# Cactus Moth Update

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## How Big is Pricklypear in Texas?

**By Victor Maddox**
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It's been over 20 years since the cactus moth (*Cactoblastis cactorum*) was first detected in the United States. Since that time, a considerable effort has been made in the fight to prevent westward expansion. Most would agree that efforts in the east may be quite different than those in the west. This may be most understood by those who live or have ventured the west and observed the thousands of native pricklypear (*Opuntia* spp.) across the rugged landscape. With the cactus moth infestation in Louisiana, we look to the west. So, just how big is pricklypear in Texas?

Figure 1. Blind pricklypear (*Opuntia rufida*) at Big Bend National Park represents one of the *Opuntia* species that only occurs naturally in Texas within the Continental United States.

**Diversity of Pricklypear within the Continental U.S.** USDA-PLANTS (http://plants.usda.gov/java/profile?symbol=OPUNT) lists 59 species and recognized hybrids, although 9 apparently do not occur within the Continental U.S. Another six are not native to the U.S., leaving 44 species and hybrids recognized within the continental United States according to USDA-PLANTS. Eight of the 44 listed are hybrids, although experts believe many more natural hybrids exist. Of the 36 species remaining, 20 (or about 56%) occur in Texas. Within the continental United States, some of these occur only in Texas. In fact eight species, or 22%, only occur in Texas within the continental United States. No other state, not even Arizona, has a number this high. In addition, at least three *Opuntia* species in Texas are rare (Figure 1). Given these numbers, is pricklypear biodiversity in Texas significant? Many would have to agree, that it is. Yet after Louisiana (current western edge of cactus moth infestation) lies Texas.

**Area of Pricklypear in Texas.** What about the habitat area for pricklypear in Texas. How big is it? Probably no one really knows the exact area occupied by pricklypear in Texas. After all, Texas is big. The Cactus Moth Detection and Monitoring Network (www.gri.msstate.edu/cactus_moth) estimates that pricklypear populate over 460,000 acres, or 0.003%, of Texas. However, much of this is based upon what is visible from interstates and other public roads. So, the total area is actually much larger, and in fact, additional population area was recorded in 2010 during every survey conducted in south Texas. In 1985 the Soil Conser-

*(Continued on page 2)*

**Inside this issue:**

# How Big is Pricklypear in Texas? (Cont.)

Figure 2. The CITES listed collared peccary (*Tayassu tajacu*) feeds on pricklypear, in part for the water content, and one example of a faunal species which would potentially be impacted by the loss of pricklypear.

***But even with consistent weather patterns, we may never know to what degree wildlife depend upon pricklypear.***

vation Service estimated that pricklypear occurred on 30.7 million acres of rangelands inhabited by wildlife and livestock in the western two-thirds of Texas (texnat.tamu.edu/library/symposia/brush-sculptors-innovations-for-tailoring-brushy-rangelands-to-enhance-wildlife-habitat-and-recreational-value/pricklypear-ecology/). But, even though no one knows exactly how much area in Texas is populated by pricklypear, the number is far higher than any state east of Texas, and possibly higher than any state.

**The Impact of Pricklypear upon Wildlife in Texas**. This is another number that's nearly impossible to calculate. Texas occupies nearly 270 thousand square miles. Although it's obvious from surveys in Texas that many fauna depend, at least in part, upon pricklypear for food and shelter (Chavez-Ramirez et al. 1997). For example, Jennings and Harris (1953), Eddy (1961) and Corn and Warren (1985) studied collared peccary (*Tayassu tajacu*) (Figure 2) and observed that pricklypear was a major food. And given the drought tolerance of pricklypear, it is probable that fluctuating weather patterns may place higher seasonal dependence by wildlife upon pricklypear in coming years. But even with consistent weather patterns, we may never know to what degree wildlife depend upon pricklypear.

So, does a lack of information about a host constitute reasonable grounds for potential eradication of the host? Or, do we look across a landscape and try to realize that the existence of so many plants (producers) must surely positively impact many more species within the food web than we know. And how can we ever know the importance of pricklypear, if we never have the chance to know.

**To the Future**. Pricklypear is big in Texas, although we still do not know just how big, and we may never know. But as we ponder questions of numbers in regard to one's fate, maybe we should go back to Texas, stand in a place like the desert at Big Bend, and try to imagine a landscape without pricklypear. And remember that this is a responsibility far more reaching than this relatively short moment in time, because these are the landscapes we pass to future generations long after we are gone. What is our future legacy in Texas, and to a Nation?

