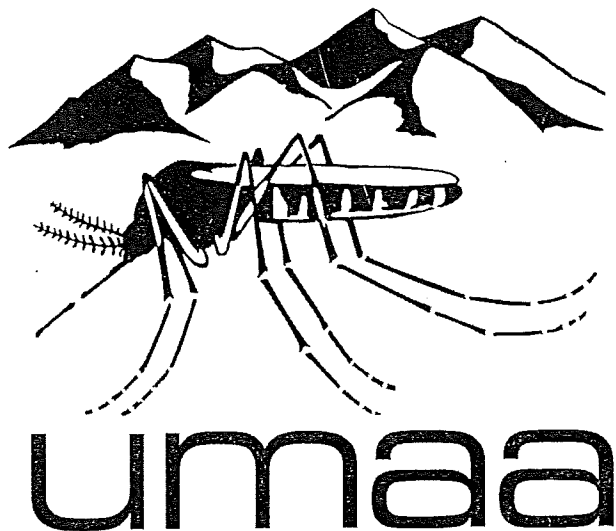


Proceedings of the
Sixty-third Annual Meeting
of the
Utah Mosquito Abatement
Association



Salt Lake City Marriott City Center
220 S. State Street
Salt Lake City, UT 84111

October 3 - 5, 2010

Proceedings of the
Sixty-third Annual Meeting
of the
Utah Mosquito Abatement
Association

Held at
Salt Lake City Marriott City Center
220 S. State Street
Salt Lake City, UT 84111

October 3 - 5, 2010

Edited by
Sammie Lee Dickson

Typed by
Sally E. Beagley

UTAH MOSQUITO ABATEMENT ASSOCIATION
PO Box 233
Hinckley, Utah 84635

TABLE OF CONTENTS

Table of Contents.....	i
UMAA Officers and Directors.....	ii
UMAA Committees.....	iii
UMAA Contributing Members.....	iv
An Update on the Natular™ Larvicide Formulations..... James R. McNelly Griffith S. Lizarraga, and Benjamin W. Goudie	1
Education Program at the South Valley MAD..... Patrick Smith	10
The Current Status of Equine West Nile Virus and Canine Heartworm in Utah..... Wyatt Frampton	11
More Mosquitoes, More Data and More Insights..... Danny M. Miler and Robert C. Mower	19
Arthropods, A Story Of Success, Secondary Education Program..... Robert C. Mower	23
Revised Constitution of The Utah Mosquito Abatement Association.....	34

UMAA OFFICERS - 2010

President.....	John Johnson
President-Elect.....	Ryan Lusty
Vice President.....	Tyson Packer
Secretary/Treasurer.....	Eldon Rowley
Past President.....	Robert C. Mower
Executive Director.....	Randel Sessions

DIRECTORS

<p>Box Elder MAD.....Randel Sessions PO Box 566 Brigham City, UT 84302 (435) 723-3700</p> <p>Cache MAD.....Chris Nelson 655 East 1300 North Logan, UT 84341 (435) 792-6439</p> <p>Carbon County.....Mike Johnson 59 East 900 North Price, UT 84501 (435) 636-3270</p> <p>College Ward/Young MAD.....Brad Tolman 3605 West 1400 South College Ward, UT 84321 (435) 636-3270</p> <p>Dagget MAD.....Ken Boyd PO Box 219 Manilla, UT 84046 (435) 784-3154</p> <p>MAD - Davis.....Gary L. Hatch 85 North 600 West Kaysville, UT 84037 (801) 544-3736</p> <p>Duchesne County.....Kay Weight PO Box 1951 Roosevelt, UT 84066 (435) 722-3802</p> <p>Emery County.....E. James Nielsen PO Box 629 Castle Dale, UT 84513 (435) 381-2933</p> <p>Juab County.....Mike Seeley 160 North Main Nephi, UT 84648 (435) 623-3408</p> <p>Logan City.....Joe Archer 456 N. 1000 W Logan, UT 84321 (435) 716-9749</p> <p>Magna MAD.....Ryan Lusty PO Box 40 Magna, UT 84044 (801) 250-7765</p>	<p>Moab MAD.....Robert A. Phillips PO Box 142 Moab, UT 84532 (435) 259-7161</p> <p>Salt Lake City MAD.....Sammie L. Dickson 2020 North Redwood Road Salt Lake City, UT 84116 (801) 355-9221</p> <p>Sevier County.....John Johnson 2780 South 600 West Richfield, UT 84701 (435) 896-6636</p> <p>South Salt Lake Valley MAD.....Val Bowlden 7308 S. Airport Rd. West Jordan, UT 84084 (801) 255-4651</p> <p>Southwest MA & Control.....Mario Boisvert 197 East Tabernacle St. George, UT 84770 (435) 652-5842</p> <p>Summit MAD.....John Jaussi PO Box 523 Coalville, UT 84017 (435) 336-2088</p> <p>Tooele Valley MAD.....Robert J Brand PO Box 788 Grantsville, UT 84029 (801) 250-3879</p> <p>Uintah MAD.....Kirk Robbins PO Box 983 Vernal, UT 84078 (435) 789-4105</p> <p>Utah County.....Robert C. Mower 2855 South State Provo, UT 84606 (801) 851-8637</p> <p>Weber MAD.....Bruce Bennett 505 West 12th Street Ogden, UT 84404 (801) 392-1630</p> <p>West Millard MAD.....Eldon Rowley PO Box 233 Hinckley, UT 84635 (435) 864-4742</p>
--	--

UMAA COMMITTEES

Auditing

Tyson Packer, Chair
Val Bowlden
Robert Brand
Eldon Rowley

Awards

Robert Mower, Chair
Glen Collett
John Jaussi

Computer/Data Processing

Gary Hatch, Chair
Andrew Dewsnup
Mario Boisvert
Brad Tolman

Encephalitis Surveillance Program

Gary L. Hatch, Chair
Grant Kofford
Chris Nelson
Robert Phillips

Environmental Impact

James Nielsen, Chair
John Jaussi
Banugopan Kesavaraju
Kirk Robbins

Legislative & Resolutions

Randel Sessions, Chair
Gary Hatch
Tyson Packer

Local Arrangements-Annual Meeting

Ryan Lusty, Chair
John Johnson
Randel Sessions

Mosquito Control, Fish and Wildlife Management Coordination

Randel Sessions, Chair
Banugopan Kesavaraju
Kirk Robbins
Gary Nelson

Newsletter

Randel Sessions, Editor

Nominating

Robert Mower, Chair
Bruce Bennett
Randel Sessions
Kay Weight

Operational

Brian Hougaard, Chair
Bruce Murray
Kyle Baird
Kirk Robbins

Pesticides

Robert Brand, Chair
Sammie L. Dickson
Randel Sessions

Policy, Finance & Bylaws

Tyson Packer, Chair
Val Bowlden
Robert Brand

Program

Ryan Lusty, Chair
Glen Collett
Sammie Dickson

Public Education

Gary Hatch, Chair
Greg Jensen
Kyle Baird

Publications & Proceedings

Sammie Dickson, Chair
John Jaussi
Lew Nielsen

Spring Workshop

Lewis T. Nielsen, Chair
Clark Burgess
Sammie Dickson
Mario Boisvert

2010 UMAA CONTRIBUTING MEMBERS

ADAPCO

Gale Jirik
550 Aero Lane
Sanford FL 32771
(866) 845-2550
(505) 366-7987 cell

AIRMOTIVE SERVICES

Wayne Larson
Brigham City Airport
1800 N. 2000 W #22
Brigham City, UT 84302
(435) 723-5702

ALLPRO VECTOR GROUP

Tanya Cafarelli
9100 W. Bloomington, FWY #113
Bloomington, MN 55431
(888) 603-1008
(952) 270-0764

AMVAC

Rennie Kubik
10808 NE 27th Court
Vancouver, WA 98686
(360) 546-5954
(360) 921-8019 cell

CENTRAL LIFE SCIENCES WELLMARK/ZOECON INC.

