by United States Department of Agriculture (USDA) Animal and Plant Health Inspection Service (APHIS)

Plant Protection and Quarantine (PPQ) Science and Technology (S&T) (Fig. 7) identifies areas of high host density based on the combined acreage of corn, sorghum, and foxtail millet. Individual host maps are in the appendix.

Agricultural host distribution maps use county level data. To combine host data for pest-specific analyses, S&T normalizes the data by dividing the total host acreage in a county by the total county area. This provides host density by county and allows S&T to combine host distributions without the skewing effects of overall county size.

Chilo partellus occurs in Plant Hardiness Zones 8 through 13 (Takeuchi et al., 2018). In the United States, these plant hardiness zones encompass most of the southern states, the west coast, and Hawaii, as well as the U.S. Territories.

Survey

Approved Methods for Pest Surveillance*:

The Approved Method is a trap and lure combination using. The trap is a wing trap or a large plastic delta trap. The lure is effective for 28 days (4 weeks).

Trap Product Names in the IPHIS Survey Supply Ordering System:

- Wing Trap Kit, Paper
- Wing Trap Kit, Plastic
- Large Plastic Delta Trap, Orange
- Large Plastic Delta Trap, Red
- Large Plastic Delta Trap, White

Delta trap color or wing trap material does not affect trap efficacy for this species.

The Lure Product Name is "*Chilo partellus* Lure."

IMPORTANT: Do not include lures for other target species in the trap when trapping for this species.

Trap spacing: When trapping for more than one species of moth, separate traps for different moth species by at least 20 m (65 ft).

*For the most up-to-date methods for survey and identification, see Approved Methods for Pest Surveillance on the CAPS Resource and Collaboration Site, at https://caps.ceris.purdue.edu/approved-methods.

Literature-Based Recommendations:

Survey site selection: *Chilo partellus* adults rarely spread far, often remaining within or close to the crop they emerged from (Harris, 1987). Place traps next to plantings of major hosts.

Trap placement: A study in Kenya compared the effect of three heights [0.5, 1, and 1.5 m (1.7, 3.2, and 4.5 ft)] on trap performance with sorghum and maize seedlings and adult plants (1.4 m / 4.5 ft tall) (Unnithan and Saxena, 1990). Trap height did not affect trap performance with seedlings. With fully-grown crops, traps hung at 0.5 m (1.7 ft) above the ground collected the most males (Unnithan and Saxena, 1990). The same study found that traps placed upwind of the crop captured two to three times more males than traps placed downwind or in the center of the field (Unnithan and Saxena, 1990).

Figure 8. *Chilo partellus* genitalia. 4-6: male genitalia. 7: female genitalia. (Drawings by Mary Lou Cooley, Systematic Entomology Laboratory, ARS, USDA).

<u>Time of year to survey:</u> In the Jammu district in northern India, *C. partellus* adult detection begins in mid-May (mean maximum temperature: 25.7 °C/ 78.26 °F, mean minimum temperature: 14.95 °C/ 58.91°F, relative humidity: 65.3 percent), peaks in mid-July (28.25 °C/ 82.85 °F, 16.45 °C/ 61.61°F, 82.5 percent), and gradually decreases until mid-October (23.34 ºC/ 74 °F, 12.54 ºC/ 54.57 °F, 67.61 percent) (Ahad et al., 2008). Since the number of generations vary based on climate, altitude, and host availability; place traps for CAPS surveys when the major hosts are present.

Key Diagnostics/Identification

<u>Approved Methods for Pest Surveillance*:</u>

<u>Morphological:</u> Final identification requires dissection of male or female genitalia.

Chilo partellus is identified by dissecting and examining the adult male or female genitalia (Bleszynski, 1970; Rao and Nagaraja, 1966) (Fig. 8). See Rao and Nagaraja (1966) for detailed drawings of *C. partellus* morphology.

For field-level screening, use:
Royals, H. R., T. M. Gilligan and S. Passoa. 2017. Screening aid: Stem borers, Chilo spp. Identification Technology Program (ITP), USDA-APHIS-PPQ-S&T, Fort Collins, CO. 5 pp.

*For the most up-to-date methods for survey and identification, see Approved Methods on the CAPS Resource and Collaboration Site, at https://caps.ceris.purdue.edu/approved-methods.

Easily Confused Species

<u>Domestic species:</u>

Chilo plejadellus Zincken, 1821, the rice stalk borer, is a North American species that may be confused with *C. partellus*. Unlike *C. partellus*, *C. plejadellus* adults have metallic gold scales on the forewings (Whittle and Ferguson, 1988). Larvae are similar, except *C. partellus* larvae have four parallel stripes, while *C. plejadellus* has five (Whittle and Ferguson, 1988).

Exotic species:
Busseola fusca (Noctuidae), a common stem borer in Africa, may be confused with *C. partellus* in the field as they share host plants (Hutchison et al., 2007). Larvae are similar, except *B. fusca* crochets form a crescent, while in *C. partellus*, they form a circle (Hutchison et al., 2007). See Meijerman and Ulenberg, 1996) for a key to separate *Busseola*, *Sesamia* and *Chilo* larvae from Africa.

Chilo auricilius larvae have five parallel stripes versus four in *C. partellus* (Rao and Nagaraja, 1966). In *C. auricilius* adults, the Sc and R_1 veins in the forewing are fused together, but are separate in *C. partellus* (Rao and Nagaraja, 1966).

Chilo suppressalis, Asiatic rice borer, adults have a prominent ridge along the lower margin of the front of the head. *Chilo partellus* does not have this ridge (Whittle and Ferguson, 1988).

Chilo tamsi, a species from south India, can be distinguished by the female genitalia (Bleszynski, 1970).

Coniesta ignefusalis, millet stem borer, is an African species that may be confused with *C. partellus* in the field as they share host plants (Maes, 1998). *Chilo* larvae can be distinguished from *Coniesta* by the presence of two setae, specialized hairs or bristles, just above the second and third pairs of legs on the thorax (Meijerman and Ulenberg, 1998).

Commonly Encountered Non-targets

North American congeners and closely related crambids may be attracted to the *C. partellus* lure. At the time of publication, however, specific non-target taxa have not been verified (Royals et al., 2017).

