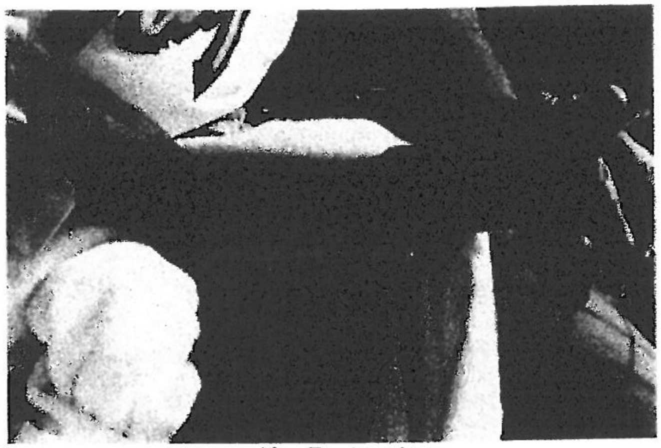

After Treatment

NOTE: Some states have approved the pesticide used in this device, but some also have regulations against the feeding of deer and other wildlife. Please check with your individual state as to current rules and regulations.

What is the Problem?

Tick populations of both the lone star tick, *Amblyomma americanum* and the 'deer tick', *Ixodes scapularis*, continue to spread geographically throughout much of the country, due in large part to a continued increase in deer herds throughout most of the United States. As tick populations increase so does disease risk, and there are currently ten known major tick-borne infections in the country affecting humans, most of which are carried by species of ticks which feed on deer. One published study has estimated that Lyme disease alone may cost society over two billion dollars a year. It is now apparent that controlling tick populations is a highly effective way to reduce local disease risk.

What is the '4-Poster' Deer Treatment Bait Station?

United States Department of Agriculture (USDA) - Agricultural Research Service (ARS) - Office of Technology Transfer (OTT) has granted an exclusive license of the ARS patented '4-Poster' Deer Treatment Bait Station to the American Lyme Disease Foundation, Inc. (ALDF). The device was developed by researchers J. Mathews Pound, J. Allen Miller, and Craig A. LeMeilleur of the United States Department of Agriculture (USDA) - Agricultural Research Service (ARS) and patented on November 29, 1994 under United States patent number 5367983.

The '4-Poster' device is specifically designed to kill species of ticks that feed on white-tailed deer and especially those for which white-tailed deer are keystone hosts for adult ticks. In this regard, two primary target species for '4-Poster' technology in the U.S. are the deer tick, *Ixodes scapularis*, that transmits agents causing Lyme disease, anaplasmosis, and human babesiosis, and the lone star tick, *Amblyomma americanum*, that transmits the agent causing human monocytic ehrlichiosis (HME). New tick-borne agents of infection have been identified, and the existence of yet others is suspected.

How does the '4-Poster' work?

The '4-Poster' basically consists of a central bin containing clean whole kernel corn used as a bait and two application/feeding stations located at either end of the device. As deer feed on the bait, the design of the device forces them to rub against pesticide-impregnated applicator rollers. The rollers in turn apply tickicide to their ears, heads, necks, and shoulders where roughly 90% of feeding adult ticks are attached. Through grooming, the deer also transfer the tickicide to other parts of the body. Studies (see below) have shown that use of '4-Poster' technology has resulted in the control of 92 to 98% of free-living tick populations in areas around the devices after three years of use.

What are basic requirements for maximum efficacy?

For maximum efficacy in areas where both deer and lone star ticks are found together, the '4-Poster' device should be maintained essentially on a year-round basis. An exception would be if temperatures remained below freezing for extended periods of time. In areas where only deer ticks are found, the devices should be maintained continuously from September through May to impact the entire adult feeding/breeding season. However, adult ticks are not active during prolonged periods of snow cover or below 45° F air temperature. Where only lone star ticks are found, maintenance of the devices from late January or early February through mid to late September will significantly impact both immature (larvae and nymphs) and adult stages on deer.

What have been the research results with the '4-Poster'?

Two studies have been completed, and data are currently being collected and compiled from a third larger study that involves sites in five states in the northeast. Sites that are deer-fenced or where movement of deer is otherwise 'controlled' have better results than 'unrestricted sites,' where deer are able to come and go as they please. Unfenced deer pick up ticks outside the immediate study area and thus are able to reintroduce ticks to treated areas. This is especially true for adult deer ticks during the fall when deer (especially bucks) often expand their normal territorial range, and tick feeding activity is at its peak. Results may also vary depending upon the tickicide used.

