

To achieve uniformly spaced swaths you will need to use swath markers, a handheld or mounted geographic positioning system (GPS), compass headings, previous swath tracks, or counted tire rotations on the turns at the ends of swaths. For this latter method, if you want to apply a swath every 42.5 feet, for example, and your ATV tires have a 30-inch circumference, then place a mark on the tire and count 17 rotations between swaths (30 inches x 17 = 510 inches = 42.5 feet). Unlike cultivating a crop, spraying grasshoppers doesn't require absolute precision. Skips in the pattern to avoid obstacles won't effect results if the majority of the area is treated at the coverage and rate desired. An advantage with ATV-RAATs is that rocky hill tops and other areas that don't hold much forage or many grasshoppers can be skipped and additional swaths placed in more heavily infested, productive areas.

Operator Safety Equipment & Training

ATVs can be hazardous to operate. ATV-sprayers should only be operated by persons at least 18 years old. Always wear recommended safety equipment such as gloves, safety goggles, and a helmet. Be sure to take a training course on the safe operation of your ATV. Drive cautiously, as fully-loaded spray tanks will affect the braking and handling characteristics of an ATV.

For more information see:

www.wygisc.uwo.edu/grasshopper/
or contact

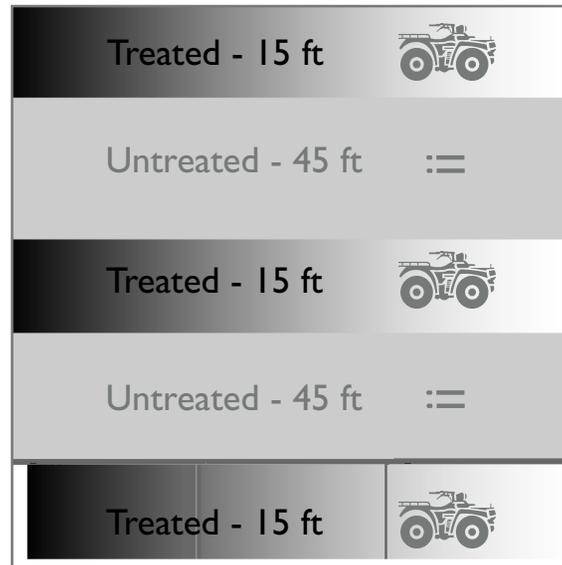
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Schematic of an ATV-RAAT application with 15 ft. spray swath and 25% coverage.



Exceptions to the "Rules"

Higher coverages may be needed if: 1) treatments are applied to late instar nymphs (if using diflubenzuron), 2) grasshopper densities are extreme, or 3) forage cover is tall or dense. In all cases, grasshopper management software (CARMA¹ or HOPPER²) should be used to assess a program. Apply insecticides in accordance with label directions and established guidelines for buffers around water, bees, and human habitations.

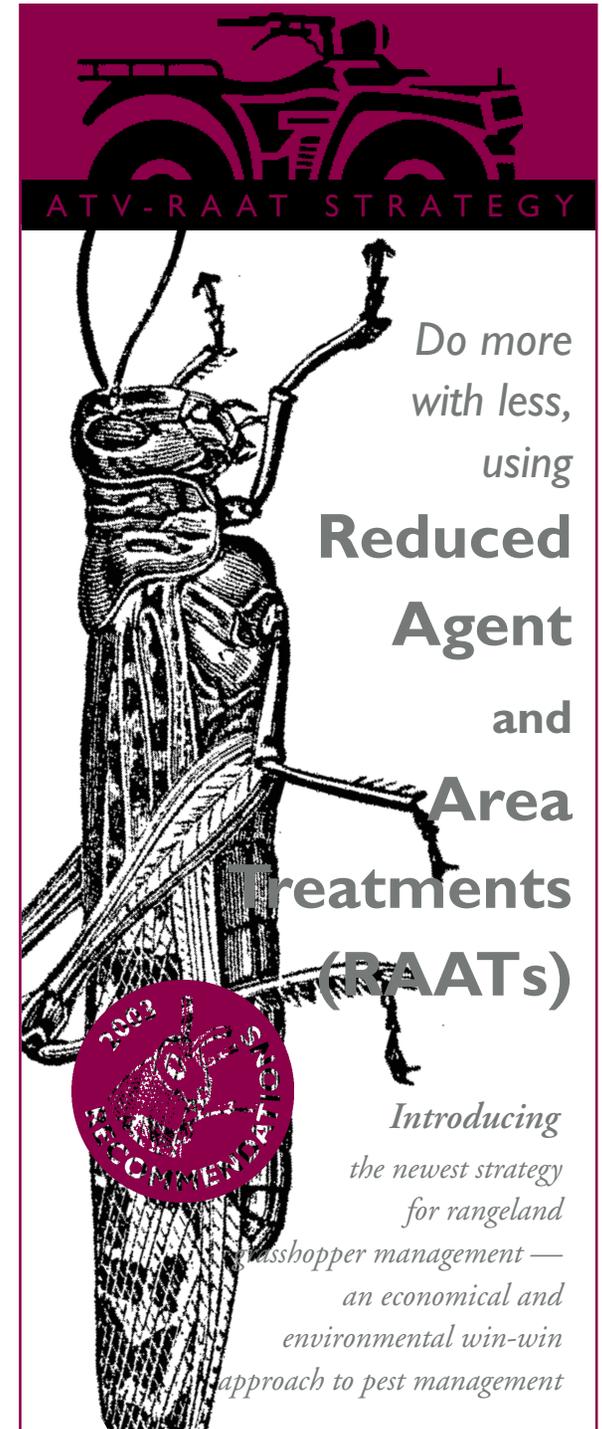
¹ Available at www.wygisc.uwo.edu/grasshopper/carma.htm

