

# Cactus Moth, *Cactoblastis cactorum* 2011 Survey Plan for PPQ and State Cooperators



*Robyn Rose, National Program Manager  
Riverdale, MD*

*Ron Weeks, Eastern Region Program Manager  
Raleigh, NC*

*Shaharra Usnick, Western Region Program Manager  
Ft Collins, CO*

## Background

*Cactoblastis cactorum* (Berg.), (Pyrilidae) was introduced into Australia from Argentina in the 1920's to control exotic invasive prickly pear cacti. The program was phenomenally successful at reducing large stands of prickly pear in a relatively short period of time. Over the next several decades, *C. cactorum* was then taken to other parts of the world to control invasive prickly pear, including Hawaii in 1950 and the Caribbean island of Nevis in 1956. Spreading from Nevis to other islands, *C. cactorum* was eventually detected in the Florida Keys in 1989.

By 2004, the moth was found as far north as Bull Island, South Carolina along the Atlantic Coast and as far west as Dauphin Island, Alabama along the Gulf Coast. In January of 2008, there was a detection on Petit Bois Island, Gulf Islands National Seashore, Mississippi. Four adult cactus moths were detected in traps on Horn Island on April 17, 2008 and larvae were found in June. On June 2, 2009, detections of the cactus moth were confirmed in Jefferson Parish, Louisiana. This was the first confirmed detection of this pest in Louisiana. After deploying additional traps, the cactus moth was also detected in Lafourche and Terrebonne Parishes, Louisiana. On August 3, 2009, *Opuntia* infested with cactus moth larvae and egg sticks were located on Singing River Island in Jackson County, Mississippi just south of Pascagoula, Mississippi; however, this infested cactus has been removed and no moths were captured on Singing River Island in 2010. Singing River Island is approximately 7.5 miles from the East End of Horn Island. The westward expansion threatens to impact desert ecosystems of the southwestern US and Mexico, as well as an important agricultural crop in Mexico.

The expansion of *C. cactorum*'s along the Gulf Coast appears to favor coastal areas and barrier islands because of the abundance of host species available. Limited trapping and visual surveys on the barrier islands of Mississippi, southern Louisiana and the east coast of Texas last year showed no further detections farther west along the Gulf Coast than Louisiana. *C. cactorum* can spread through natural dispersal of flight or storm events, or in infested nursery stock or plant material for consumption. More information is needed along the Gulf States and in the Southwestern US to help better define the distribution of *C. cactorum*.

## Host plants

The main host of *C. cactorum*, the genus *Opuntia*, consists of all prickly pear cacti, those having flat-pad leaf forms, or cladodes. The generic name *Opuntia* is often applied to a related group called "cholla" cactus (pronounced "choya"), and these are now in a separate genus known as *Cylindropuntia*. (In older taxonomic treatments, you will see *Opuntia* divided into two subgenera, *Platyopuntia*, with a pad-like form, and *Cylindropuntia*, with a cane-like form). The list of hosts for *C. cactorum* tested or recorded are prickly pear cactus species in the genus, *Opuntia*, with the exception of a few records from one species in the related genus, *Nopalea*. While other host records appear in the literature, *C. cactorum* is not known to reliably attack any other cactus

species. *Cylindropuntia* are not thought to be hosts of *C. cactorum*. Another related genus, *Grusonia*, appears in older literature as *Opuntia*, and species in that genus are also not known to be hosts of *C. cactorum*. See Appendix I for a list of all native *Opuntia* species by state (within the *Platyopuntia* group). Many native ornamental prickly pear species are sold in nurseries or used in landscaping, but there are also non-native species, and these are not listed in Appendix I.



Figure 1. *Platyopuntia* (left) and *Cylindropuntia* (right). The later are not considered hosts.



Figure 2. *Platyopuntia* (foreground) and *Cylindropuntia* (background). Photos by Joel Floyd, USDA, APHIS, PPQ, unless otherwise noted

A recent key to *Opuntia* species native to the US with illustrations and range maps, can be accessed at: [http://www.efloras.org/florataxon.aspx?flora\\_id=1&taxon\\_id=123045](http://www.efloras.org/florataxon.aspx?flora_id=1&taxon_id=123045) Many *Opuntias* used in landscaping or as potted nursery plants however, may not be listed in this key if they are not native to the US. When surveying these hosts, attempt to get the species name from the grower.