Site one: Located near Kerrville, TX at the Kerr Wildlife Management Area, two 96-acre deer-fenced wooded plots were used to test efficacy of the '4-Poster' technology in controlling free-living populations of lone star ticks. A single corn-baited '4-Poster' was placed in each pasture, but only the device in one pasture was treated with an oily formulation of the tickicide amitraz. After three years, a 92 to 97% reduction in tick numbers was observed in the plot where deer were allowed to passively treat themselves at the device. Lone star ticks in this region of Texas characteristically have a one-year life cycle. In contrast, deer ticks have a two or three-year life cycle, and hence a meaningful level of control may take longer to appear.

Site two: Located at the Goddard Space Flight Center in Maryland (a single 600+ acre deer-fenced facility) an exceptional 96 to 98% reduction in free-living nymphal deer ticks was noted after three years of treatment using permethrin (tickicide).

Sites in five Northeastern States:

Data is currently being compiled after five years of study at sites in MD, NJ, NY, CT and RI. Treatment was terminated in the spring of 2002, but tick sampling will continue through 2004 because the tick's two-year life cycle necessitates observing efficacy of treatment for two additional years.

4-Poster 'Tickicide'

The EPA has approved a specially formulated 10% permethrin based tickicide for use in treating ticks on deer. As with any pesticide, labels regarding its safety are included with its shipment to the Licensed Pesticide Operator.

For Additional information and to place an order contact:
Andy Szulinski, Vice President
Dandux Outdoors
3451 Ellicott Center Drive
Ellicott City, MD 21043

Telephone: 800-933-2638, ext 481
E-mail: ars@crdaniels.com

Attachment 3

Aerial Infrared Deer Count Report

Ogden Dunes, IN

26 February 2012

The Town of Ogden Dunes was the subject of an aerial infrared (IR) deer count flight on the night of 12 February 2012. The IR imaging conditions were good during the flight. Additional details can be found in the analysis notes below.

This report package includes this written report, DVD video of the raw infrared imagery of the count area, map printout of the deer count and dispersion within and near the count areas and a copy of the map in *.jpeg* format on CD-ROM. Deer and possible deer are noted on the maps by dots of different colors. Deer are red and possibles are gray. The dots representing animals cover an area approximately 60 feet in diameter on the maps so they can be seen and printed easily.

Results:

LOCATION	Acres	DEER Inside/Possible // Outside/Possible
Ogden Dunes	~640	**58 / 2 // 43 / 1**

Analysis Notes

Ogden Dunes, IN **2/12/2012**

The aerial infrared imaging flight for Ogden Dunes was conducted between 1948 and 2039, 12 February 2012. Imaging conditions were good and I estimate the accuracy of the count to be better than 90%. Small animals were visible in the imagery both on the ground and in trees. Most of the deer counted outside of town were south of town and within ¾ mile of the railroad tracks. The two largest concentrations of deer (seven each—indicated by a larger dot on the map with the number '7' near it) may have been as a result of informal feeding stations, particularly the location in the northeast portion of Ogden Dunes, along Shore Drive. A captured infrared image of that group is appended to this report and included separately on the accompanying CD-ROM.

The area inside the boundaries marked around the town on the accompanying map is approximately 640 acres—one square mile. A total of at least 1450 acres were imaged for this count.

Surface winds were from the west at ten knots with light turbulence at the imaging altitude of 1500 feet above ground level. The ground was freshly snow covered and the temperature was minus four Celsius. The sky was clear.

Mapping:
If the deer count number and dispersion information is destined for a Geographic Information System (GIS) and AutoCAD files have not been provided, my recommended method of transferring the data into the GIS is to import the map image file and overlay/register it on an existing map of the park. Use an input device (mouse, pen, etc.) to rapidly note the location of each dear count 'dot' as a new data point. Once these data are entered as a new layer, the imported map can be discarded from GIS, leaving the new 'deer count' layer to be incorporated with other GIS data and maps. If AutoCAD or .dxf files have been provided, one of these formats should be directly transferable into the GIS system so the 'deer dots' can be placed into any desired map type produced by the park system.