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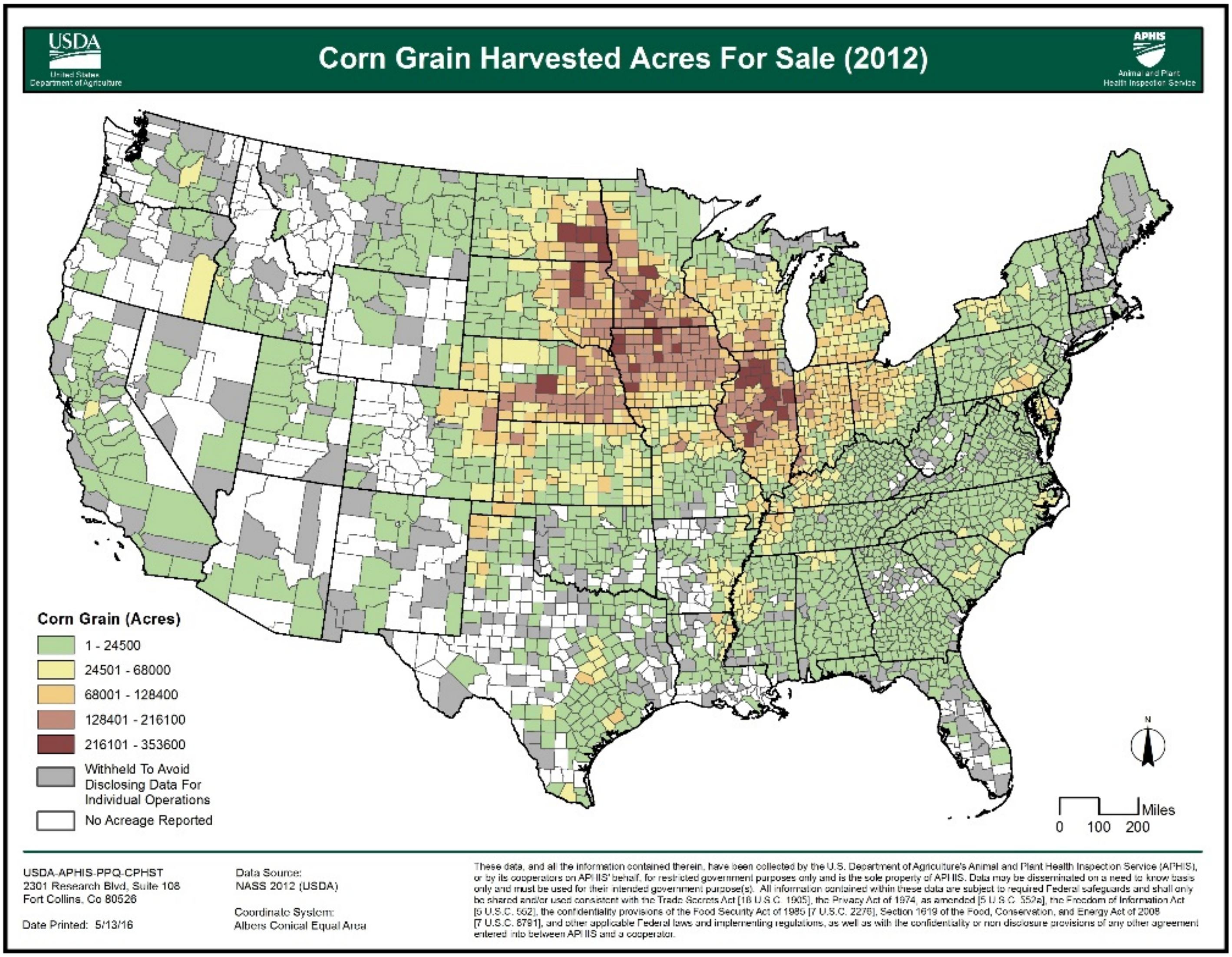
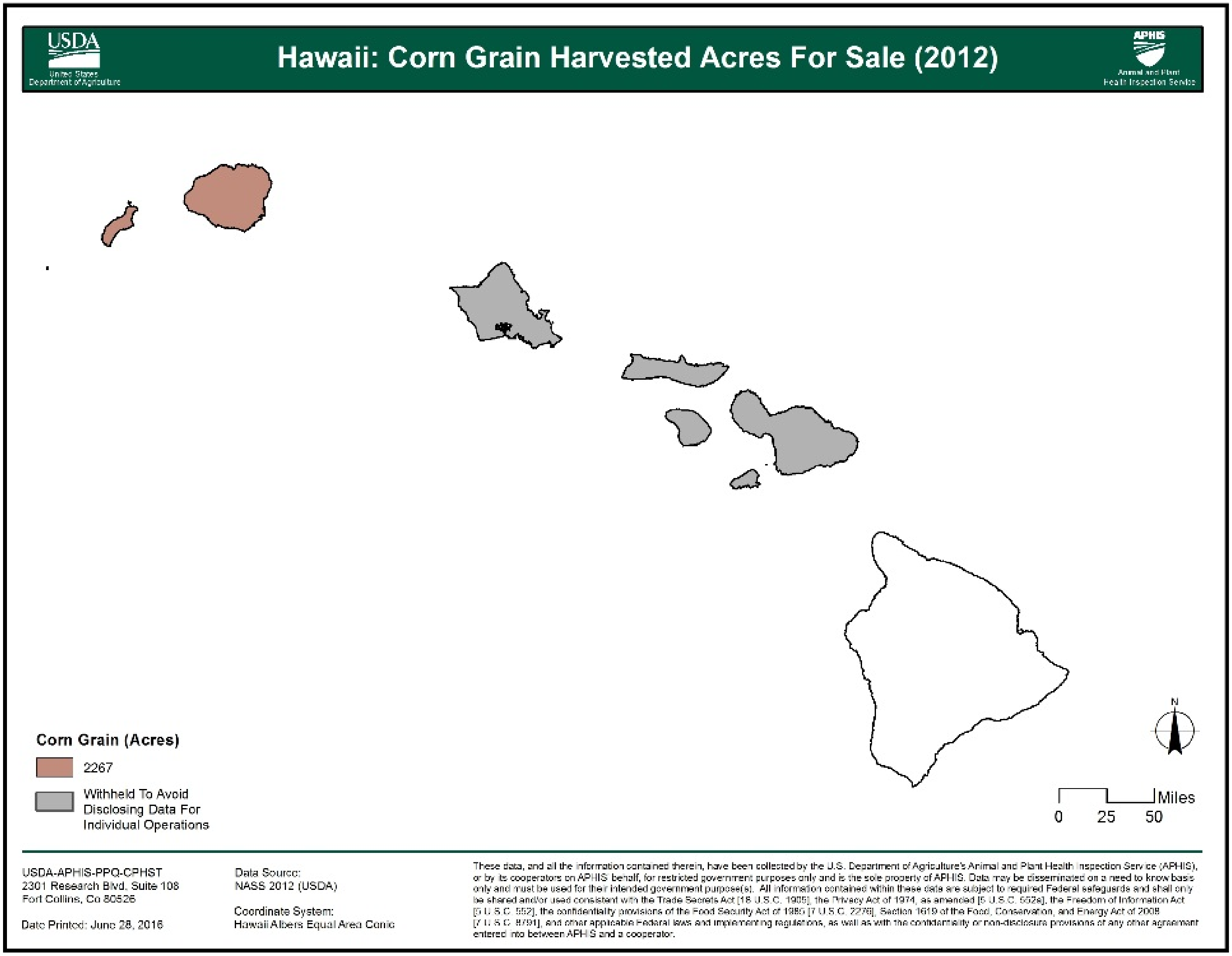
Appendix 1: Individual Host Maps for *Chilo partellus*

USDA-APHIS-PPQ-S&T developed individual host maps were prepared for the major hosts of *C. partellus*: corn, sorghum, and foxtail millet.