Ed Bredemeyer
3631 Sumantra Cliff
San Antonio, TX 78261
(800) 877-6374
(303) 883-7408 cell

CLARKE

Ben Goudie
110 E. Irving Park Rd., 4th Floor
Roselle, IL 60172
(209) 747-6230 cell

COGNIS CORPORATION

Dean Oester
5051 Estecreek Drive
Cincinnati, OH 45232-1446
(513) 252-1029
(800) 254-1029

DYNAMIC AVIATION

Caleb Stitely
1402 Airport Road
PO Box 7
Bridgewater, VA 22812
(540) 828-6070

ELECTRONIC DATA SOLUTIONS

Ryan Pierson
682 E. 950 N.
Shelley, ID 83274
(208) 346-6106
(208) 358-1142 cell

FOUR STAR MICROBIAL PRODUCTS LLC

David Sjogren
19503 Fisher Lake Lane
Bend, OR 97702
(503) 913-6249

GIL MANUFACTURING

Ted Gilreath
PO Box 242725
Montgomery, AL 36124
(334) 284-2725

UNIVAR

TJ Shelby
650 W. 800 S.
Salt Lake City, UT 84104-1026
(801) 933-6134
(801) 884-8579 cell

UTAH LOCAL GOVERNMENTS TRUST

Steve Hansen
55 South Hwy 89
North Salt Lake, UT 84054-2504
(801) 936-6400
(800) 748-4440

VALENT BIO SCIENCES

Stephanie Whitman
1450 North 45th Street
Laramie, WY 82072
(307) 721-4335
(307) 399-1732 cell

An Update on the Natular™ Larvicide Formulations

James R. McNelly and Griffith S. Lizarraga

Clarke Technical Center
1501 Wright Boulevard
Schaumburg, IL 60193
and

Benjamin W. Goudie

110 E. Irving Park Road
Roselle, IL 60172

Abstract – Natular™ represents both a successful collaboration between Clarke and DowAgro Sciences (DAS) and the first new larvicide for the control of mosquitoes in decades. The active ingredient, spinosad, was first discovered in 1982 and first registered for use in 1997 under the US Environmental Protection Agency's (EPA) Reduced Risk initiative. EPA registration of Natular™ for public health use as a mosquito larvicide was achieved beginning in 2007. To date, six formulations of Natular™ have been registered in the US, two single-brood and four multi-brood formulations. Field trials with US cooperators began in 2008 and have continued through the 2010 mosquito season. Integration of Natular™ within domestic and international control programs has provided invaluable documentation of labeled use patterns and insight into potential operational influences. In June of 2010 Clarke was awarded the EPA's Presidential Green Chemistry Challenge Award for its Natular™ larvicide formulations.

Introduction – The active ingredient in Natular™ is generated through fermentation of a naturally occurring soil actinomycete, *Saccharopolyspora*

spinosa, by DAS in Michigan. The organism itself was first discovered in 1982 by Dr. John Mynderse, an Eli Lilly Company chemist, from a soil sample taken near an abandoned rum distillery in the Caribbean. Spinosad is comprised of two insecticidal factors (A and D) present in an 85:15% ratio.

First registered by the US EPA in 1997 under that agency's Reduced Risk Initiative, DAS focused on the incorporation of this active ingredient within the agricultural industry. It is now registered for use on more than 250 crop types in 80 countries. In addition, it is used in the turf and ornamental industry, animal health and pet care industries, and stored grain industry among others. In 1999 spinosad achieved the EPA'S Presidential Green Chemistry Challenge Award, one of only six insecticides that have met the requirements of this award.

Spinosad affects the nervous system of the insect at unique sites on the nicotinic acetylcholine and gamma aminobutyric acid (GABA) receptor sites (Saldago and Sparks 2005). The insect is exposed to spinosad through both ingestion and contact.

Clarke entered into collaboration with DAS in 2004 to bring spinosad into the public health market, specifically for use as a mosquito larvicide. This was achieved through Clarke's Product Development team three years later, with the first of six Natular™ formulations (single brood G and 2EC) granted registration by the EPA in October of 2007. The multiple brood formulations (XRG, T30, XRT, and DT) were registered the following year in June 2008.

All Clarke formulations of Natular™ meet the EPA's reduced risk criteria. To date, five of six formulations – G, EC, XRG, T30, and XRT – have successfully been reviewed as having met the standards for use in organic food production sites, and are so listed by the Organic Materials Review Institute (OMRI). The DT tablet was developed primarily for international use in potable water sites; as such this formulation is not subject to review by OMRI.

Stewardship Initiatives – During the mosquito season of 2008, limited "blind trials" were performed in the US by four cooperators. These cooperators received the final formulations of Natular™, however, all samples and associated paperwork such as the Material Safety Data Sheet (MSDS) identified the formulation by code rather than trade name, and further identified as a DAS formulation. All communication necessary to initiate and complete these blind trials was performed by Dr. David Dame.

The tablet formulations of Natular™, the T30 and XRT, are

pharmaceutical grade tablets that enhance handling and application by technicians. These are dust free tablets formulated to provide applicators with a clean handling experience. The light, white color as more than several collaborators observed is "easy to see" when submerged in habitats ranging from mangrove swamps to catch basins.

Both tablets validated label claims of residual activity when applied to catch basins. Found in Figures 1 and 2 are graphs developed by the Metropolitan Mosquito Control District (MMCD), MN. MMCD's efficacy evaluations, both blind trials, utilized pupae as a proxy for successful development - a lack of pupae demonstrates positive product efficacy.

The individual graphs chart cumulative pupal populations over the duration of the MMCD catch basin season. The control (untreated) data related curve was used in both the T30 and XRT evaluations. That curve rises steadily over the season, as the untreated catch basins continue to serve as *Culex* production sites. Clearly, in T30 (8.33% AI) treated catch basins (one per basin), there is an absence of pupae over the formulations expected 30 day period of residual activity (Fig. 1).

Comparable results were achieved in MMCD Natular™ XRT (6.25% AI) catch basins and are presented in Figure 2. Catch basins were treated prior to the on-set of larval populations. Again, the curves associated with treated and untreated basins provide clear evidence

supporting labeled expectations of control and the formulation's ability to provide season-long control. Species controlled included both *Culex restuans* and *Culex pipiens*.

Clarke's Environmental Sciences department initiated evaluations in the Chicagoland area of Illinois of the three residual formulations in 2008; below in Figure 3 are the results of a Natular™ XRG sand core granular evaluation. This formulation, containing 2.5% active and labeled for applications between five and 20 lbs per acre, like the T30 carries a labeled 30 day duration of efficacy.

Figure 3 show the results of the XRG formulation applied to a retention site at slightly less than mid-label rate, 10 lbs per acre (mid-label = 12.5 lbs per acre). The site was dry at the time of application and XRG as applied as a pre-hatch application. The results from this evaluation, displayed as per dip numbers (each number the average of two dips) in treated and non-treated (control) sites indicate that labeled use patterns can provide the type and duration of control that a mosquito control district would expect from a larvicide within their Integrated Mosquito Management (IMM) program.

The XRG formulation, applied as a pre-hatch, has the ability to provide control mosquito production once flooding occurs. In this case, a rain event induced hatch of an *Aedes vexans* brood between weeks one and two. *Ae. vexans* production was subsequently controlled at the treated site and as can be seen, *Cx. pipiens*

populations in the flooded retention site were also mitigated for 35 days, the end of the evaluation. Similar results were obtained by MMCD in 2009 versus *Culex restuans* using the same application rate of 10 lbs per acre and are displayed in Figure 4.

Large scale aerial applications of Natular™ XRG have been made using both rotor craft (Washoe County, NV) and fixed-wing aircraft (Portsmouth, VA and Cayman Islands) and have achieved results comparable to those found in Figures 3 and 4. As of this past season, the Cayman Islands have incorporated this formulation into a rotational regimen of larviciding in mangrove swamps versus *Aedes taeniorhynchus*.

Maximum mortality, particularly with the residual formulations, may at times take 72 hours to achieve. This trend with spinosad as the active ingredient has been noted previously and documented in the literature (Hertlein et al 2010). Often, however, efficacy is significant in the first 24 hours following exposure - this is evident in both Figures 5 and 7.

In 2008, efficacy evaluations were performed by Dr. Grayson Brown (University of Kentucky) of several formulations. Figure 5 is provided as an example of the "ladder of efficacy" over a 72 hour post-treatment period for, in this instance, *Anopheles quadrimaculatus*.

Labeled application rates of Natular™ G for typical *An. quadrimaculatus* production sites range from 3.5-9lbs per acre. The rates found in Figure 5 represent the

minimum and mid-label rates for this formulation. At the minimum labeled rate of application, 75% control of the larval population was achieved within 24 hours; control rose to 80% at 24 hours at the mid-label rate. As demonstrated by the histogram's rise over the course of the evaluation, exceptional efficacy was obtained across 72 hours versus *An. quadrimaculatus*.

Similar results were obtained in Utah during the 2010 season by the Salt Lake City Mosquito Abatement District (SLCMAD) using the same formulation, Natular™ G, a single brood corn cob based formulation (0.5% AI). Larval populations of both *Culex tarsalis* and *Aedes dorsalis* were treated with this formulation from ATV-mounted granular spreaders previously calibrated for an application rate of 9 lbs per acre.