This Discover Life website may also help in identifying *Opuntia* spp. <http://pick4.pick.uga.edu/mp/20q?guide=Opuntia&btxt=NBII+invasives&burl=invasivespecies.nbio.gov>

## Where to Survey for *C. cactorum*

Potential survey sites include any place where prickly pear grows, but certain factors can narrow the potential sites to areas with the higher perceived risk of introduction. Despite the fact that the efficiency of the current trapping system needs improvement, there have been instances where the traps identified new areas of infestation of *C. cactorum* that were not identified by visual inspection. Also, although some infestations were initially detected by visual inspection, the use of traps generally allows for a greater area to be surveyed faster than other survey methods. Male moth captures on traps can be used as indicators of migration and areas with infested cactus. Ideally, a large grid of traps should be deployed to help with early detection and to identify movement patterns. If moths are consistently trapped in an area where there is no known cactus, increased efforts should be made to survey the area for hidden host plants. If none are found, it may indicate a dispersal corridor, although this theory has not been verified.

Based on currently known populations and previous experience with *C. cactorum* in North America, *Opuntia* within 5 miles of the Gulf Coast is considered most vulnerable relative to the moth's western expansion (as opposed to more interior sites). An intensive delimitation survey of the Louisiana and Texas coastlines is needed, with the most immediate intensive survey efforts needed in LA just west of the marshes and Vermilion Bay between Chenier Plane and the Texas border. An intensive survey would involve making an initial visual survey of all coastal areas to identify cactus hotspots and then placing traps at regular intervals along coastal roads as well multiple traps in areas where the larger patches of *Opuntia* were found. A highly intensive survey may involve placing traps 100 m apart.

In the Gulf States, because of the propensity for *C. cactorum* to disperse along coastal areas, surveys should be concentrated on barrier islands and other suitable habitats along the coast. The types of soils that support prickly pear cactus populations usually consist of sandy, well-drained areas, often with full sun exposures. These include sand dunes and beaches above the tide line on barrier islands and the mainland, or areas that consist of sandbanks behind beaches or near water courses such as rivers or streams.

Ornamental prickly pear cactus can be found in residential areas as landscape plants. Based on surveys in coastal Florida, older residential neighborhoods are more likely to have such plantings. In these neighborhoods or in older commercial districts, prickly pear cactus can also grow in vacant lots. Commercial properties such as hotels and restaurants may also have ornamental prickly pear plantings. Very often these are *Opuntia ficus-indica*, the Indian fig cactus, and older plants of this species can be quite large. When surveying private property, be sure to request permission from the land owner to access the property for the purpose of conducting inspections.

Nurseries with cacti for sale along the Gulf Coastal areas are another place to survey. Retail outlets, including national distribution chains, may sell prickly pears in dish gardens consisting of mixed cacti or singly grown as house, or landscaping plants. For states with no record of *C. cactorum*, a priority for surveys is to check nurseries and retail outlets for prickly pear cacti that have originated from growers in Florida or other states where it is known to occur. In western states, commercial areas landscaped with prickly pear could be a good place to monitor if near a national distribution chain store with a nursery section.

## **Visual Surveys**

When moths aren't flying, visual inspections are necessary. Visual inspections are most effective on cactus species with upright growth habits and large pads. Infestation by *C. cactorum* can be indicated by the presence of egg-sticks, which resemble cactus spines (Figures 3 and 4). However, similar looking egg sticks are laid by native cactus feeding Lepidoptera that are of no threat. (There is currently no viable method for distinguishing the egg-sticks of each species.) Examine cactus pads that are yellowed or have clear areas and check for the presence of green, brown, or yellowish brown exudates on the pad surface for evidence of internal feeding by larvae. Frass from the larvae can usually be

seen on external surfaces of the infested pad. Take care not to come in contact with cactus spines, and then carefully cut open the pad to reveal internal feeding larvae (Figures 5-8).



Figure 3. Egg stick of *C. cactorum*, 2-3 cm in size containing 50-70 eggs.  
Photo by Dale Habeck, Univ. of Florida



Figure 4. First instar larvae hatch and burrow into the plant where they feed gregariously.  
Photo by Ignacio Baez, USDA-ARS



Figure 5. The first visible evidence of internal feeding by larvae is yellowing and frass on the plant surface.