USDA
United States Department of Agriculture
Hawaii: Corn Grain Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Corn Grain (Acres)
2267
Withheld To Avoid Disclosing Data For Individual Operations
N
Miles
0 25 50
USDA-APHIS-PPQ-CPHST
2301 Research Blvd. Suite 108
Fort Collins, Co 80526
Date Printed: June 28, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Hawaii Albers Equal Area Conic
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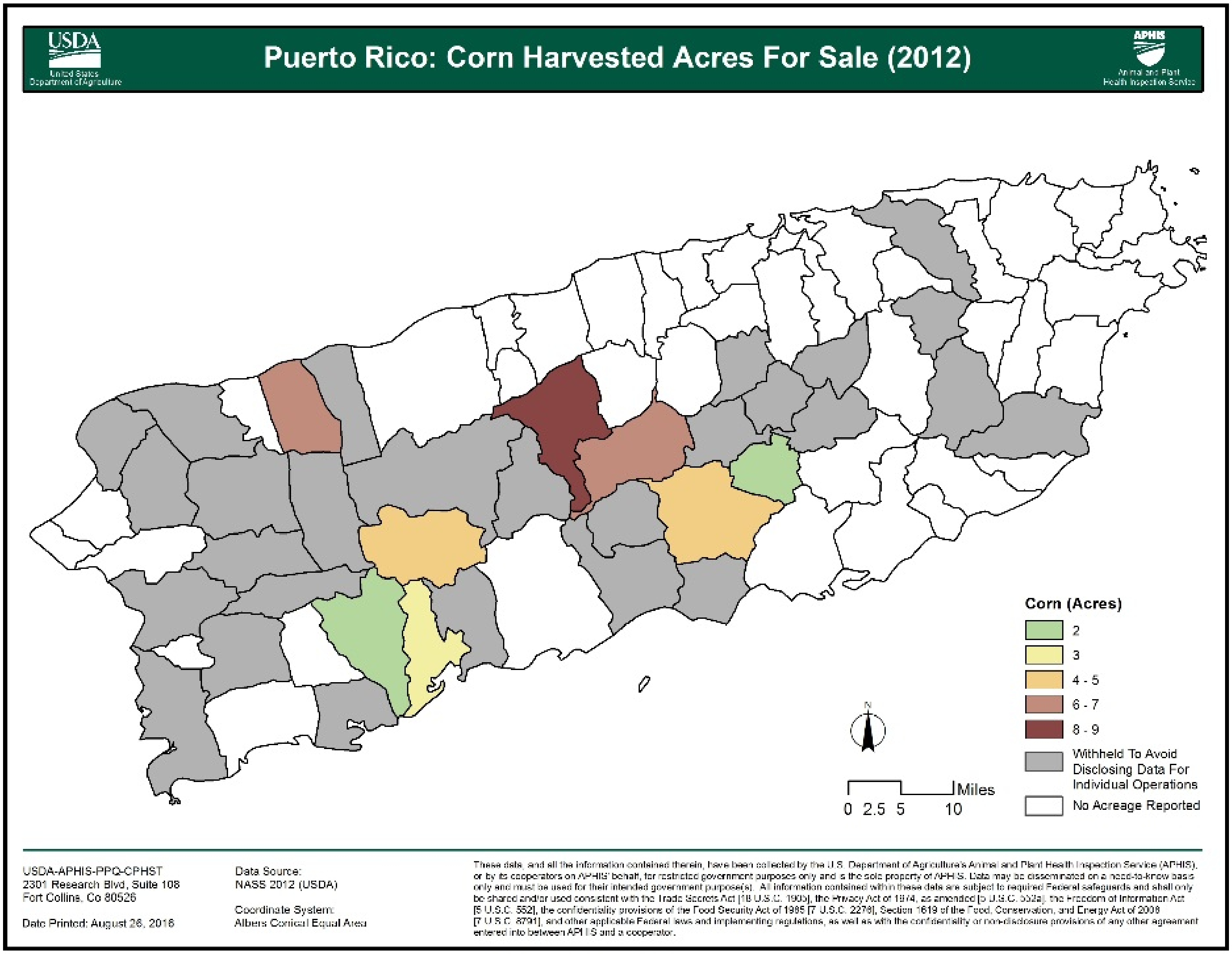