Surveillance (Fig. 6) was employed 24 hours prior to treatment as well as both 24 and 72 hours post-treatment and included non-target assessment. All of the collections made in the field were returned to the SLCMAD laboratory where identification took place.

The three sites monitored as part of the efficacy evaluation and displayed in Figure 5 document results similar to those in Figure 5. Two of three sites surveyed have had larval abundance reduced significantly within 24 hours; the third site follows suit at 72 hours post-treatment. Impacts to the wide array of non-target arthropods inventoried were not significant.

The corn cob G formulation has provided control of *Ae. taeniorhynchus* in the Florida Keys as well as *Aedes vexans* and *Ae. dorsalis* in Montana, and *Aedes melanimon*, *Aedes nigromaculis* and *Cx. tarsalis* in California and Washington.

In 2009, Natular™ efficacy evaluations were performed in 21 states in collaboration with more than 40 operational and university collaborators. These collaborators collected vital information related to product performance and keen insight into a variety of environmental and application methodology influences, as well as species interactions.

Further, international utilization of the DT tablet has helped to alleviate mosquito production in dengue ravaged areas, including the holy city of Mecca in Saudi Arabia. In late 2009 nearly 300,000 homes had production sites treated with the DT tablets. Sites achieved 63 days control at 97% efficacy and dengue was reduced by 71% in the treatment zone. As a result, Natular™ DT tablets were registered for use in Florida, specifically to meet the needs of the Florida Keys Mosquito Control District in their door-to-door dengue control efforts.

The spinosad based Natular™ formulations have been used across a wide range of mosquito production sites during the past two seasons. The 2EC formulation has met efficacy expectations on tidal wetlands versus *Aedes sollicitans* in New Jersey - applied aerially via fixed-wing aircraft, as well as in Waste Water Treatment

Plants (WWTP) and sewage influenced ditches in Louisiana versus *Cx. quinquefasciatus*.

Residual formulations such as the XRT tablet have provided districts with season-long control of *Culex* spp production in Minnesota catch basins and abandoned swimming pools in Saginaw, Michigan. Abandoned or "green pools" have been successfully treated with XRT tablets in Phoenix AZ. To date, more than twenty (20) mosquito species including several arbovirus vectors have been successfully controlled during operational evaluations.

Conclusion - Spinosad is designated a Group 5 insecticide by the Insecticide Resistance Action Committee (IRAC). IRAC is a global industry organization committed to promoting the development of insecticide resistance management strategies to maintain efficacy, support sustainable agriculture and improve public health. The unique mode of action of spinosad makes the Natular™ formulations perfect candidates for inclusion within a rotational, or resistance management program.

Stewardship of our insecticide control options is paramount to our ability to mitigate the public health impacts of mosquito mediated disease. Evaluations of new agents,

such as those carried out by industry professionals across the US between 2008 and 2010 with Natular™, are vital to the stewardship of this molecule. Understanding the role of Natular™ within IMM programs will continue to be defined by the professionals of our industry for years to come.

Acknowledgement – The authors would like to thank Dr. Banugopan (Banu) Kesavaraju of the Salt Lake City Mosquito Abatement District for Figure 7 and both Banu and Greg Jensen for all the effort associated with its data accumulation. We would also like to thank Dr. Stephen Manweiler of Metropolitan Mosquito Control District, MN for his figures and efforts.

Selected References

Hertlein MB, Mavrotas C, Jousseau C, Lysandrou M, Thompson GD, Jany W, Ritchie SA. 2010. A review of spinosad as a natural product for larval mosquito control. *J Am Mosq Control Assoc* 26(1):67-90.

Saldago, VL, Sparks TC. 2005. The Spinosyns: Chemistry, biochemistry, mode of action, and resistance, In L.I.Gilbert, K.Iatrou, and S. Gill (eds), *Comprehensive Insect Molecular Science*, Vol. 6 Control, Elsevier, B.V, pp. 137-173.

Fig. 1. Cumulative pupal populations in Natular™ T30 treated and control catch basins in Minnesota as treated and surveyed by the Metropolitan MCD (2008).

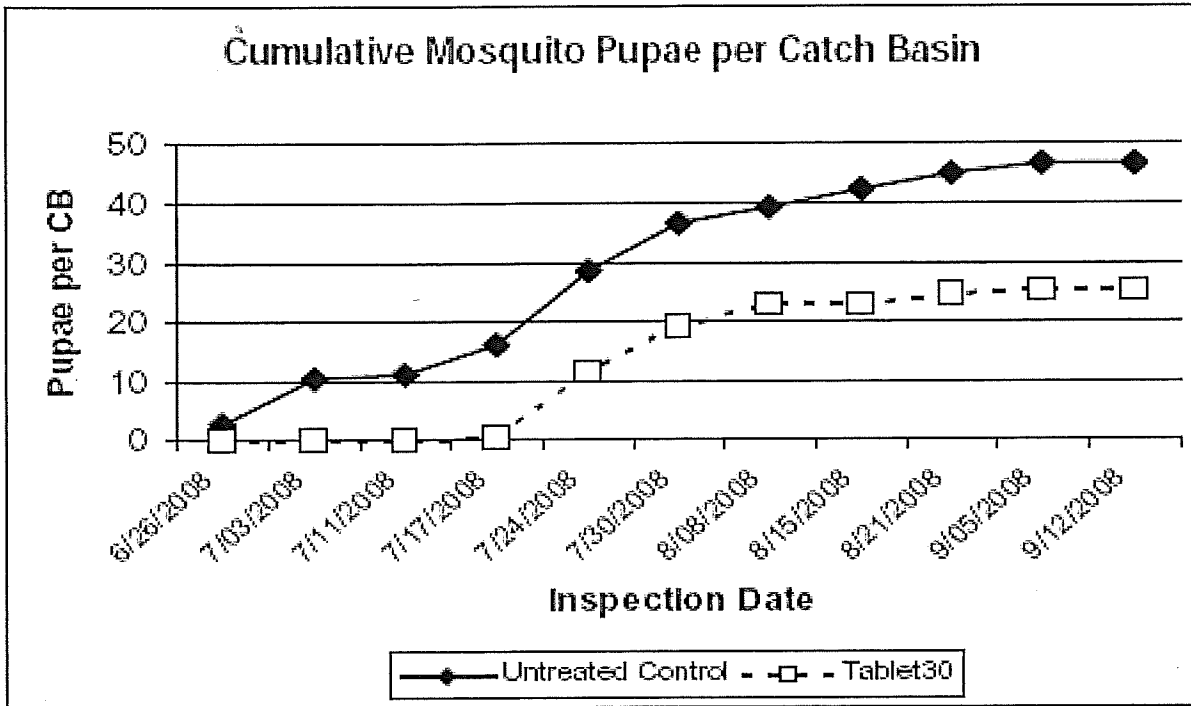


Fig. 2. Cumulative pupal populations in Natular™ XRT treated and control catch basins in Minnesota as treated and surveyed by the Metropolitan MCD (2008).