Figure 6. Further evidence of internal feeding by larvae is yellowing and exudates of the plant. Photo by Ken Bloem, USDA, APHIS, PPQ



Figure 7. Symptoms of internal feeding including frass from *C. cactorum* in *Opuntia stricta*.



Figure 8. Hollowing out and eventual collapse of *C. cactorum* infested *O. stricta* plant.  
Photo by Ignacio Baez, USDA, APHIS, PPQ



Figure 9. When held up to the light, an infested prickly pear pad has a translucent quality and larvae can be seen feeding through the pad epidermis.



Figure 10. Cutting open the cactus pad in cross-section reveals *C. cactorum* larvae feeding.

Holding a pad up to the light will reveal internal feeding (Figure 9) and carefully cutting open the pad lengthwise will expose the larvae for collection and identification (Figure 10).

### Precautions to Take When Handling Prickly Pear Cacti

Obviously, cactus plants should be handled with care. *Opuntia* spp. produces two kinds of spines, the regular large sharp spines and much smaller glochids, which have a velvety appearance. The glochids (Figure 11) can enter your skin without your experiencing pain, but will become evident when you rub your fingers together. They are seen with a hand lens and can be difficult to remove. Wearing gloves only causes the gloves to be contaminated with glochids. The proper way to handle prickly pear pads is with tongs and a large knife or machete (Figure 12).

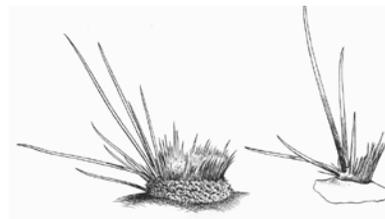


Figure 11. Spines and smaller glochids on areoles of *Opuntia ficus-indica* (l) and *O. phaeacantha*(r).  
From Benson, 1982



Figure 12. Using a knife in conjunction with tongs to handle prickly pear pads prevents injury from spines and the small glochid spines.

### Timing of Visual Surveys

Symptoms of internal feeding on prickly pear can be seen at anytime of the year, however, larvae may be difficult to find during the colder months. Larvae tend to congregate in the lower parts of the plant and are not seen feeding in galleries when it is cold. If daytime temperatures reach a certain point, larvae will migrate to the upper cactus pads, and even sometimes be seen on the exterior of the pad on the sunny side of the plant.

## Trapping Surveys with Experimental Lure

To date, the most effective trap for *C. cactorum* has been the Pherocon<sup>®</sup> 1-C wing trap, available through the normal sources (see Appendix II). A lure for *C. cactorum* has been developed by USDA-ARS and is available from the APHIS trap and lure database. The pheromone is still in development; however we have been given permission to use the experimental lure in the meantime. Be aware that it may attract some non-target Lepidoptera. The experimental lure has been known to catch grapeleaf skeletonizer (*Harrisina americana*) and beet armyworm (*Spodoptera exigua*). To assure continued efficacy, store unused lures under refrigeration.

Lures should be ordered in late summer/early fall when the trap and lure database is available. *Cactoblastis cactorum* experimental lures for western state surveys can be ordered by contacting:

Shaharra J. Usnick, Ph.D.  
Regional Program Manager  
USDA-APHIS, PPQ, WRO  
2150 Centre Ave, Bldg B  
Ft Collins, CO 80526  
Phone: 970 494-7571  
[shaharra.j.usnick@aphis.usda.gov](mailto:shaharra.j.usnick@aphis.usda.gov)

Figures 13-17 show the Pherocon<sup>®</sup> 1C wing trap. The trap can be mounted on a post to a height of 2-4', hung on a larger prickly pear plant, or in a tree or shrub near a host. Lures should be changed every six weeks during the adult flight period determined for your area according to the recommended times.



Figure 13. Parts of the Pherocon® 1C wing trap including septum containing the experimental lure, hanger, insert, and pole.

*Photo by Stephen Hight, USDA-ARS*



Figure 14. The Pherocon® 1C wing trap mounted at a height of 2-3' on a post next to, or hanging from the host plant.

*Photo by Stephen Hight, USDA-ARS*



Figure 16. If using t-posts from mounting, the wire holding the trap together can be threaded through a hole in the post and secured by wrapping the wire around it.