United States Department of Agriculture
Puerto Rico: Corn Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Corn (Acres)
2
3
4 - 5
6 - 7
8 - 9
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
0 2.5 5 10
Miles
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: August 26, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Albers Conical Equal Area
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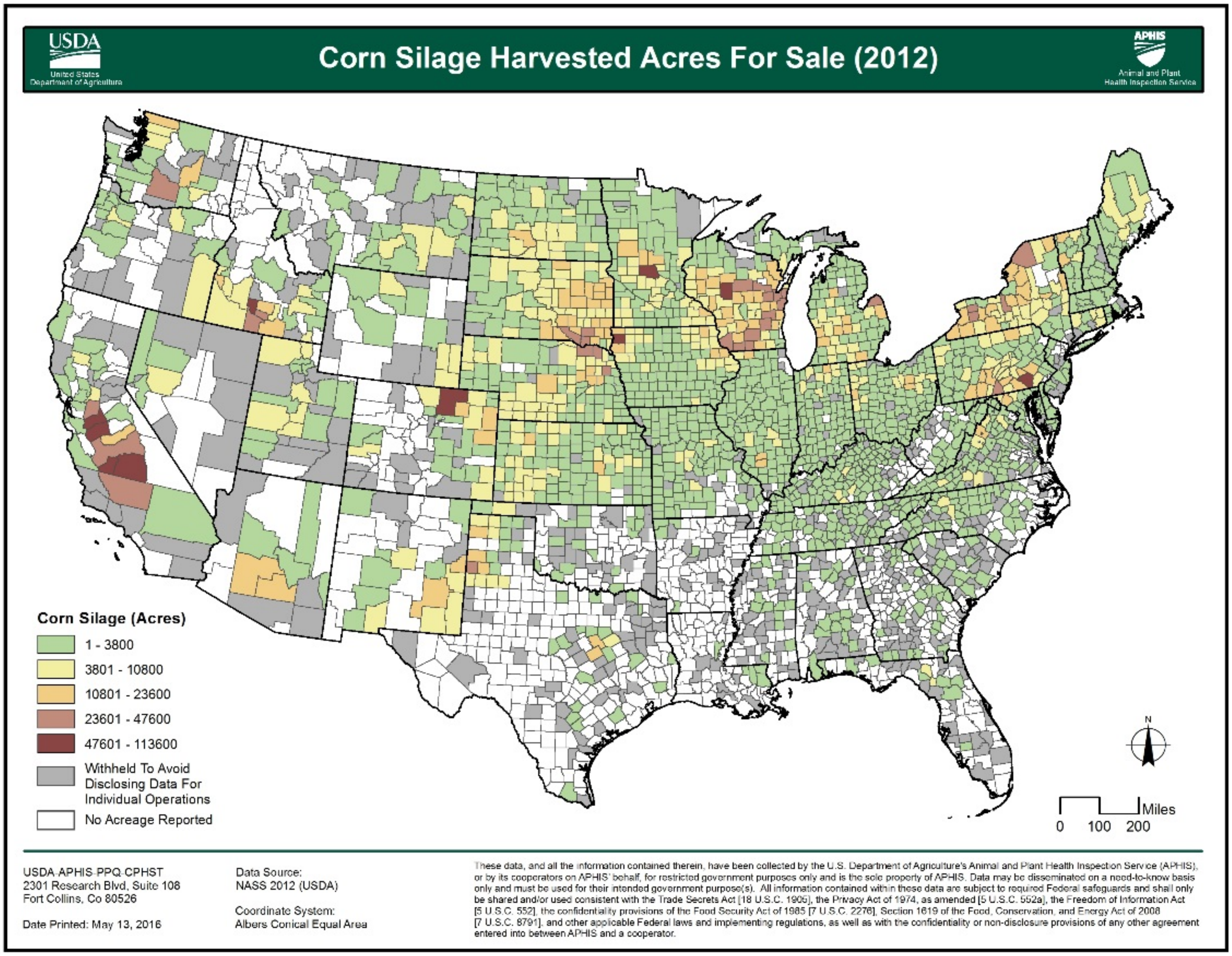
USDA
United States
Department of Agriculture
Corn Silage Harvested Acres For Sale (2012)
APHIS
Animal and Plant
Health Inspection Service
Corn Silage (Acres)
1 - 3800
3801 - 10800
10801 - 23600
23601 - 47600
47601 - 113600
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
Miles
0 100 200
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: May 13, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Albers Conical Equal Area
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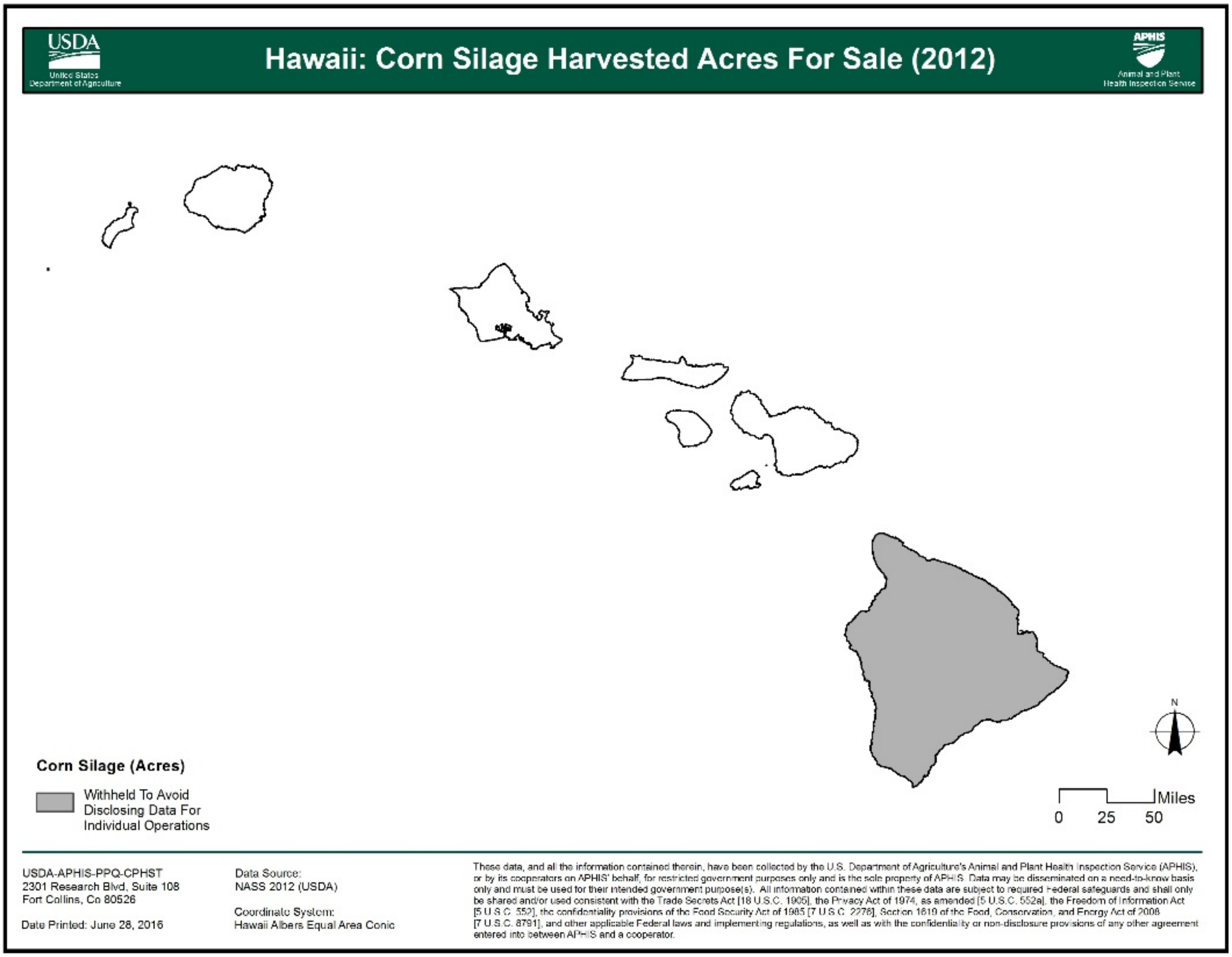
USDA