Equipment:
This count was accomplished with a single-engine Cessna 182 airplane and using a high-resolution Mitsubishi M-600 thermal imager oriented 'looking' straight down through a camera hole in the belly of

the airplane. The thermal imager NTSC video output is routed through a video encoder-decoder (VED) that labels the video with a continuous stream of GPS-derived position, time, date, speed and altitude information. A guide to the alpha-numeric annotation seen on the accompanying videotape may be found at the end of the specification block below. A bar code of the same GPS alphanumeric information is recorded on the far left side of the imagery although it may not be within the visible portion of a conventional TV screen. The bar-coded information is used by the VED during video playback and analysis. The annotated video imagery is recorded with a Sony MiniDV digital video cassette recorder using digital videotape capable of storing 500 horizontal lines of video information (over 50% more than the 330 lines found on conventional VHS videotape.) The mapping program used for marking the count area borders and laying out the flight lines is DeLorme's GPS Link II and MapExpert version 2.0.

Mitsubishi M-600 thermal imager specifications:

Detector	Platinum Silicide Schottky-Barrier IRCSD
Number of Elements	512 X 512 pixels
Detectable Wavelength Band	3 to 5 microns
Lens	Infrared, polarized f50 mm, F 1.2
NETD (Noise Equivalent Temperature Differential)	0.08 degrees C blackbody at 80.6 deg. F. (27 deg C) using f50 mm, F 1.2 lens
Field of View (using f50mm lens)	14 degrees horizontal X 11 degrees vertical
Field Time	1/60 second
Cooling Method	Stirling Cycle cooler
Image Display	Monochromatic, 256 gray levels
Video Output	RS170 video output (1 BNC port, 75 ohms)

Annotation Guide:

Flight Methodology:
The counts are flown at an average altitude of 1500 feet above ground level. The camera view directly below the airplane from that altitude is 375 feet wide on the ground surface. Flight lines are spaced an average of 325 feet apart to allow for image overlap and 100 percent coverage of the study area. A 'bread crumb' feature of the mobile mapping software used for the flight allows me to track my flight path and helps guide me along predetermined flight lines to assure complete coverage. The recording device is normally paused during the turns outside the study area; hence the tape appears to jump from the end of one run to the beginning of the next.

Analysis Methodology:
After the flight, I analyze the videotape using a TV monitor and a computer monitor. As the videotape plays, the VED decodes the bar-coded GPS signal that was received from the GPS during the flight. The VED recreates the original GPS signal and sends it to the computer so the mobile mapping software 'thinks' it is receiving a live signal. The mapping software shows the moving position of the airplane superimposed on a street map on the computer screen while the recorded infrared imagery of the area below the airplane is visible on the TV monitor. The GPS updates the airplane position once per second throughout the flight and at the same rate during the post-flight analysis.

To count the deer, I watch the entire tape, pausing and playing it backward and forward at regular speed and in slow motion, as necessary. Generally, for each hour of tape, three or more hours of analysis and reporting are required to complete the count. As I view the tape and note the deer, I mark each one as a dot on a computer version of the maps accompanying this report. When I have viewed the entire tape, I count the dots on the map to find the number of deer in the count area. If I note large domestic animals on the computer map, I mark them with a different color dot. In these counts, red dots denote deer, gray or yellow dots (if any) denote possible deer or other unknown animal similar in size to a deer but apparently not a deer and blue dots (if any) represent domestic animals such as cattle, sheep or horses. These animals are always much warmer and in the case of horses and cattle, substantially larger than any deer.

Deer usually appear as a fairly bright white dot or narrow line (similar to a grain of rice) in the infrared imagery. In this imagery, white and lighter shades of gray represents warmer objects while black and darker shades of gray are cooler. Other white (warmest in the scene) objects that are common are roads and pavement that retain latent heat from sunshine during the day, man hole covers, street lights, house lights, fires, furnace stacks on houses, car engines that are running or have run recently, groundwater seepages, puddles, ponds, streams, rivers and large rocks and boulders in the woods. Other animals in the picture are often white or bright. Domestic animals are commonly very bright—hotter than deer, which have highly insulating coats.

In order to count deer with a high degree of confidence and accuracy, several factors have to be taken into account. Among them are deer infrared signatures, background infrared signatures, deer behavior and location. Questions I am commonly asked, and the answers I give, include the following:

Q. How do you know you are not counting the same deer twice?

Given:

- deer are not disturbed by a light plane flying more than a quarter of a mile above them,
- deer often congregate in groups of two or more—up to 20 or more in extreme cases,
- deer generally move very slowly as they graze, congregate or rest,
- deer live and act according to generally well known behaviors,
- I fly along a well documented flight path with an 'infrared view' of a known area below the aircraft that is recorded on videotape.