Figure 17. Right, the post is driven in the ground about two feet if possible with this photograph showing the approximate optimum height for mounting the trap near host plants.

*Photos by Stephen Hight, USDA- ARS*

## **Prescreening and Processing of Traps Before Submitting for Identification**

Please only send traps that have suspect moths of the correct size range, color, and shape as depicted in the screening guide attached. This guide, prepared by Richard Brown, can be used by screening personnel depending on their ability and use of a magnifier or dissecting scope.

If moths are caught in the trap, remove the sticky trap insert and fold it over partially and secure it with a rubber band. This will keep the inserts from laying flat and protects the insect. Traps with suspect moths that are stored for more than two weeks should be kept in a freezer or cooler to prevent decomposition of the specimens.

Send the trap bottoms in a box by overnight carrier and be sure to include the trap number, observation number, and all collection information to Dr. Richard Brown in the

Eastern Region. For the Western Region traps should be sent to the following individuals at the addresses below for identification: Eric White (Louisiana), Jason Botz (Arizona, New Mexico, Nevada and Utah), Cain Gaona (California), or Kira Zharova (Texas). Dr. Brown will forward the information from his determinations back to the submitter and to APHIS Regional and National Program Managers.

Dr. Richard Brown , Director  
Mississippi Entomological Museum  
Box 9775  
Mississippi State, MS 39762  
Phone: 662-325-2085  
e-mail: [moth@ra.msstate.edu](mailto:moth@ra.msstate.edu)

Eric White  
USDA, APHIS, PPQ  
Plant Inspection Station  
900 East Airline Highway  
Service Road A  
Kenner, LA 70063  
Phone 504-464-8863  
e-mail: [eric.a.white@aphis.usda.gov](mailto:eric.a.white@aphis.usda.gov)

Jason Botz  
USDA, APHIS, PPQ  
9 N. Grand Ave.,Rm 120  
Nogales, AZ 85621  
Phone: 520-287-4462  
e-mail: [Jason.t.botz@aphis.usda.gov](mailto:Jason.t.botz@aphis.usda.gov)

Julieta Brambila  
USDA, APHIS, PPQ - CAPS Office  
1911 SW 34th Street  
Gainesville, FL 32608  
Office phone 352-372-3505 ext. 438  
Cell phone 352-494-5841  
E-mail: [julieta.brambila@aphis.usda.gov](mailto:julieta.brambila@aphis.usda.gov)

Cain Gaona  
USDA, APHIS, PPQ  
Plant Inspection Station  
9777 Via De La Amistad, Rm. 140  
San Diego, CA 92154

## Timing of Trapping Surveys

*Cactoblastis cactorum* undergoes three generations per season in the Southeastern US. Therefore, adult flight periods on the Gulf Coast (Florida Panhandle, Alabama, Mississippi, and Louisiana) occur roughly as follows:

- 1<sup>st</sup> flight period - late March through May
- 2<sup>nd</sup> flight period - July through August
- 3<sup>rd</sup> flight period - late September through mid November

This information will not necessarily be valid for other areas including the Texas Gulf Coast. For a guide to optimum trap placement dates, our Center for Plant Health Science and Technology (CPHST) developed a NAPPFAST model for *C. cactorum* which is based on limited phenology and occurrence information. Adult flight activity is well known within the time periods above for the Southeastern US, but it may vary in other parts of the US where *C. cactorum* is not known to occur. As more data is collected, the NAPPFAST model will be refined.

In NAPPFAST MapViewer (login information below), it is possible to view the predicted progression of adult emergence using the sequence of weekly maps. The overwintering adult moths are predicted to begin emergence in south Florida most frequently in the second to third week of February, with the band moving northward as the weeks progress. The successive generations of *C. cactorum* adults (adult 1 and 2) can be followed in similar manner through the season. By installing a pheromone trap in your area of interest slightly prior to the adult emergence band reaching the area, it is estimated that the timing for placement for the pheromone trap would be effective. This predictive phenology model is designed to represent the early/initial developers of the *C.cactorum* population and it is still under development, however, it should assist survey personnel in their activities. The maps can be found at