United States Department of Agriculture
Hawaii: Corn Silage Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
N
Corn Silage (Acres)
Withheld To Avoid Disclosing Data For Individual Operations
Miles
0 25 50
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: June 28, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Hawaii Albers Equal Area Conic
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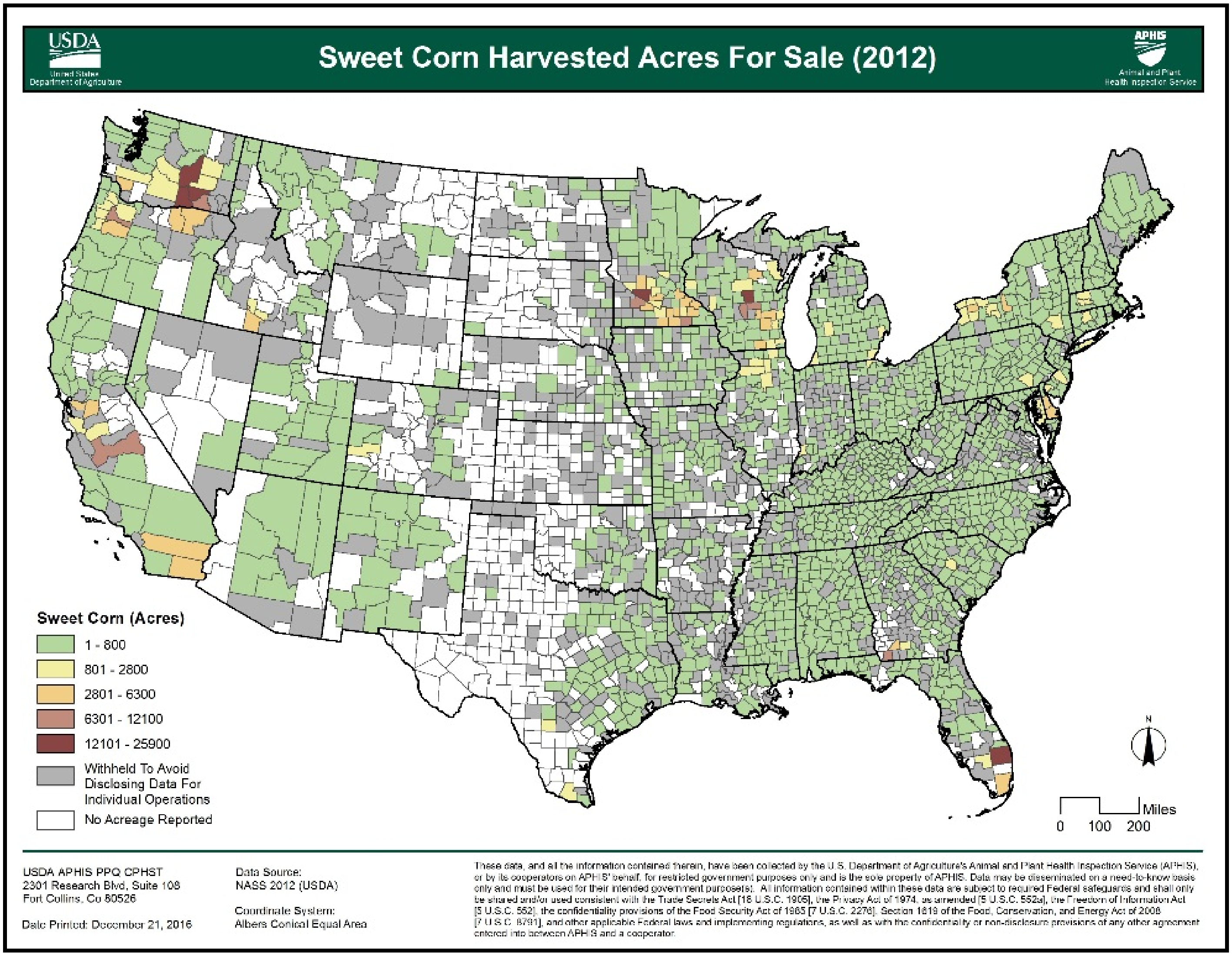
USDA
United States Department of Agriculture
Sweet Corn Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Sweet Corn (Acres)
1 - 800
801 - 2800
2801 - 6300
6301 - 12100
12101 - 25900
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
Miles
0 100 200
USDA APHIS PPQ CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: December 21, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Albers Conical Equal Area
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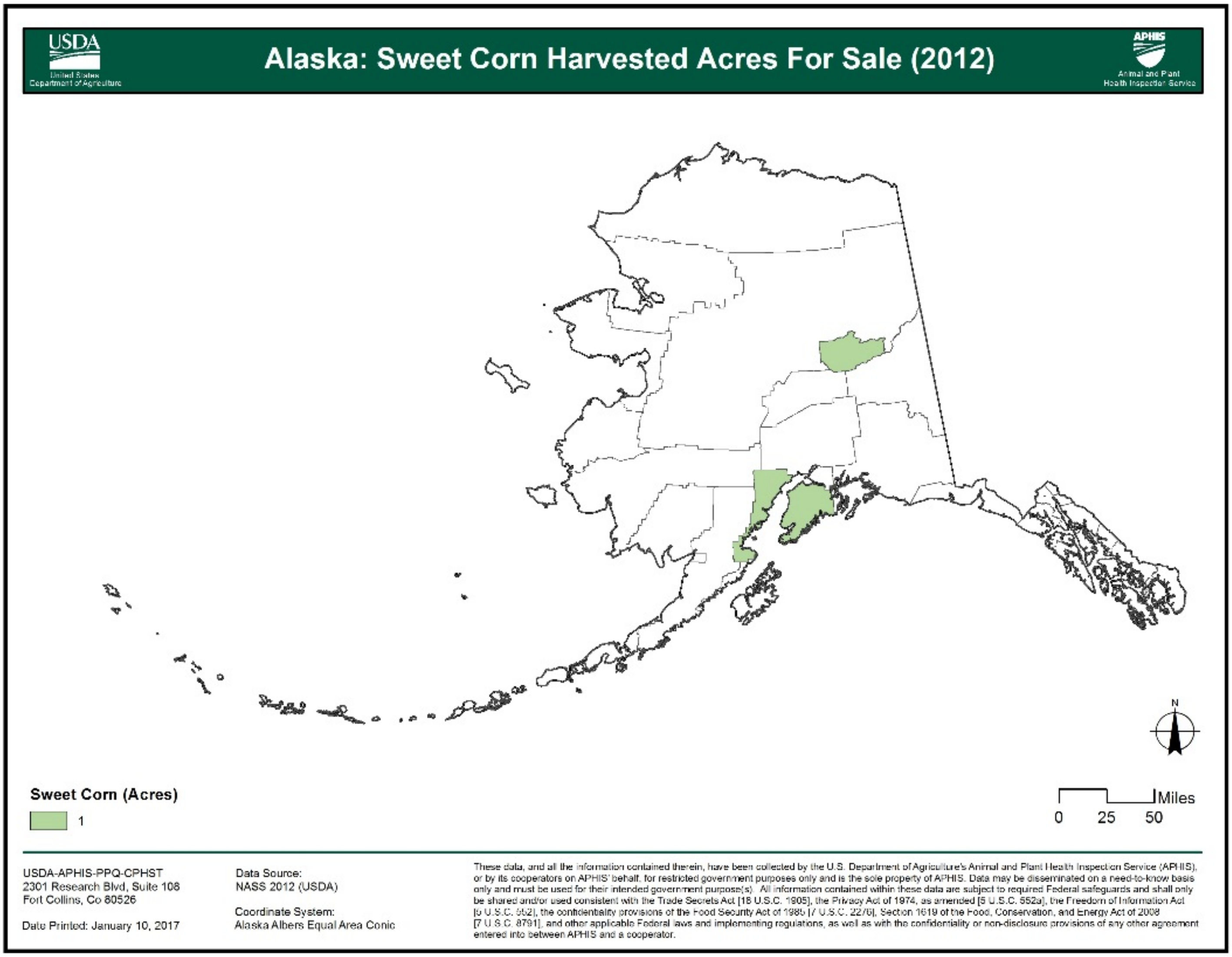
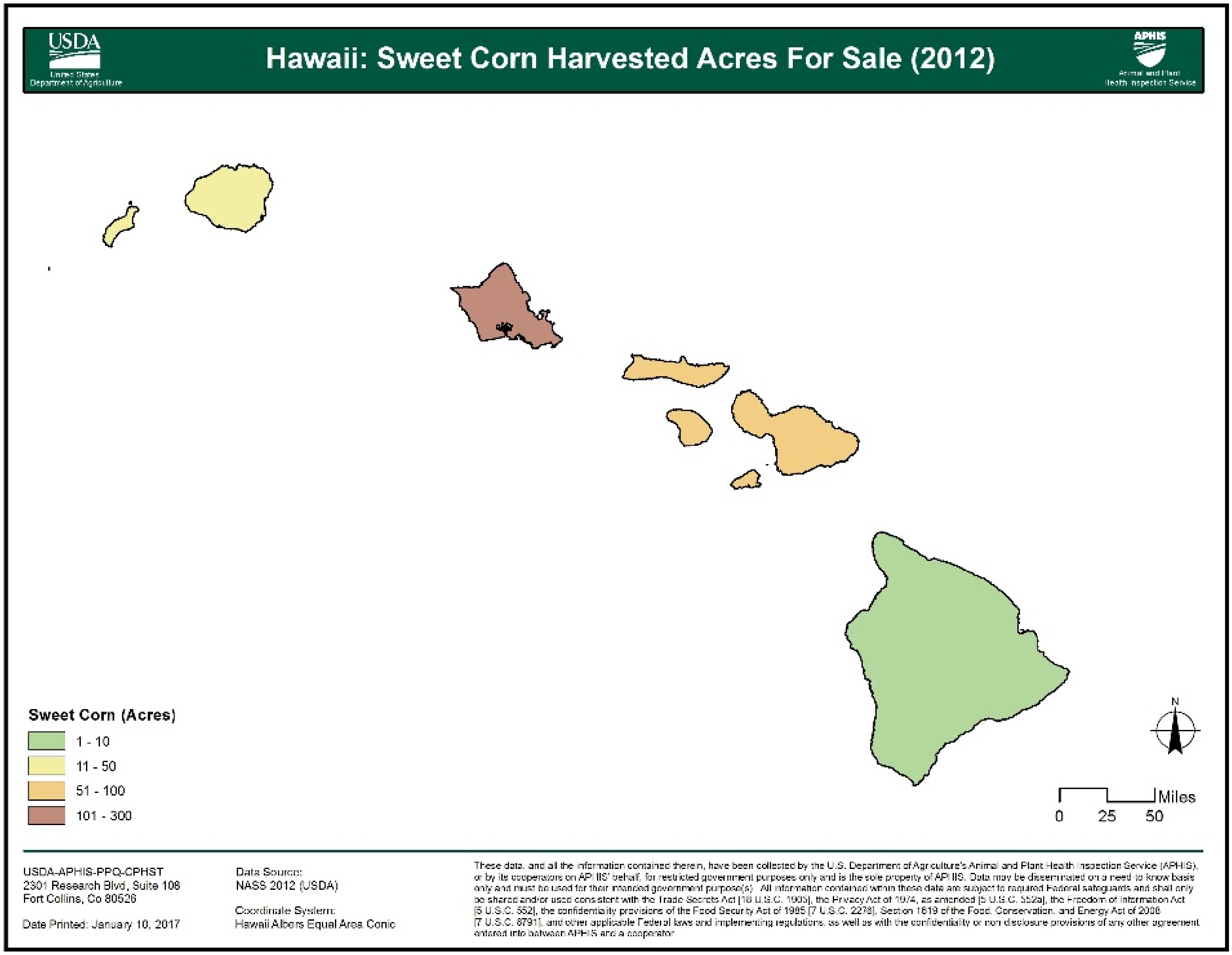