² Available from your USDA APHIS State Plant Health Director

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ATV-RAAT STRATEGY

Do more with less,
using
Reduced Agent and Area Treatments (RAATs)

Introducing
the newest strategy
for rangeland
grasshopper management —
an economical and
environmental win-win
approach to pest management

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RECOMMENDATION

What are RAATs?

RAAT is a method of integrated pest management (IPM) for rangeland grasshoppers in which the rate of insecticide is reduced from traditional levels and/or untreated swaths (refuges) are alternated with treated swaths.

RAATs work through *chemical control*, meaning grasshoppers are killed directly in treated swaths and as they move out of untreated swaths, and *conservation biological control*, which allows predators and parasites preserved in untreated swaths to suppress grasshoppers. This IPM approach can reduce the cost of control and the amount of insecticide used by more than 50 percent.

Why use RAATs?

Economics

Inflation and changes in governmental cost-share programs have tripled the cost of rangeland grasshopper management for ranchers compared with the control cost during the last major outbreak in 1987. Most states no longer subsidize grasshopper control programs; therefore, the cost of traditional tactics usually will exceed the benefits.

Environment

Less insecticide in the environment lowers the risk to native species, including fish and wildlife, water quality, and humans. Unconcentrated swaths provide refuges for organisms with lower reproductive rates. Grasshoppers, on the other hand, are organisms that move into the treated swaths and will be largely unaffected unless they feed on the foliage.

What to expect from RAATs

Efficacy

This method normally will result in 80 to 95 percent control, which is approximately 5 to 15 percent lower mortality than with a standard (high rate, blanket coverage) treatment. Leaving low densities of

grasshoppers after RAATs does not necessarily result in a subsequent outbreak (see *Environment*).

Economics

Using ATV-RAATs will reduce costs by approximately 70 to 80 percent, depending upon the agent and swath width. For example, if a standard insecticide application costs \$2.50 per acre, the equivalent ATV-RAAT program should cost approximately \$0.50 to \$0.75 per acre protected. It should be noted that the greatest economical benefits derive from increased swath spacing since this effectively decreases the costs for both purchasing insecticide and application.

Environment

RAAT means 60 to 80 percent less insecticide application. Rangeland grasshopper control in the untreated swaths harbor species, natural insect predators, including biocontrol agents of grasshoppers, and provide low densities of surviving grasshoppers and parasites and predators in the untreated swaths to re-colonize swaths by reestablishing natural regulation of grasshopper populations. For these reasons, RAAT programs seldom sustain higher densities of birds than blanket applications.

Ground-Applied Reduced Agent Area Treatment strategies (RAATs)

Ground-based spraying to control grasshopper infestations is not new, but it has been largely disregarded by pest managers for two reasons. First, blanketing thousands of infested acres using a spray rig is impractical. However, economically and rapidly treating moderate sized “hot spots” (up to 640 acres) can prevent them from growing into serious outbreaks. Second, equipment and operators can't stand the abuse when using traditional tractor or truck-mounted sprayers on rangeland. But now there is a viable alternative to these vehicles.

By combining RAATs and heavy-duty, 4-wheel drive, All Terrain Vehicles (ATVs), we have found a way to suppress incipient infestations. These ATVs are widely used for applying herbicides in rough country, and these systems can be easily adapted to grasshopper control. By combining ATV-mounted spray equipment and adapting strategies gleaned from 7 years of aerial RAAT research, it is now possible for one person to protect up to 300 acres in a day for less than \$1000 acre protected.

Application, Calibration, Rate, and Timing for Recommendations

The various systems that can be used for rangeland grasshopper treatments and their calibration are described on our website: <http://www.wyisc.uwyo.edu/grasshopper/>. Only emulsifiable formulations of carbaryl, malathion, and diflubenzuron are labeled for grasshopper control on rangeland and all non-cropland areas. At this time, we recommend the maximum label rates be used for these three compounds. Please refer to current labels of these insecticides to ensure safe, effective control.

Coverage Recommendations

Although our studies have not yet allowed us to fully test and optimize this strategy, we have sufficient information to provide some recommendations. Our preliminary analyses indicate that the percent coverage should be equal to the average number of grasshoppers/square-yard in the infestation, with a minimum of 20% coverage. For example, if you have 30 grasshoppers/square-yard, then you should use 30% (0.3, as a proportion) coverage. Under these conditions, if you determine that your spray swath is 15 feet, you will need to spray a swath every 50 feet (15 feet/0.3 = 50 feet). If you have 40 grasshoppers/square-yard and your swath is 17 feet you will need to treat a swath every 42.5 feet (17 feet/0.4 = 42.5 feet).