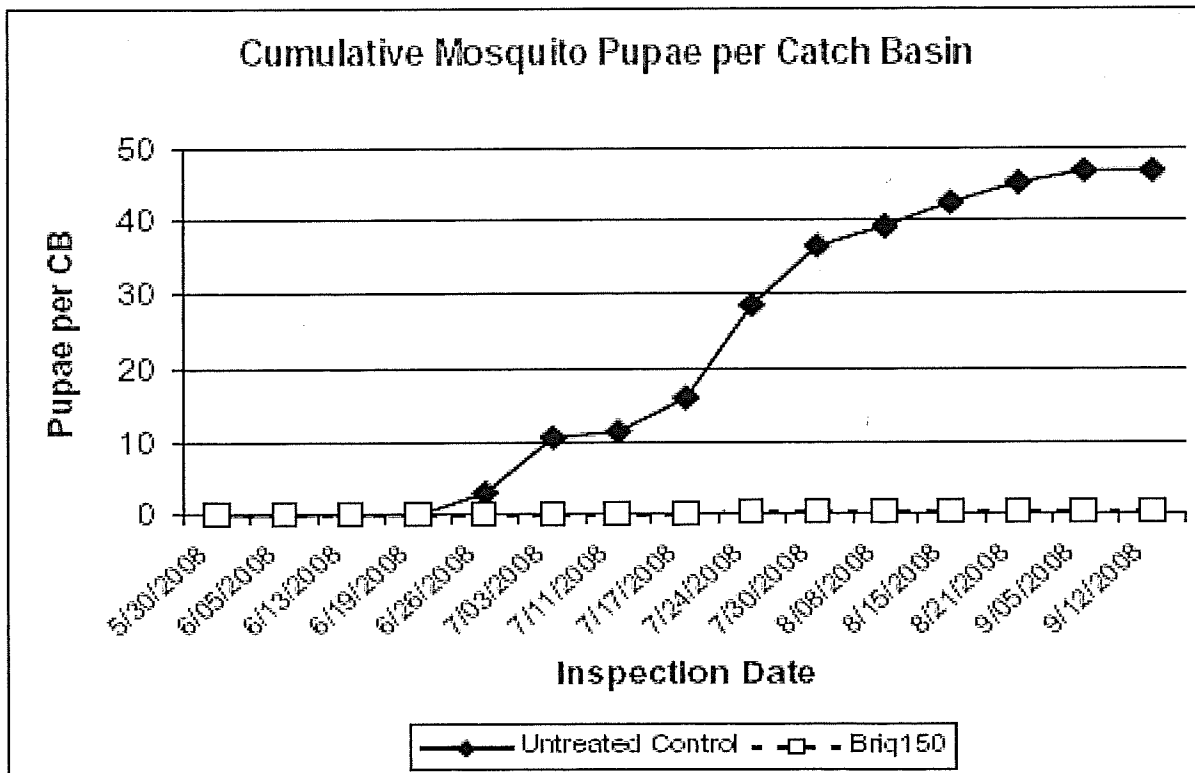


Fig. 3. Natular™ XRG applied as a pre-hatch treatment at the rate of 10lbs/acre to a dry retention pond site in Illinois and resulting efficacy delineated through standard dip counts in treated and control sites versus *Ae. vexans* and *Cx. pipiens* over 35 days.

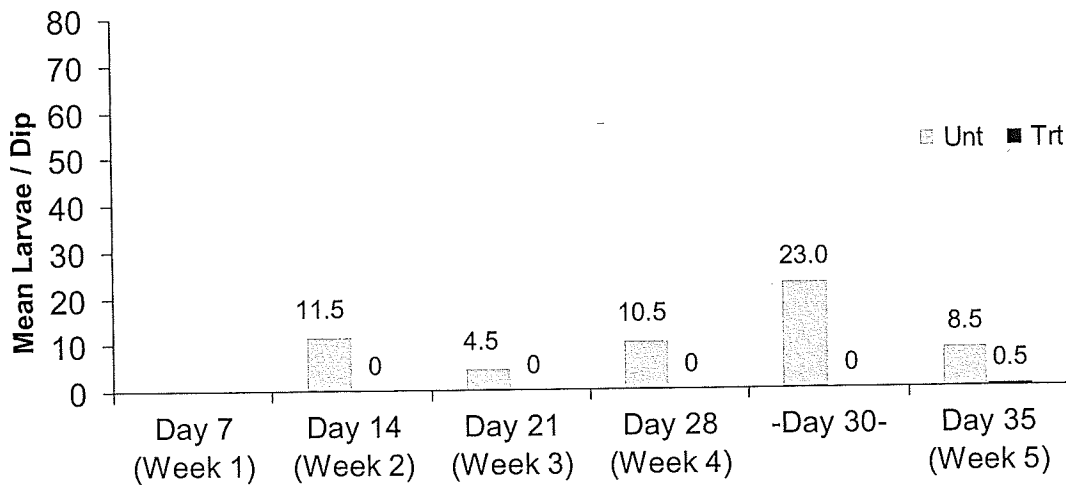


Fig. 4. Natular™ XRG applied at the rate of 10lbs/acre to culverts in Minnesota by the MMCD in 2009 and resulting efficacy versus *Cx. restuans*.

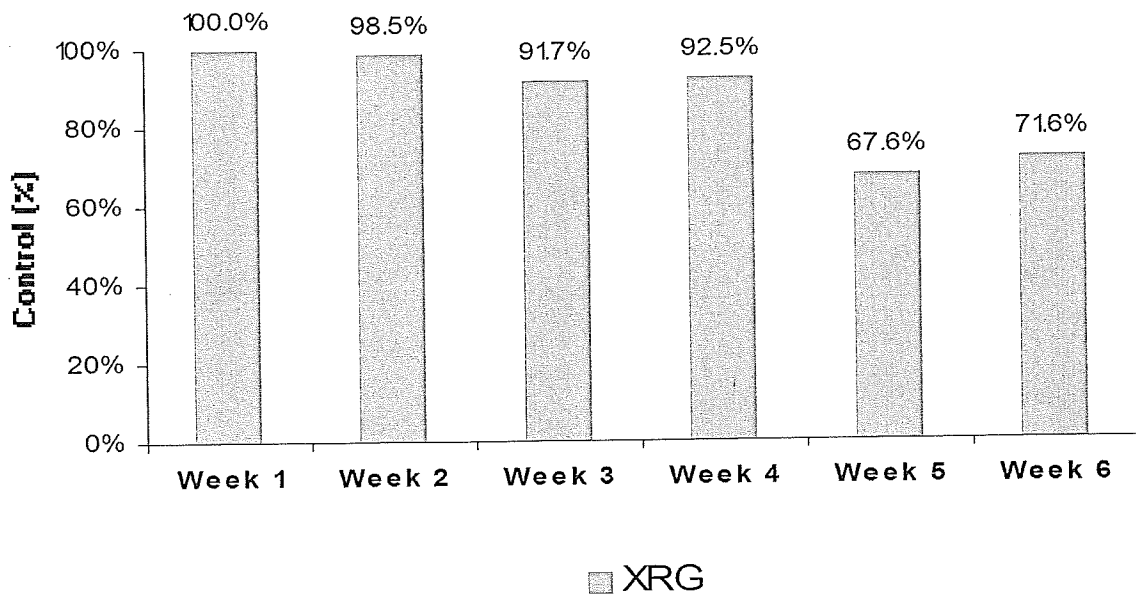


Fig. 5. Natular™ G induced mortality over a 72 hour period as applied at the labeled minimum and mid-rate rate as treated and monitored by the University of Kentucky.

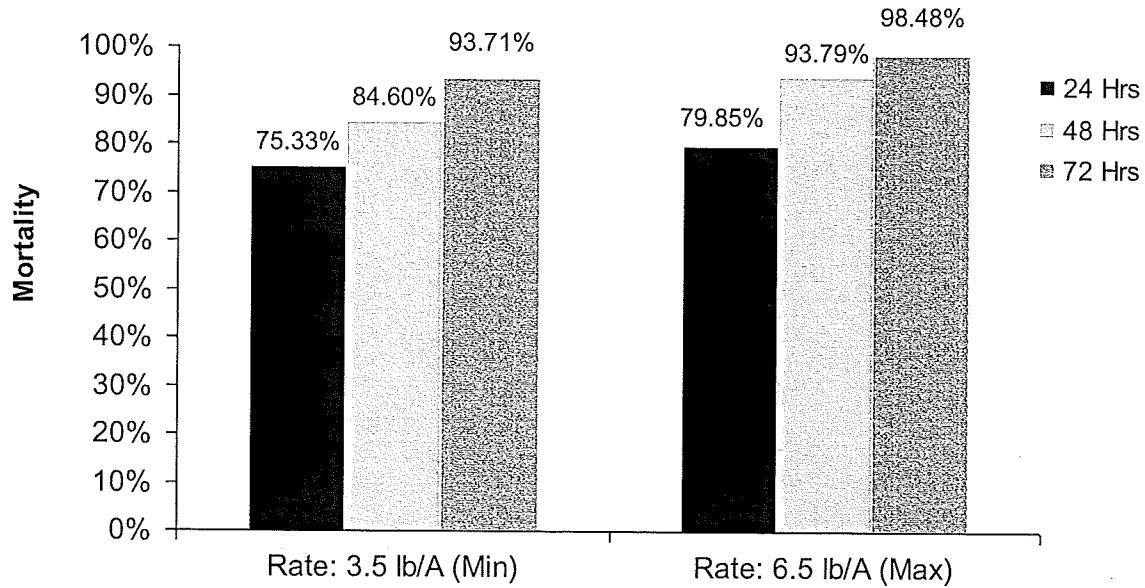
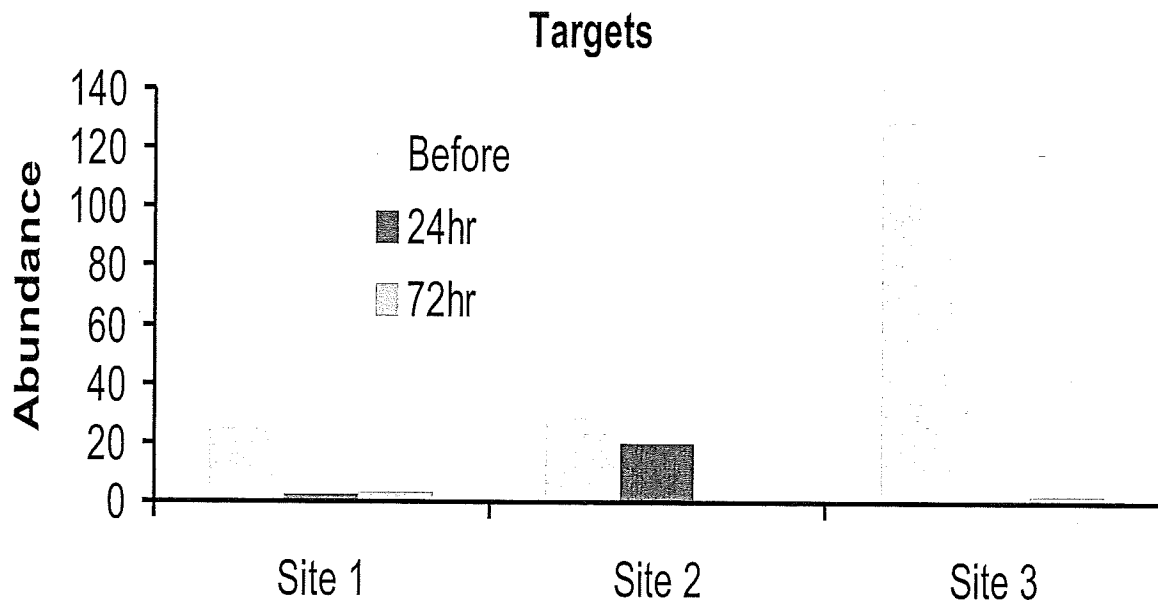