USDA
United States Department of Agriculture
Alaska: Sweet Corn Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
N
Sweet Corn (Acres)
1
Miles
0 25 50
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: January 10, 2017
Data Source:
NASS 2012 (USDA)
Coordinate System:
Alaska Albers Equal Area Conic
These data, and all the information contained therein, have been collected by the U.S. Department of Agriculture's Animal and Plant Health Inspection Service (APHIS), or by its cooperators on APHIS' behalf, for restricted government purposes only and is the sole property of APHIS. Data may be disseminated on a need-to-know basis only and must be used for their intended government purpose(s). All information contained within these data are subject to required Federal safeguards and shall only be shared and/or used consistent with the Trade Secrets Act [18 U.S.C. 1905], the Privacy Act of 1974, as amended [5 U.S.C. 552a], the Freedom of Information Act [5 U.S.C. 552], the confidentiality provisions of the Food Security Act of 1985 [7 U.S.C. 2276], Section 1619 of the Food, Conservation, and Energy Act of 2008 [7 U.S.C. 8791], and other applicable Federal laws and implementing regulations, as well as with the confidentiality or non-disclosure provisions of any other agreement entered into between APHIS and a cooperator.


USDA
United States Department of Agriculture
Hawaii: Sweet Corn Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Sweet Corn (Acres)
1 - 10
11 - 50
51 - 100
101 - 300
N
Miles
0
25
50
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: January 10, 2017
Data Source:
NASS 2012 (USDA)
Coordinate System:
Hawaii Albers Equal Area Conic
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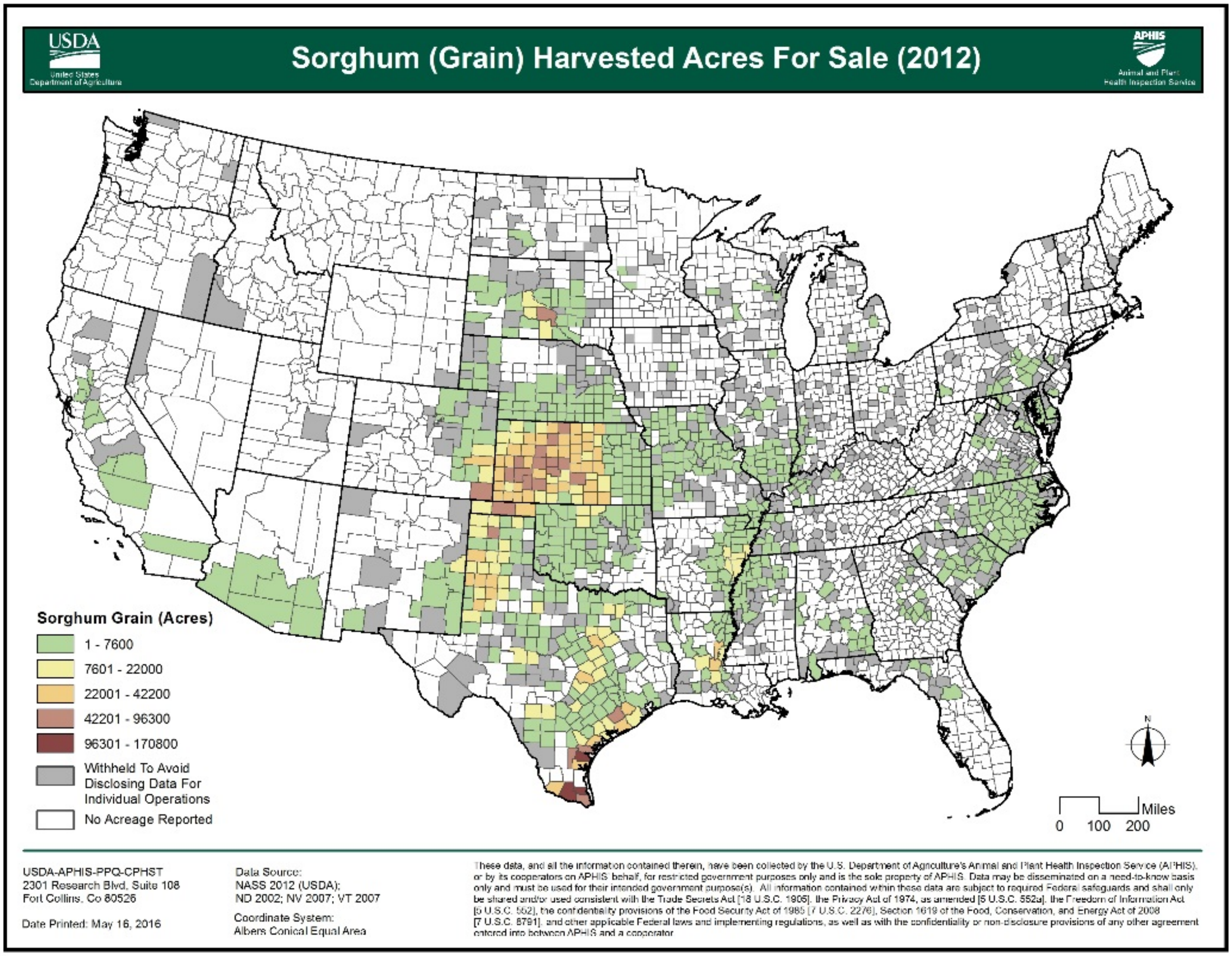