<http://aphis.zedxinc.com/>

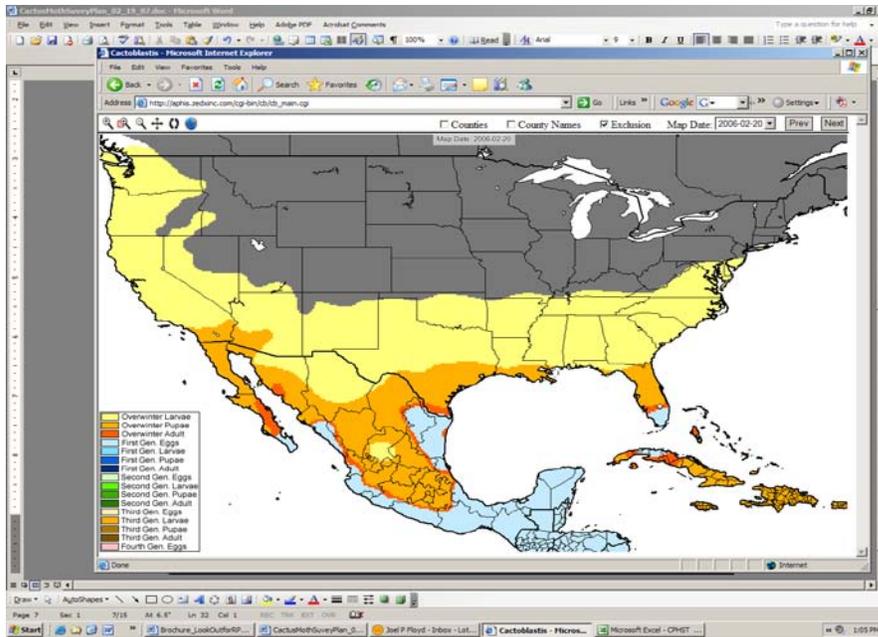


Figure 19. NAPPFAST Phenology Map for Cactus moth, *Cactoblastis cactorum* 2/20/2007

Using the drop down menu for “Start Date” in the upper right of the screen, start by loading a February 2006 map. Click on the “Next” button to the right of the drop down menu to make the map progress by week. The orange colored band that passes over the area of the trap placement shows when the overwintering adults will begin to emerge. Install the trap(s) two weeks prior to when the orange band would pass over the area. Then keep the traps up for 6 to 8 weeks to cover each emergence, changing lure and checking traps every two weeks. Repeat these steps for each subsequent generation, and there are 3 generations likely in most parts of the Southern United States.

## Identification

The adults of *Cactoblastis cactorum* (Berg) (Pyralidae: Phycitinae) are non-descript brownish-gray moths that can only be definitively identified by a microscopic examination of dissected male genitalia. They generally appear as typical pyralid moths with pronounced labial palps of the female, thus the name “snout moths” (Figure 21 and 22). The forewings show a characteristic banding pattern, however other related Phycitinae have similar banding.

The larvae are more distinctive with a characteristic orange to red color interrupted by dark banding or spots on the body. The more mature larvae of native species are relatively easy to distinguish from those of *C. cactorum*, however some collectors have misidentified immature stages of native species as *C. cactorum* (see Figures 23 and 24). The limited larval keys that do exist are based on color, on mature larvae, and host. Also, records of some species may only be known from limited reference material. Dr. Richard Brown at Mississippi State University is interested in receiving specimens of any Lepidoptera found on prickly pear in the US, including eggs and different larval stages,

accompanied by adults reared out from larval collections. Digital photos of live larvae will also be helpful in documenting color variations and providing future visual keys to surveyors.



Figure 21. Adult male (l) and female (r) of *C. cactorum* showing relative size.  
 Photo by Ignacio Baez, USDA-ARS



Figure 22. Adult female *C. cactorum* mounted showing banding on wings.  
 Photo by Sue Ellis, USDA, APHIS, PPQ



Figure 23. *C. cactorum* larva (right) and *Melitara prodenialis* (left) normally found on prickly pear.  
 Photo courtesy of Ignacio Baez, USDA-ARS, Tallahassee, FL Photo by Ignacio Baez



Figure 24. *Rumatha glaucatella* larva found in Florida on prickly pear.  
 Photo by Dale Habeck, University of Florida

For more information and a key to the cactus feeding species in the Southeastern US, see: M. Alma Solis, Stephen D. Hight, and Doria R. Gordon. 2004. *Tracking the Cactus Moth, Cactoblastis cactorum Berg., as it flies and eats its way westward in the U.S.* *News of the Lepidopterists Society* 46(1) 2-3.