Fig. 6. Natular™ G was applied at the rate of 9 lbs/acre to typical *Ae. dorsalis* / *Cx. tarsalis* habitat and the results monitored by staff of the Salt Lake City Mosquito Abatement District (July – 2010).



Fig. 7. Natujar™ G mortality over a 72 hour period as applied at the labeled maximum rate of 9 lbs per acre as treated and monitored by the Salt Lake City Mosquito Abatement District.



Education Program at the South Valley MAD

Patrick Smith

South Salt Lake Valley MAD
7308 S. Airport Road
West Jordan, UT 84084

This year was a successful one for education at the South Salt Lake Valley MAD. We tried several new ideas and we were able to see positive results from our attempts to provide education about mosquitoes and mosquito control to the public. We would like to take this opportunity to share some of the things we learned.

We had several booths at various fairs, festivals, etc. We found these to be a very effective source for raising public awareness about mosquitoes. There were a few things that we felt made the difference between a successful booth and an unsuccessful one.

Location, location, location. We found it to be worthwhile to pay a little extra money to get a booth space that is in higher traffic locations. By our estimates visitors to our booth were about three times higher when we had a good location.

Appeal to the children. Many parents, who would not normally take the time to stop, will stop if their children find something interesting. We tried to provide a variety of activities. We had a beanbag toss, a fish tank (where they could feel larvae to the fish), compound eye glasses, and magnifying glasses. While one of our crew entertained the

kids the other crew member would approach the parent.

Another activity we found to be effective were special events for school children. We were able to present at zoo days at the Hogle Zoo, farm days in Herriman, and the health fair at Indian Hills Middle School. At all of these events we were able to reach out to hundreds of students in just a few days of presentation. We provided them with handouts to take home to their parents and had them pledge to look for, and eliminate, mosquito spots in their own yards.

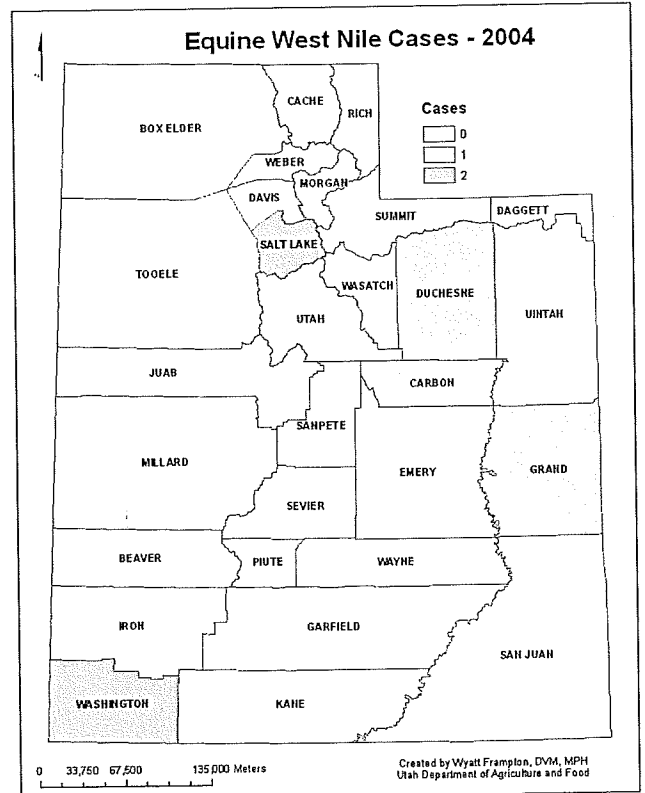
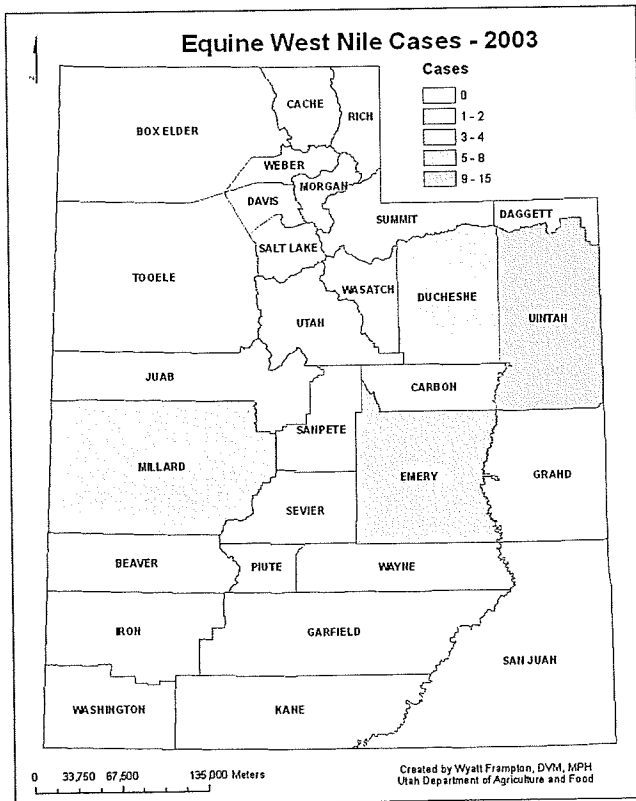
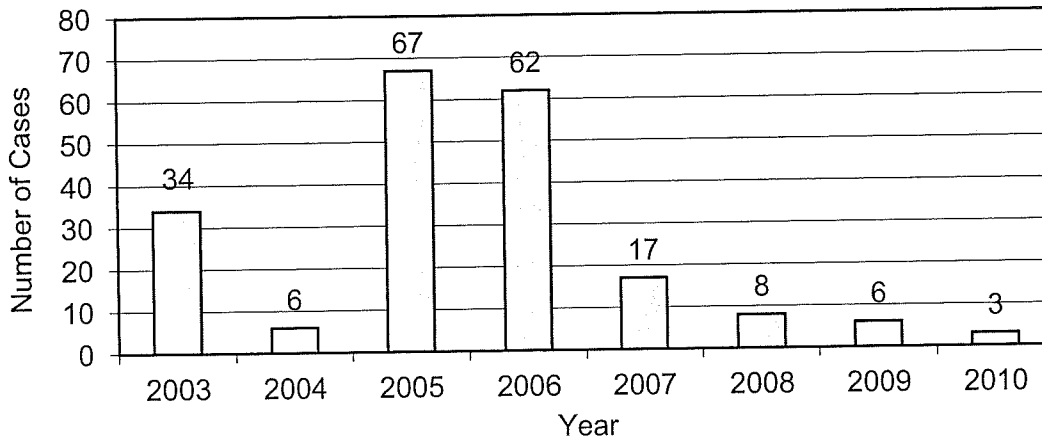
One thing we found to be ineffective were presentations in grocery stores. We arranged with several grocery stores to have a booth in the entrance. We found that people were too busy or uninterested in stopping and learning. Unlike the fair or other activities, people did not come to the grocery store to stop at an educational booth.

