

# The Florida Cattleman

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## Biological Control of Invasive Mole Crickets in Florida Pastures: Well Worth The Cost

Adopted from:  
*Mhina, G.J., N.C. Leppa, M.H. Thomas and D. Solis. "Cost effectiveness of biological control of invasive mole crickets in Florida pastures. Biological Control, 199 (2016) 108-115.*

In an ongoing effort to control the many pests that hinder cattle production, it's nice to look back every-now-and-then to celebrate a true success story. One such story is close to home and affects hundreds of Florida's cattle producers: the battle to control invasive mole crickets.

Accidentally introduced to the Southeastern United States during the early 20<sup>th</sup> century were three species of South American mole crickets (short-winged mole cricket, tawny mole cricket and southern mole cricket) two of which spread across the coastal area of the United States from North Carolina to Texas. By the mid-1900's they were causing widespread losses to agriculture. Pastures and other grasslands along with vegetable crops were particularly vulnerable to the mole cricket's habit of burrowing and feeding on roots. Initially chemical pesticides were mostly successful in controlling the mole crickets and eventually the liberal use of chlordane was considered the most cost effective control. However, during the 1960s and 1970s a series of environmental laws were adopted that eventually removed the more effective chemicals from wide use. Efforts to identify replacement chemicals were tried but found ineffective or too expensive. By 1978 farmers and ranchers faced a serious threat from mole crickets with no clear remedy in sight.

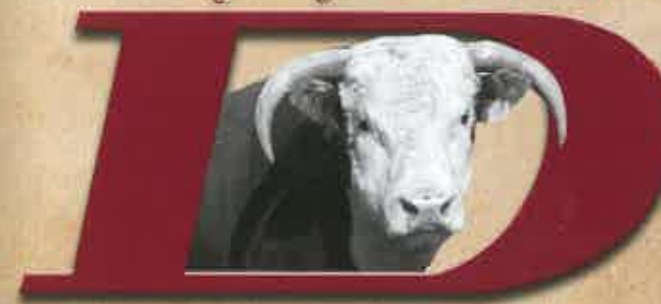
The growing sense of concern by Florida cattlemen and other agricultural interests spurred the search for a new approach to mole cricket control. Most

agreed it was time to think outside the box and researchers with the University of Florida's Institute of Food and Agricultural Sciences (UF IFAS) Entomology and Nematology Department were asked to assist in finding a solution. These researchers proposed a completely different pest management tactic, one they termed classical biological control (CBC).

At the time, CBC was considered by many to be unorthodox and less effective than chemicals in controlling important pests, yet CBC is actually one of the oldest and most successful forms of pest management. Simply stated, CBC seeks to reunite alien invasive pests with natural enemies from their homeland. The idea is quite simple; in natural ecosystems, plants and animals evolve within a complex system of checks and balances. Because of these natural checks, native species seldom become pests because their natural predators, parasites, pathogens, and competitors are working to keep them in check. However, when an animal or plant is accidentally or purposely introduced into an entirely new environment, the new host ecosystem will often lack the natural enemies needed to control the newly introduced species. Free of its natural checks, an invasive species can rapidly grow in numbers, overwhelming the native flora and fauna. With the CBC approach, researchers search for the pest's natural enemies, and after they're assured these controlling species won't become pests themselves,

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## Biological Control...

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release these species to resume their job of controlling the pest in its new ecosystem. So in 1978 the UF IFAS team of researchers, led by Drs. Tom Walker and Howard Frank, established the Mole Cricket Biological Control Project (MCBCP) with the goal of finding and releasing the mole cricket's natural enemies.

After a number of years researching pest mole crickets and their natural enemies in South America, the MCBCP eventually settled on three control species (two parasitic insects and an insect pathogenic nematode) who were host specific to the pest mole crickets and unlikely to create problems for the native flora and fauna. The three natural enemies were released widely across the state during the 90's and early 2000's with varying degrees of success. Of the three, the nematode proved particularly effective so was mass produced and sold until recently as a commercial product, Nematac® S. The nematode eventually became epidemic among the pest mole crickets, reducing their populations by more than 95% in many areas of the state. By 2012, 34 years after its beginning, the MCBCP was declared a success and officially closed. Today, pest mole crickets are no longer considered a significant pasture pest in most areas of Florida and only resurface sporadically for limited periods of time before

the nematodes and if necessary limited application of pesticides crash the mole cricket invaders.

While the program has been a clear success, it came with a significant price tag. As economists are known to caution; "there is no such thing as a free lunch." To fairly judge the overall benefit of the MCBCP one would need to measure both its benefits and costs to answer the more telling question, "was this program a good use of public money?" This is the question recently considered by researchers with UF IFAS, Florida A&M University and the U.S. Department of Agriculture, Animal and Plant Health Inspection Service.