Check the PPQ *Cactoblastis* pest alert website (References and Links) to find this paper: [http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/cactoblastis/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/cactoblastis/index.shtml)

The table below is a list of Phycitine moth species that are found on prickly pear in the US.

PHYTCITINAE

Eastern US

Western US

<i>Cactoblastis</i>	<i>cactorum</i>	X	
<i>Melitara</i>	<i>prodenialis</i>	X	
	<i>dentata</i>		X
	<i>Texana</i>		X
	<i>doddalis</i>		X
	<i>apicigrammella</i>		X
	<i>junctolineella</i>		X
	<i>subumbrella</i>		X
<i>Ozamia</i>	<i>fuscomaculella</i>		X
	<i>clarefacta</i>		X
	<i>lucidalis</i>		X

Larvae encountered on prickly pear *Opuntia* should be collected, killed in boiling water, and preserved in 70% ethyl alcohol. These should be sent to your state department of agriculture or cooperating university entomologist. The screened larvae should be sent, with all collection information (PPQ form 391, see Appendix V) with any digital photos, for verification to:

Dr. Richard Brown , Director  
Mississippi Entomological Museum  
Box 9775  
Mississippi State, MS 39762  
Phone: 662-325-2085 e-mail: moth@ra.msstate.edu

New state records will be verified by Dr. Alma Solis, of the ARS Systematic Entomology Laboratory at the US Natural History Museum, Smithsonian Institution, Washington, DC.

## Public Outreach

APHIS Legislative and Public Affairs (LPA) staff has provided a survey “toolkit” for *Cactoblastis cactorum* that contains web-based public information products to assist PPQ and State officials with public outreach. They consist of a press release, feature article, a pest alert, and identification card. Contact Robyn Rose (robyn.i.rose@aphis.usda.gov) if you would like the press release or feature article to run in local news outlets, and he will work with LPA to provide the appropriate item.

You can request the last pest alert and identification card by sending an e-mail to Ed Lawson (edward.s.lawson@aphis.usda.gov) in the APHIS Mail Distribution Center, Riverdale, MD. Ask for the “Cactus Moth ID Card”, Program Aid No. 1883, or the “Cactus Moth Pest Alert”, Program Aid No. 1834.

## Other *C. cactorum* Detection Activities

The Department of Interior and non-profit environmental organizations have expressed interest in helping survey for *C. cactorum* on public and managed lands. To this end, the US Geological Survey funded a project at Mississippi State University’s GeoResources Institute to gather data on *Opuntia* distributions and *C. cactorum* monitoring activity. The MSU Geosystems Research Institute has set up a password protected website

database that various agencies can log into and record their negative and positive observations and monitoring activity on their land units. The list of cooperating agencies or groups currently includes national parks and seashores, national wildlife refuges, military bases, state parks, The Nature Conservancy, and others. Many of these groups have volunteers and their observations will be entered by the land unit's program contact person. The data gathered at MSU will be formatted and coded to fit with NAPIS database requirements, then will be sent to the State's CAPS coordinator for review before entry into NAPIS. If the data is collected by a volunteer, that information will be coded for later access.

If you, as a PPQ Pest Survey Specialist or State Survey Cooperator, make contact with a land management agency to place traps or monitor host plants, please document the collection of information the same way you would with normal CAPS surveys. If the land unit manager or responsible party wishes to do their own monitoring, please ask them to log-in to the MSU-GRI Cactus Moth Detection and Monitoring Network website (see URL below) and have their data entered through that mechanism. The data will be collected there and eventually routed back to the State survey coordinator for review and entry into NAPIS.

That site can be accessed at the following URL

<http://www.gri.msstate.edu/research/cmdmn/>

For managed land entities interested in participating in this detection network, please contact:

John D. Madsen, PhD  
Mississippi State University  
GeoResources Institute  
Box 9652  
Mississippi State, MS 39762-9652  
ph. 662-325-2428 fax 662-325-7692  
E-mail [jmadsen@gri.msstate.edu](mailto:jmadsen@gri.msstate.edu)  
[www.gri.msstate.edu](http://www.gri.msstate.edu)

## References

Benson, Lyman, 1982 *The Cacti of the United States and Canada*, Stanford University Press.