USDA
United States Department of Agriculture
Sorghum (Grain) Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Sorghum Grain (Acres)
1 - 7600
7601 - 22000
22001 - 42200
42201 - 96300
96301 - 170800
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
Miles
0 100 200
USDA-APHIS-PPQ-CPHST
2301 Research Blvd. Suite 108
Fort Collins, Co 80526
Date Printed: May 16, 2016
Data Source:
NASS 2012 (USDA);
ND 2002; NV 2007; VT 2007
Coordinate System:
Albers Conical Equal Area
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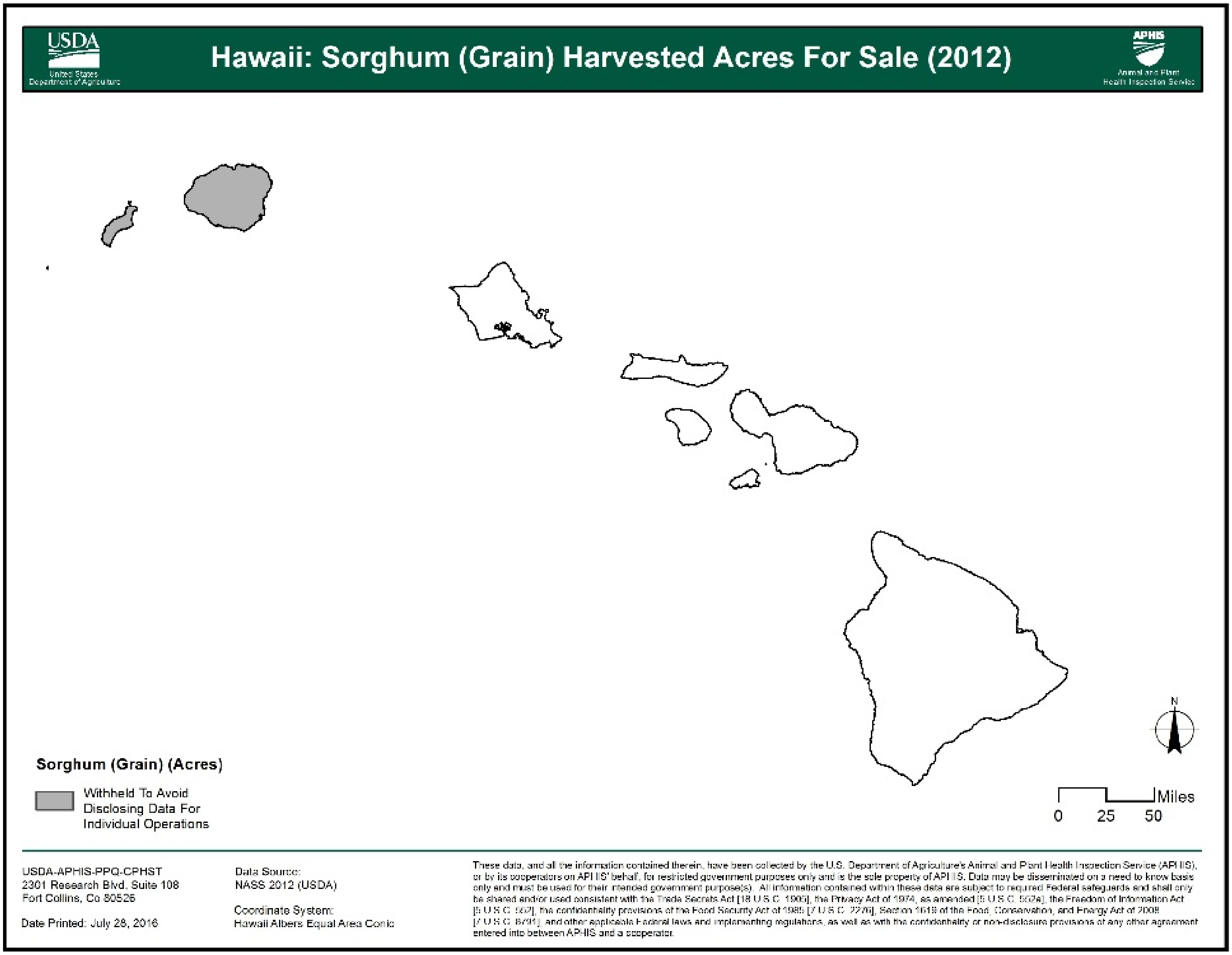