Starting with the project's cost, a thorough assessment was conducted of the MCBCP budget history which accounted for all costs associated with the 34-year program. The assessment included operating funds from state appropriations, grants, the Florida Cattlemen's Association, and other funding sources along with compensation for salaries and benefits for the UF IFAS faculty associated with the project. In total the costs summed to \$8.6 million (adjusted to 2013 dollars).

On the other side of the ledger, accounting for the project's benefits proved more difficult. Because the crickets harmed many disparate agricultural and landscape interests in addition to pastureland, including private homeowner's lawns, public parks, golf courses etc., the benefit from reduced mole cricket numbers would be wide spread and difficult to quantify. To err on the conservative side, this study only considered benefits to commercial pastureland, more specifically, those benefits realized by Florida's cattle producers as represented by a membership survey conducted by the Florida Cattlemen's Association (FCA). To this end, the FCA membership was surveyed by mail in the fall of 2012 and participants answered a series of questions about their cattle operation, history of mole cricket problems and the cost of

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## Biological Control...

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mole cricket control both before and after the MCBCP.

In some cases survey participants indicated that mole crickets have been entirely eliminated as a pasture pest while others claimed the pest numbers were significantly reduced and less costly to control. As for any realized benefits, survey participants reported nearly 20% of their infested pastureland had been recovered, with the largest number of beneficiaries in central Florida. There were also large savings in mole cricket control costs, particularly in central Florida. Statewide these savings totaled more than \$13 million annually (adjusted to 2013 dollars). Please refer to Table 1 for a regional breakdown of savings. This means every eight months the MCBCP is saving Florida's cattle producers more money in pest control than its full 34 year price tag (13/12 = 1.08 x 8 = 8.6 million)!

To estimate the economic benefit resulting from the MCBCP reducing pest control costs one can consider the \$13 million annual benefit in perpetuity and apply the commonly used 3% social discount rate (the annual rate society uses to reduce the value of future payments). This would result in the \$13 million perpetual annual benefit equating to a onetime sum of \$453 million (\$13.6 million/.03), a benefit to cost ratio of 52:1. This means every public dollar invested in the project has resulted in \$52 in benefits from reduced control costs. Don't forget that this is a very conservative investment and doesn't include savings to states outside Florida or interests outside commercial pastureland.

There's more to consider too. The continuous cost of managing mole crickets in Florida pastures, as well as golf courses, turf farms, athletic fields, residential lawns, and other areas infested by mole crickets would have been much greater if the Florida Legislature, Florida Cattlemen's Association, and other organizations had not funded the MCBCP. Nearly 2 million hectares potentially would have become infested and damaged at some level as the pest mole crickets spread throughout Florida. Fortunately, due to the MCBCP and other mole cricket pest management practices, infested lands were limited to about one third this level.

In conclusion, while classical biological control projects can often be time consuming and can involve significant capital investments during their research and development phase, when they work, the savings to agriculture and the public at large can be enormous. This onetime \$8.6 million dollar investment

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## Biological Control...

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returned nearly half a billion dollars in savings to Florida's cattle producers in reduced control costs. If one were to measure the benefits to other states and other areas of turf harmed by the invasive mole crickets (golf courses, home lawns, public lands etc.) it would be reasonable to say the benefits could exceed one billion dollars. Not a bad investment of public funds!



Collecting mole crickets in a Polk County pasture

Table 1.

Estimated acres of infested pasture and annual savings in 2013 after the mole cricket biological control program (MCBCP).

Region	Number acres of pasture	Number acres of pasture infested	Pasture infested (%)	Pre-MCBCP annual control cost	Post-MCBCP annual control cost	Post-MCBCP annual Savings
North Florida	1,058,900	370,600	35.0	\$6,286,448	\$2,076,469	\$4,209,979
Central Florida	3,032,700	727,850	24.0	\$9,700,943	\$2,315,353	\$7,385,592
South Florida	840,100	319,250	38.0	\$2,640,127	\$625,998	\$2,014,129
TOTAL	4,931,700	1,417,700	29.0	\$18,627,518	\$5,017,820	\$13,609,698

Useful links:

<http://entomology.ifas.ufl.edu/pestmolecrickets/index.htm>  
[http://ipm.ifas.ufl.edu/Agricultural\\_IPM/Mole\\_Cricket\\_project.html](http://ipm.ifas.ufl.edu/Agricultural_IPM/Mole_Cricket_project.html)

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