Flora of North America Editorial Committee, eds., 2003, *Flora of North America North of Mexico, Vol. 4., Magnoliophyta: Caryophyllidae, part 1*, New York: Oxford University Press.

Mann, J., 1969, *Cactus Feeding Insects and Mites*, Bulletin 256, Washington DC: Smithsonian Institution.

Neunzig, H. H., 1997, *The Moths of North America North of Mexico, Fascicle 15.4, Phycitinae (part)*, Washington DC: Wedge Entomological Research Foundation.

Solis, M. A., Hight, S. D., and Gordon, D. R., 2004, *Tracking the Cactus Moth, Cactoblastis cactorum Berg, as it flies and eats its way westward in the U.S.*, Spring, 2004, News of the American Lepidopterist's Society

Zimmermann, H., Bloem S., and Klein. H., 2004, Biology, history, threat, surveillance and control of the Cactus moth, *Cactoblastis cactorum*, Vienna Austria: International Atomic Energy Agency. Available at:

[http://www-pub.iaea.org/MTCD/publications/PDF/faobsc\\_web.pdf](http://www-pub.iaea.org/MTCD/publications/PDF/faobsc_web.pdf)

A USDA, APHIS, PPQ Pest Alert website, with additional information, will soon be available at:

[http://www.aphis.usda.gov/plant\\_health/plant\\_pest\\_info/cactoblastis/index.shtml](http://www.aphis.usda.gov/plant_health/plant_pest_info/cactoblastis/index.shtml)

For more information on *C. cactorum* biology and concerns, see the special issue of the *Florida Entomologist*, vol. 84, no. 4, "*Cactoblastis cactorum* in North America: Proceedings of a Workshop for Assessment and Planning September 20-21, 2000, Tampa, FL" found at:

<http://www.fcla.edu/FlaEnt/fe844.htm>

Other links:

National Invasive Species Council species profile of the Cactus moth:

<http://www.invasivespecies.gov/profiles/cactmoth.shtml#fed>

## APPENDIX I

Table 1 Common nursery or landscape *Opuntia* host plants:

<i>Opuntia basilaris</i>	<i>O. lindheimeri</i>	<i>O. rufida</i>
<i>O. engelmannii</i>	<i>O. microdasys</i>	<i>O. santa-rita</i>
<i>O. ficus-indica</i>	<i>O. robusta</i>	

Table 2 List of *Opuntia* hosts, native and naturalized\*

Alabama	Arizona	California
<i>OPUNTIA FICUS-INDICA</i> *	<i>O. AUREA</i>	<i>O. BASILARIS</i>
<i>O. HUMIFUSA</i>	<i>O. BASILARIS</i>	<i>O. CHLOROTICA</i>
<i>O. MONACANTHA</i> *	<i>O. CHLOROTICA</i>	<i>O. ENGELMANNII</i>