USDA
United States Department of Agriculture
Hawaii: Sorghum (Grain) Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
N
Sorghum (Grain) (Acres)
Withheld To Avoid Disclosing Data For Individual Operations
Miles
0
25
50
USDA-APHIS-PPQ-CPHST
2301 Research Blvd. Suite 108
Fort Collins, Co 80526
Date Printed: July 28, 2016
Data Source:
NASS 2012 (USDA)
Coordinate System:
Hawaii Albers Equal Area Conic
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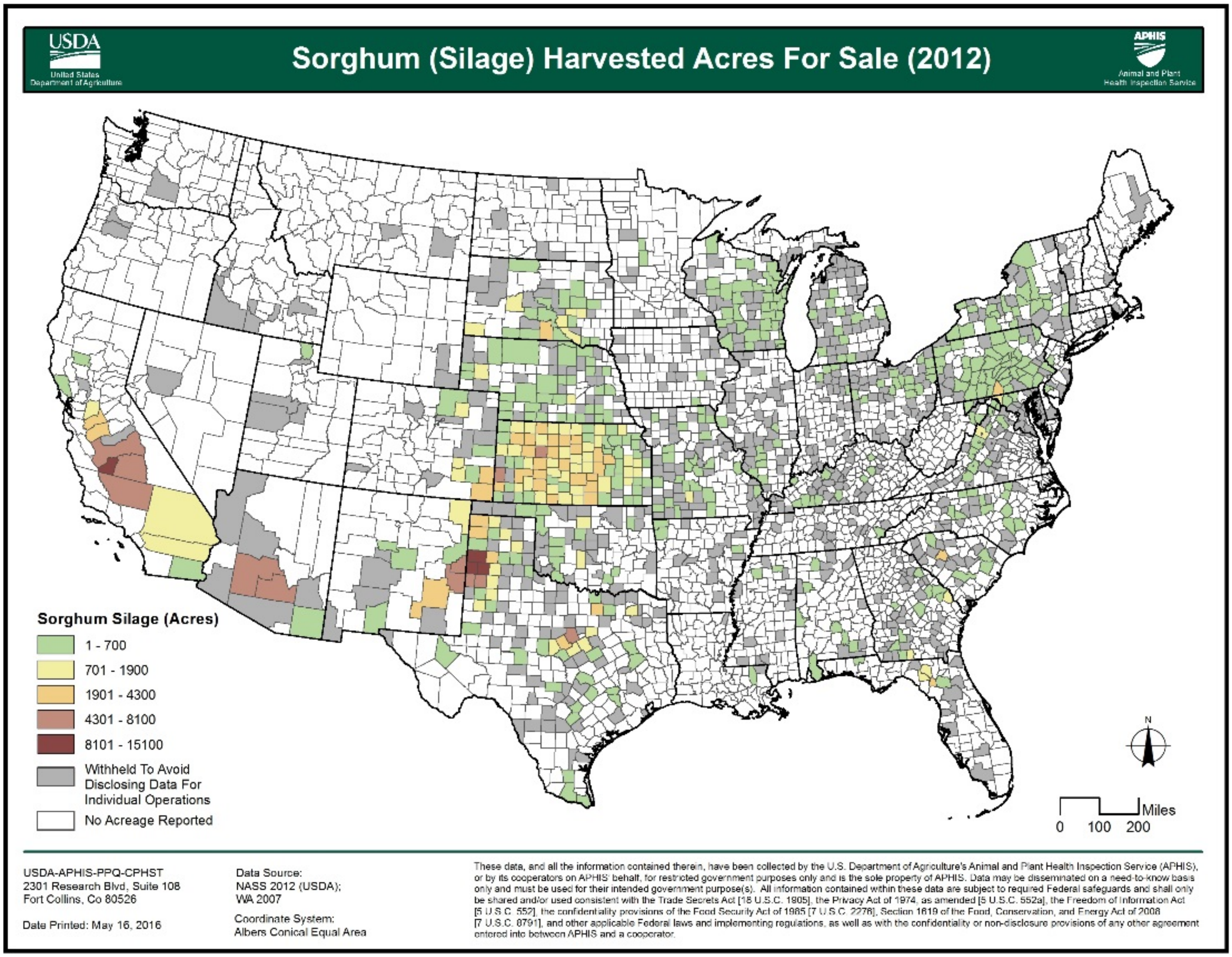
USDA
United States Department of Agriculture
Sorghum (Silage) Harvested Acres For Sale (2012)
APHIS
Animal and Plant Health Inspection Service
Sorghum Silage (Acres)
1 - 700
701 - 1900
1901 - 4300
4301 - 8100
8101 - 15100
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
Miles
0 100 200
USDA-APHIS-PPQ-CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: May 16, 2016
Data Source:
NASS 2012 (USDA);
WA 2007
Coordinate System:
Albers Conical Equal Area
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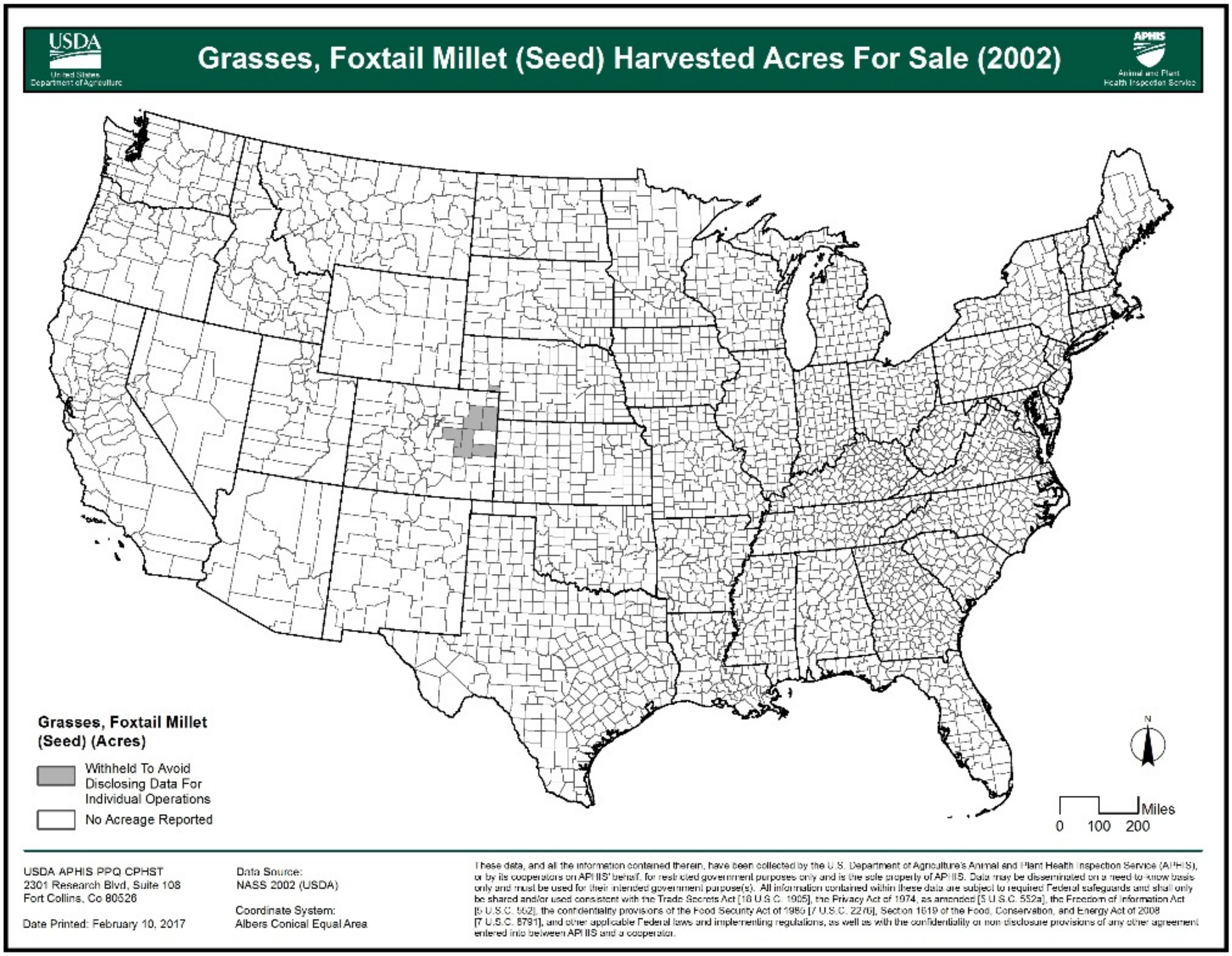
USDA
United States Department of Agriculture
Grasses, Foxtail Millet (Seed) Harvested Acres For Sale (2002)
APHIS
Animal and Plant Health Inspection Service
Grasses, Foxtail Millet (Seed) (Acres)
Withheld To Avoid Disclosing Data For Individual Operations
No Acreage Reported
N
Miles
0 100 200
USDA APHIS PPQ CPHST
2301 Research Blvd, Suite 108
Fort Collins, Co 80526
Date Printed: February 10, 2017
Data Source:
NASS 2002 (USDA)
Coordinate System:
Albers Conical Equal Area
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