**Literature Cited**

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# Examining Susceptibility of western Gulf Coast cacti to infestation by *Cactoblastis cactorum*

**By Gary N. Ervin and Chris Brooks**
**Department of Biological Sciences**

During June and July 2010, Chris Brooks collected pads from prickly pear cacti along the Texas and Louisiana Gulf Coast for use in experiments to determine whether any variation exists in the ability of *C. cactorum* to survive and reproduce along the western Gulf Coast. Those plants were potted and grown for 10 months in a greenhouse on the MSU R. R. Foil Plant Science Research Center.

In late April 2011, we moved experimental plants to the USDA-APHIS approved quarantine Insect Rearing Facility in the Clay Lyle Entomology Building. In mid-May, we placed eggs of *C. cactorum* (obtained by collaborators working in western Florida) onto these plants.

Figure 1. Cactus plants were grown from collections made at sites identified in the CMDMN database, such as this one near the Louisiana – Texas border.

Undergraduate student Brice Lambert currently is monitoring progress of insects on these plants, and most plants presently have larvae entering the pupal stage. Once adults moths emerge, reproduction and egg laying will be recorded, followed by weighing of adult insects. We hope this experiment will provide additional information about the susceptibility of cacti along the Gulf Coast in areas where the moth would be most likely to spread, if it moves beyond its current US distribution.

Figure 2. Individual pads were potted in soil obtained from an *Opuntia pusilla* population near Columbus, MS and maintained in a greenhouse until the experiment began (left). Potted plants were relocated to the quarantine-approved growth chamber in the MSU Insect Rearing Center. Plants were maintained within mesh cages to restrict movement of moth larvae during the study and maintained at 80°C and at least 70% relative humidity during the experiment.

In addition to this laboratory work, Brice has begun writing a manuscript for his previously reported work on the distribution of different *C. cactorum* larval morphologies. Brice will ultimately serve as the primary author on this manuscript, to be co-authored by Ervin and Brooks.

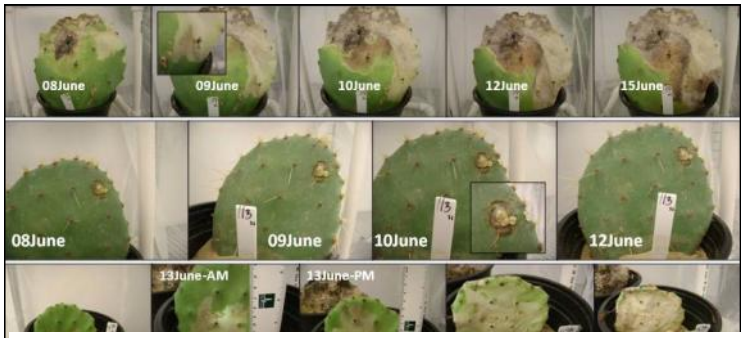


Figure 3. Progression of damage in three experimental *Opuntia* plants infested with *C. cactorum* larvae. Each row represents sequence of feeding in a single pad beginning on June 8. Eggs were collected in Florida by Arkansas State University Ph.D. student Anastasia Woodard.

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## "Dissection of Female Cactus Moth Genitalia" — A Training Video

**By Richard L. Brown, Sangmi Lee and Joe MacGown**
**Department of Entomology**

***This is the first video available on the web that gives methods for dissecting female genitalia of any Lepidoptera. In additional to showing the specialized method for dissecting the female, this four and a half minute video discusses how to determine if the dissected female has been mated.***

A new training video on preparing dissections of the female genitalia of the cactus moth has been produced, and this supplements an earlier video on dissecting male genitalia. This is the first video available on the web that gives methods for dissecting female genitalia of any Lepidoptera. In addition to showing the specialized methods for dissecting the female, this four and half minute video discusses how to determine if the dissected female has been mated. The anatomical parts of the female genitalia are identified and labeled. The genitalia of the cactus moth and native species of *Melitara* are compared, and anatomical differences are given for making identifications. The video can be accessed at YouTube with a search for "cactus moth" or downloaded from the cactus moth web site at: http://mississippientomologicalmuseum.org.msstate.edu//Researchtaxapages/CactusMoths/Videos_CactusMoths.html.


Figure 1. The first on-line video for demonstrating methods for making dissections of female genitalia of moths.