Other ideas we are hoping to implement this year are: visiting Home Owners Association's about potentially presenting to the homeowners, working with scouts to spread word about mosquitoes and WNV, going into elementary schools, and expanding the number of outdoor events we visit.

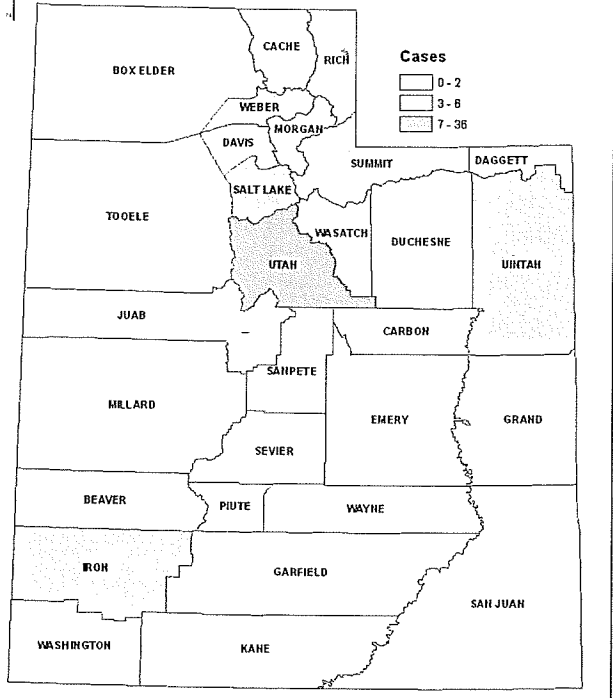
The Current Status of Equine West Nile Virus and Heartworm in Utah

Wyatt Frampton, D.V.M., M.P.H.
 Utah Department of Agriculture and Food
 Salt Lake City, UT

Number of Equine West Nile Cases in Utah from 2003 to 2010
 (as of October 4, 2010)

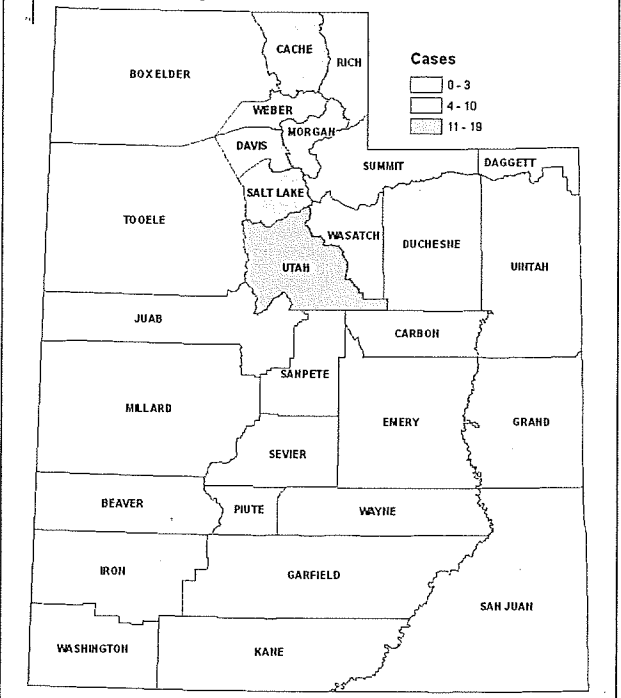


Equine West Nile Cases - 2005



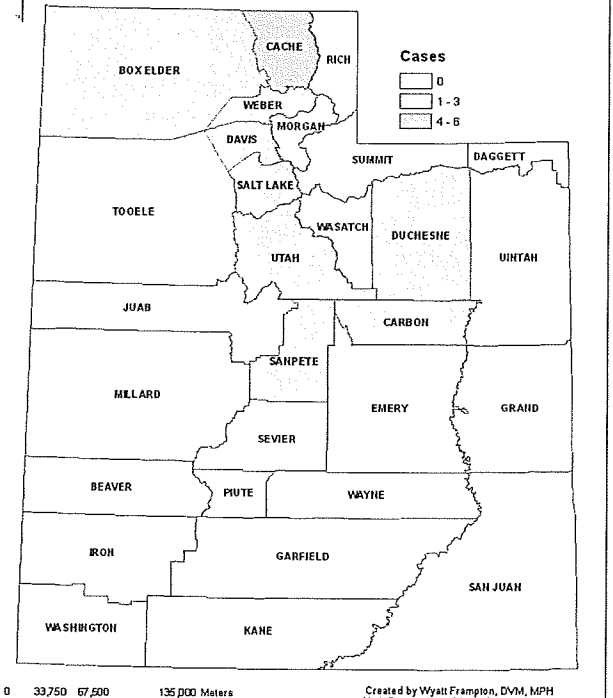
Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

Equine West Nile Cases - 2006



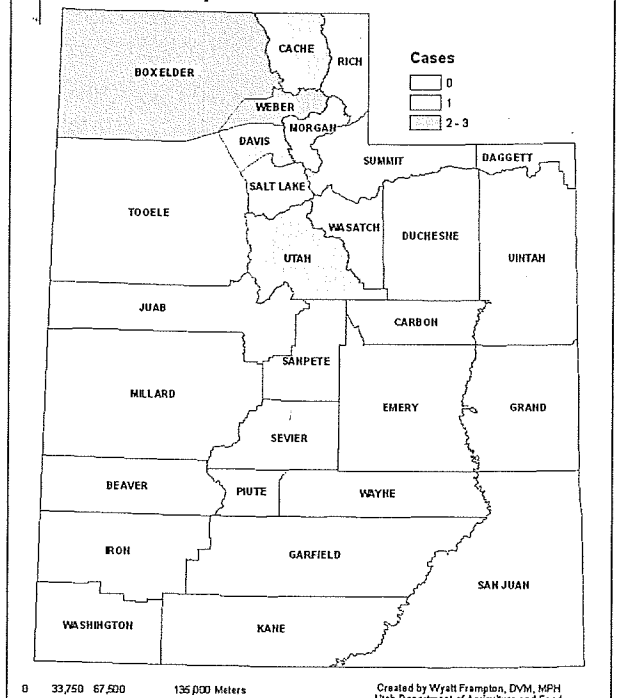
Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

Equine West Nile Cases - 2007

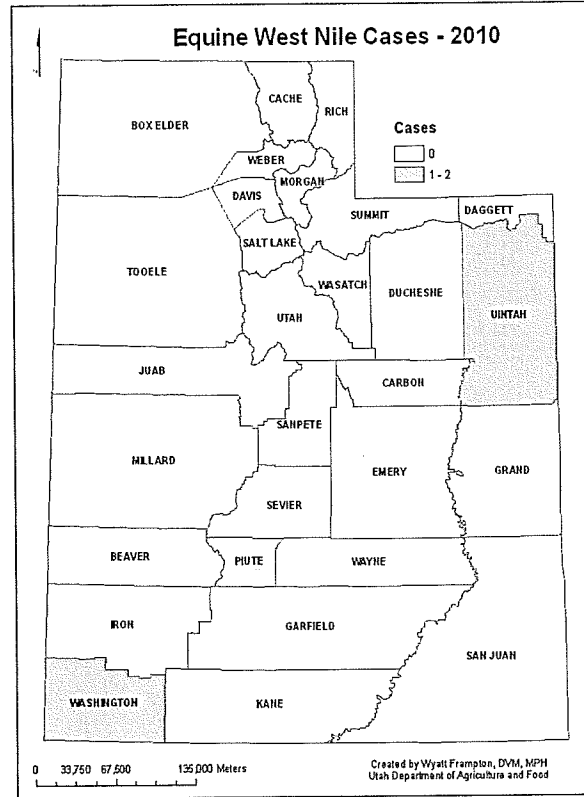
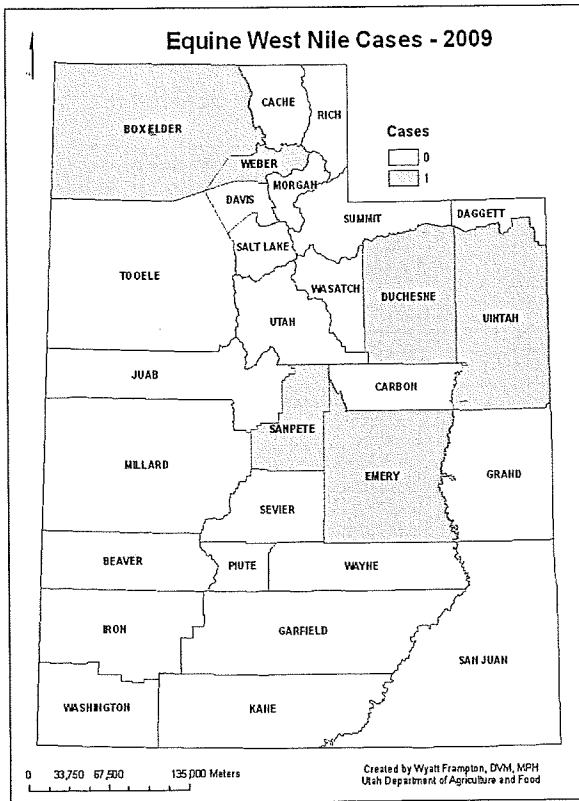


Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

Equine West Nile Cases - 2008



Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

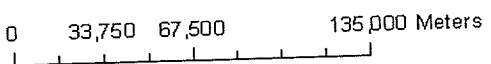
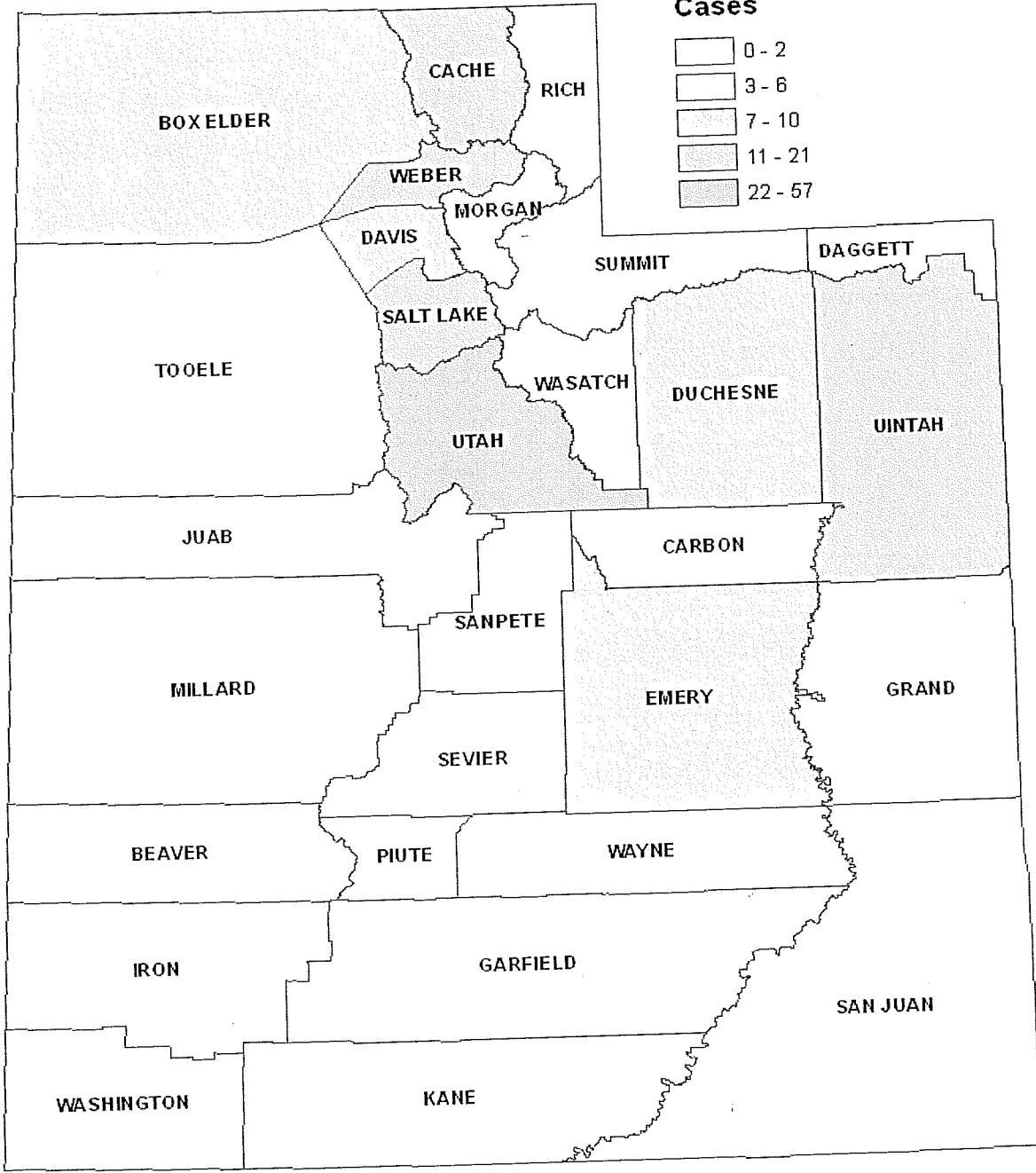
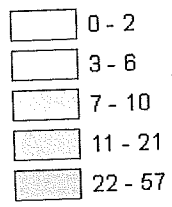


County	2003	2004	2005	2006	2007	2008	2009	2010
Beaver			1					
Box Elder			1	2	3	2	1	
Cache				10	6	1		
Carbon					1			
Davis			1	5		1		
Duchesne	4	1	1	1	1		1	
Emery	8			1			1	
Grand		1	1					
Iron			5					
Juab			1	1				
Kane								
Millard	3			2				
Salt Lake		2	6	10	1			
San Juan								
Sanpete	2			1	1		1	
Sevier								
Summit				1				
Uintah	15		4				1	
Utah			36	19	1	1		1
Wasatch				3				
Washington		2	2					2
Wayne	2							
Weber			4	6	1	3	1	
Unknown			2					
Total	34	6	67	62	17	8	6	3

Equine West Nile Cases - 2003 to 2010

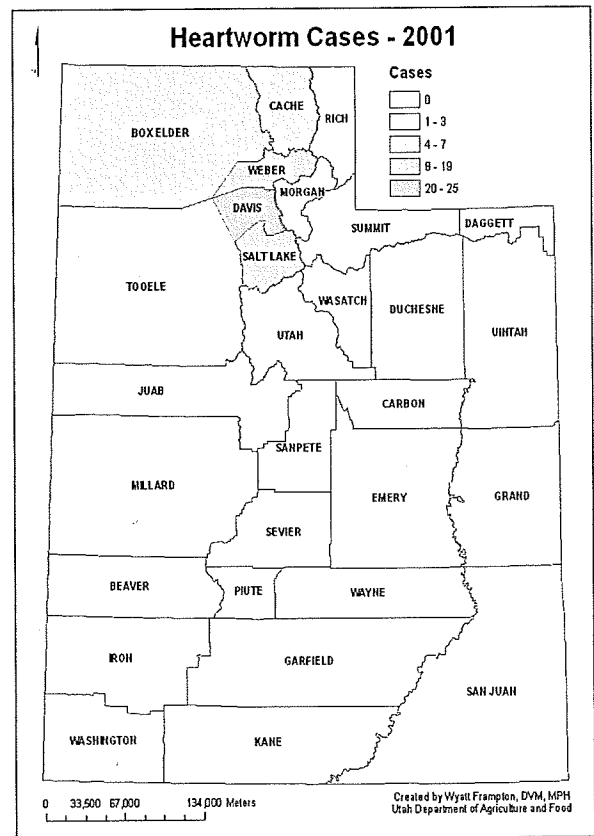
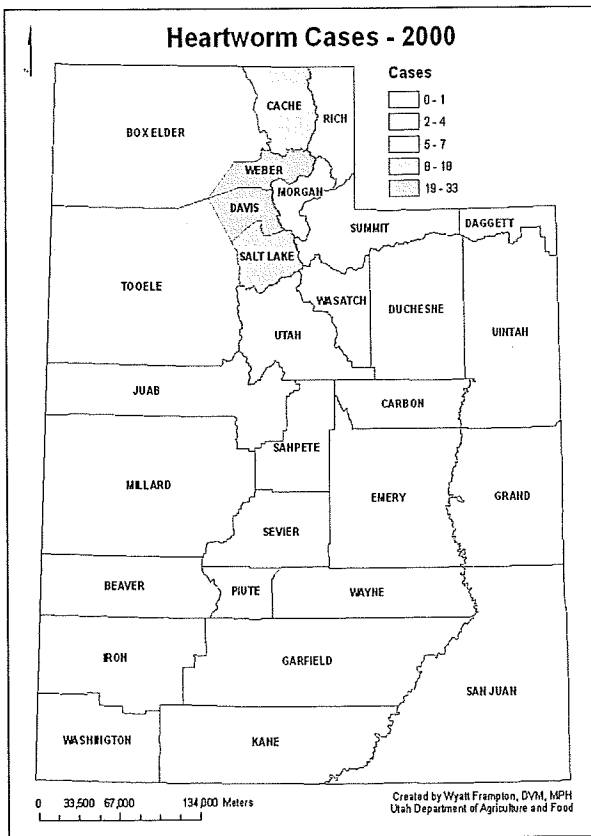
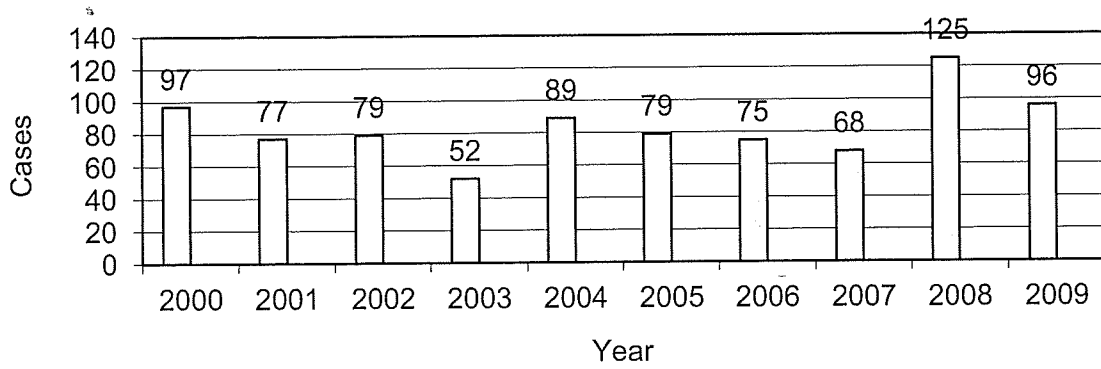