<i>O. PUSILLA</i> <i>O. STRICTA</i>	<i>O. ENGELMANNII</i> <i>O. FICUS-INDICA</i> * <i>O. FRAGILIS</i> <i>O. LITTORALIS</i> <i>O. MACROCENTRA</i> <i>O. MACRORHIZA</i> <i>O. PHAEACANTHA</i> <i>O. PINKAVAE</i> <i>O. POLYACANTHA</i> <i>O. SANTA-RITA</i>	<i>O. FICUS-INDICA</i> * <i>O. FRAGILIS</i> <i>O. LITTORALIS</i> <i>O. ORICOLA</i> <i>O. PHAEACANTHA</i> <i>O. POLYACANTHA</i> <i>O. TOMENTOSA</i> *
<b>Colorado</b>	<b>Florida</b>	<b>Louisiana</b>
<i>O. FRAGILIS</i> <i>O. HUMIFUSA</i> <i>O. MACRORHIZA</i> <i>O. PHAEACANTHA</i> <i>O. POLYACANTHA</i> <i>O. TORTISPINA</i>	<i>O. COCHENILLIFERA</i> (Syn. <i>Nopalea cochenillifera</i> ) <i>O. CUBENSIS</i> <i>O. FICUS-INDICA</i> * <i>O. HUMIFUSA</i> <i>O. LEUCOTRICHA</i> * <i>O. MONACANTHA</i> * <i>O. PUSILLA</i> <i>O. SPINOSISSIMA</i> (Syn. <i>Consolea corallicola</i> ) <i>O. STRICTA</i> <i>O. TRIACANTHA</i>	<i>O. ENGELMANNII</i> <i>O. FICUS-INDICA</i> * <i>O. HUMIFUSA</i> <i>O. MACRORHIZA</i> <i>O. MONACANTHA</i> * <i>O. PUSILLA</i> <i>O. STRICTA</i>
<b>Mississippi</b>	<b>Nevada</b>	<b>New Mexico</b>
<i>O. ENGELMANNII</i> <i>O. FICUS-INDICA</i> * <i>O. HUMIFUSA</i> <i>O. MONACANTHA</i> * <i>O. PUSILLA</i> <i>O. STRICTA</i>	<i>O. BASILARIS</i> <i>O. CHLOROTICA</i> <i>O. ENGELMANNII</i> <i>O. FRAGILIS</i> <i>O. PHAEACANTHA</i> <i>O. POLYACANTHA</i>	<i>O. CHLOROTICA</i> <i>O. CYMOCHILA</i> <i>O. ENGELMANNII</i> <i>O. FICUS-INDICA</i> * <i>O. FRAGILIS</i> <i>O. GRAHAMII</i> <i>O. HUMIFUSA</i> <i>O. MACROCENTRA</i> <i>O. MACRORHIZA</i> <i>O. PHAEACANTHA</i> <i>O. POLYACANTHA</i> <i>O. SANTA-RITA</i>
<b>Texas</b>	<b>Utah</b>	
<i>O. ACICULATA</i> <i>O. ATRISPINA</i> <i>O. AUREISPINA</i> <i>O. CHISOSENSIS</i> <i>O. CYMOCHILA</i> <i>O. EDWARDSII</i> <i>O. ELLISIANA</i> <i>O. ENGELMANNII</i> <i>O. FICUS-INDICA</i> * <i>O. FRAGILIS</i> <i>O. HUMIFUSA</i> <i>O. MACROCENTRA</i> <i>O. MACRORHIZA</i> <i>O. PHAEACANTHA</i>	<i>O. AUREA</i> <i>O. BASILARIS</i> <i>O. CHLOROTICA</i> (Syn. <i>Consolea chlorotica</i> ) <i>O. ENGELMANNII</i> <i>O. FRAGILIS</i> <i>O. MACROCENTRA</i> <i>O. MACRORHIZA</i> <i>O. PHAEACANTHA</i> <i>O. PINKAVAE</i> <i>O. POLYACANTHA</i>	

<i>O. POLYACANTHA</i> <i>O. PUSILLA</i> <i>O. RUFIDA</i> <i>O. SANTA-RITA</i> <i>O. STRIGIL</i>		
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APPENDIX II

**Resources**

**Pherocon® 1C wing trap sources:** PPQ offices can obtain traps from the National Trap Procurement Coordinator. State offices should go through the State Plant Health Director to order traps through this source.

David Asher, National Trap Procurement Coordinator  
 USDA, APHIS, PPQ, FMS  
 22675 N. Moorefield Rd.  
 Moore Air Base Bldg. 6407

Edinburg, TX 78541  
Phone: 956-580-7222  
Fax: 956-580-7325  
martha.garza@aphis.usda.gov

Commercial sources of the Pherocon® 1C wing traps:

**Trécé, Inc.**

Physical Address:  
7569 Highway 28 West  
Adair, OK 74330

Mailing Address:  
P.O. Box 129,  
Adair, Oklahoma 74330

e-mail: [custserv@trece.com](mailto:custserv@trece.com)  
phone: 866-785-1313  
fax: 918-785-3063  
<http://www.trece.com/>

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**Great Lakes IPM, Inc.**

1022 Church Road  
Vestaburg, MI 48891-9746  
TEL: (989) 268-5693 / (989) 268-5911  
TOLL FREE: 1-800-235-0285  
FAX:(989) 268-5311  
EMAIL: [glipm@nethawk.com](mailto:glipm@nethawk.com)

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Posts for Traps available at: Home Depot (6 foot “-Post”) or Lowe’s (fence post steel).