## Publication April — June 2011

### Peer-Reviewed Journals

Marsico, T. D., Wallace, L., Ervin, G. N., Brooks, C., McClure, J. E., & Welch, M. E. (2011). Geographic Patterns of Genetic Diversity from the Native Range of *Cactoblastis cactorum* (Berg) Support the Documented History of Invasion and Multiple Introductions for Invasive Populations. Biological Invasions. 13, 857-868.

### Presentations

Brooks, C. P. 2011. Integrating models and data: The intersection of math, statistics and biology. Mathematics & Statistics Research Experience for Undergraduates, Mississippi State University, June 2011. (Invited)

### Technical Reports

Madsen, J. D., Amburn, P., Brown, R. L., Dibble, E. D., Ervin, G. N., Shaw, D. R., Abbott, C. F., Baker, G., Bloem, K., Brooks, C., Irby, D., Lee, S., Maddox, V. L., Rose, R., Schulz, R., Wallace, L., Wasson, L. L., Welch, M., Wersal, R. M., McBride, D. W., & Madsen, N. (2011). Research to Support Integrated Management Systems of Aquatic and Terrestrial Invasive Species: Annual Report, 2010. GRI Report #5047. Mississippi State University: Geosystems Research Institute.

### Professional Presentations

Abbott, C. F. (2011). Invasive Species Databases and Websites. Mississippi - Texas Invasive Species Work Group. Mississippi State University: Geosystems Research Institute.

Madsen, J. D. (2011). Invasive Species Research and Extension at GRI. Mississippi - Texas Invasive Species Work Group. Mississippi State University: Geosystems Research Institute.

Maddox, V. L. (2011). Invasive Species Identification and Management. Mississippi Horse Park, Starkville, MS: Everything Garden Expo.

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# Is it a Mobile Device or Not?

**By Clifton Abbott**
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With the Cactus Moth Monitoring and Detection Network and the Invasive Plant Atlas of the MidSouth heading to mobile devices, the questions that come up are "What is a mobile device, how do you detect them, and should you provide different content to a mobile device versus the desktop?"

After doing some "googling," I was not shocked to see these issues debated among different user groups. Some say that the same content should be used no matter what the browser or device is. Some say use the same content, just change how it looks through styles. Others say provide a more usable, a more robust, a more "mobile centric" layout to mobile devices. Some even ask what is considered a mobile device. With the "larger" mobile devices coming out, mainly the iPAD, Galaxy Tab, Folio, PlayBook, and the like, should these be treated as mobile devices? I guess the answer is the old generic answer that answers all questions: it depends.

Not only is the question what is a mobile device contended, the other debate is how do you identify these devices?

There are several methods suggested and since there are multiple exceptions to each of these methods, the overall summary of this issue is best described by one person's comment, "It's still a crap shoot." Since someone is going to be sent to the wrong content layout, the question then becomes would you rather a desktop user be sent to the mobile layout, or the mobile user be sent to the full size layout? Then there is the thought, "Why not give the user the choice?" If the user is directed to the wrong layout, give the user the choice to switch.


Figure 1. GIS running on one of many different types of mobile devices.

For CMDMN and IPAMS purposes, slightly different content layout would be best for the map functions. Giving the user the option to switch layouts would probably be a smart option. I still remember going to KFC's website from my desktop and being sent to their mobile layout. It is a little aggravating when you don't have a choice. Identifying the mobile device then becomes the important part, especially since things in the mobile world changes so fast. No one wants to have to go back every month and change their detection routine. So, how are we going to do it? The best answer I can come up with is, it depends. More research and actual testing on the different methods are under way. The end result will probably be a combination of the different methods.

# Collaboration April — June 2011

**Christopher Brooks** and **Gary Ervin** are continuing their collaborations with Varone and Logarzo (USDA-ARS, Buenos Aires, Argentina) and Carpenter and Hight (USDA-ARS, Tifton and Tallahassee). They currently are planning studies to investigate the roles of climate versus host species on growth, survival, and reproduction of *C. cactorum* in the US and Argentina.

**Victor Maddox** and **Ryan Wersal** participated in the 2011 Mississippi CAPS Meeting hosted by the Mississippi Department of Agriculture and Commerce, Bureau of Plant Industry on 15 June 2011.

**John Madsen** participated in the North American Invasive Species Network board meeting, April 4, 2011.

**John Madsen** participated in the North American Invasive Species Network board meeting, May 20, 2011.