A. With the help of the moving map program, I can place dots representing deer on a map in their respective positions and orientation to one another quite accurately, particularly when referring to the nearby streets, intersections, rivers and streams that may be in view or recently in view on the videotape. As I analyze the tape, becoming quite familiar with the 'neighborhood' of the count area (houses, roads, hills, streams, rivers, golf courses, trails, etc.) and place the dots on the map, I recognize specific deer and groups of deer as I pass them a second and sometimes third time. For example, I may see and place a group of three deer/dots in an equilateral triangle near a trail a few seconds after passing a particular road. In the case where I first saw them they may have been on the right side of my screen. When I fly the next adjacent run, thanks to overlapping imagery, they may appear on the extreme left side of the screen. Very often, they will be in the same spot or not far from it, in the same or similar 'formation' five, ten, fifteen or even thirty minutes later. If I fly along and see a lone deer in the forest, it will still be there in the same general area when I make adjacent passes. On occasion, I will fly over a group of deer in an area, and on subsequent passes, I will see an additional deer that I did not see earlier because it may have been out of the picture, too close to another deer (appearing larger than normal—but not counted as two) or it may have been obscured by a tree or foliage on the first pass. In those cases, I add the dot to the map. In uncommon cases where deer are moving quickly, I will look for them elsewhere in the direction they were originally seen moving. If I later see deer in the vicinity and cannot recognize them as the same group, I have to make a judgment whether to count them or not.

Q. How do you know what you are seeing and counting are deer and not some other animal?

Given:

- there is usually a sizable quantity of deer in the area in which I am flying the deer count,
- there are other wild and domestic animals in the same area, usually in smaller numbers,
- deer don't climb trees,

- deer are somewhat 'brazen' in their occupation of human communities,
- domesticated animals are often corralled, fenced in, densely grouped or tethered,
- deer are notably larger than foxes, raccoons, skunks and many dogs and smaller than cows and horses,
- deer have a variety of apparent temperature ranges/thermal signatures but are nearly always cooler than common domestic animals (dogs, horses, cattle, sheep),
- skunks, raccoons, and foxes appear to have warmer apparent body temperatures than deer and often look like a bright pinpoint of light in the woods, whereas a deer is larger, usually cooler and with less distinguishable edge contrast with their surroundings (i.e., they look slightly 'fuzzy' around the edges).
- deer congregate more and move less, and generally less rapidly, than smaller nocturnally active wild animals such as skunks, raccoons, coyotes and foxes.

A. Experience, practice and experiments with the Michigan Department of Natural Resources and others in counting and identifying a variety of captive animal types have given me high confidence in identifying deer in their normal forest, rural and suburban habitats. The deer that I have difficulty identifying and counting are those that are partially hidden from view in evergreen vegetation or exhibit such a low apparent temperature (thermal signature) that I cannot see them or distinguish them sufficiently enough to identify them as deer, or even as animals. I do not count 'white dots or blobs' that I do not have a strong feeling are deer. This includes deer bedding areas in light snow cover that contain melted through areas to the ground that approximate deer thermal signatures. Close examination of most infrared deer count videotapes will reveal to the viewer quite a few animals in trees or on the ground that do not appear on the deer count map. These animals are most likely to be something other than deer. My deer counts are generally considered a minimum definite number, as opposed to a maximum. Some deer will go undetected in nearly every environment.

Q. How accurate is the count?

A. I don't know. I believe an average of 90% is in the ballpark, perhaps better for very good and excellent conditions, sometime worse. Conventional methods (deer-car collisions, spotlighting, pellet counts) are considered to be accurate within 30 to 40 percent—not a high number. In this method, we are looking at 100% of the area in question and under good conditions all active deer not hidden from view should be seen and counted with infrared.

Note: I will retain the original digital video tape of this deer count for at least one year.

Larry Davis
Kent, Ohio
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(330) 554-4794


Burns Waterway
CRISMAN
COTTAGE GROVE
MARINE
STANTON
MADISON
BURNS
7 - feeding?
COTTONWOOD
E HILL
TURRET
SKYLINE
SHORE
ASPEN
OGDEN
BITTERSWEET
BOAT CLUB
Ogden Dunes
CEDAR TRL
CEDAR
THE LEDGE
HILLCREST
BEACH
THE THUMB
DEER TR
LUPINE
SKI HILL
SUNSET TRL
HILLCREST
DIANA
PINE TRL
LINDEN
7
INDIAN CAMP TR
LOCUST
TAMARACK
SUMMIT
SKI HILL
SHORE
ROSE
CHESTNUT
SYCAMORE
VALERIE
STAGECOACH PORTAGE
STAGECOACH