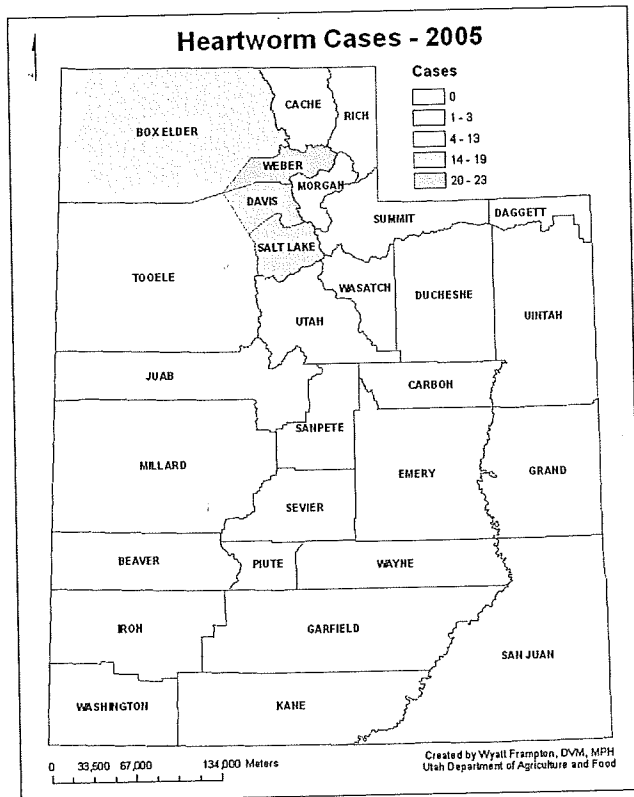
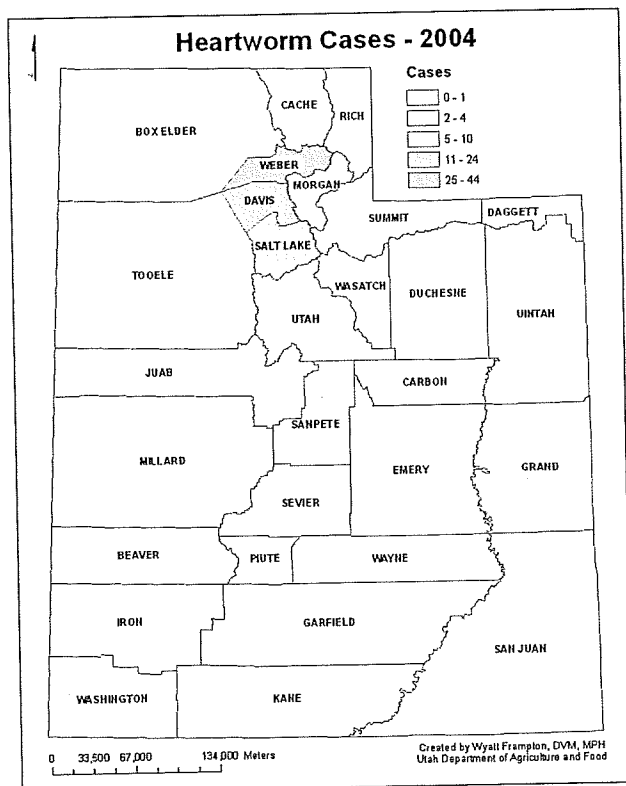
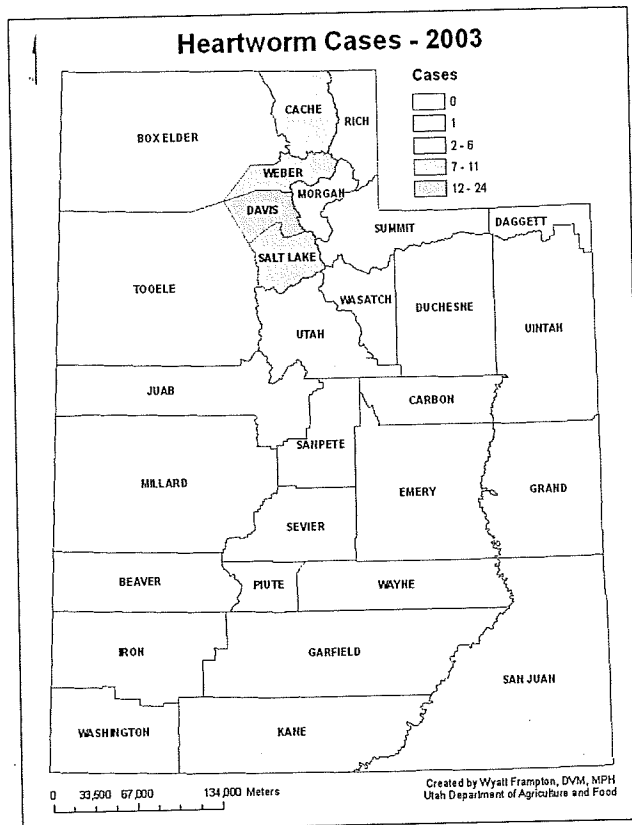
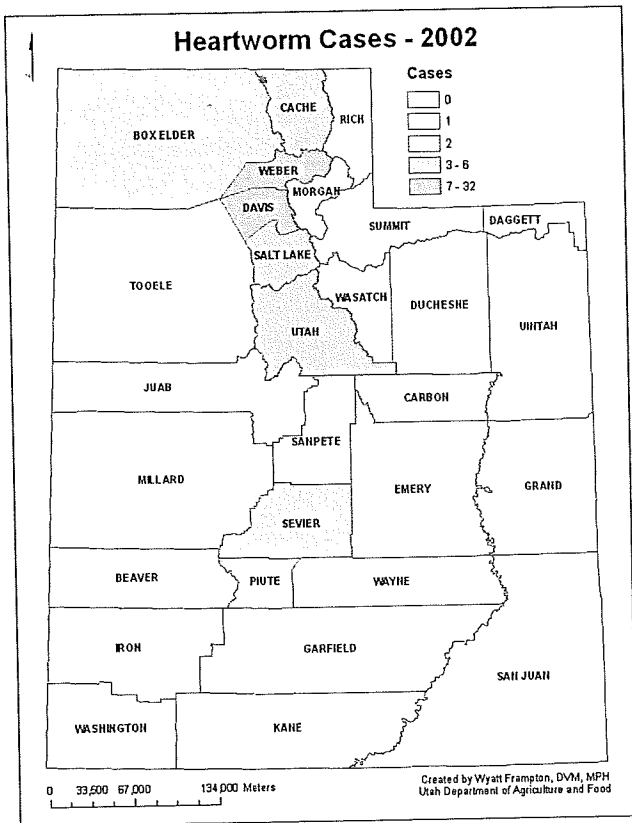
Cases

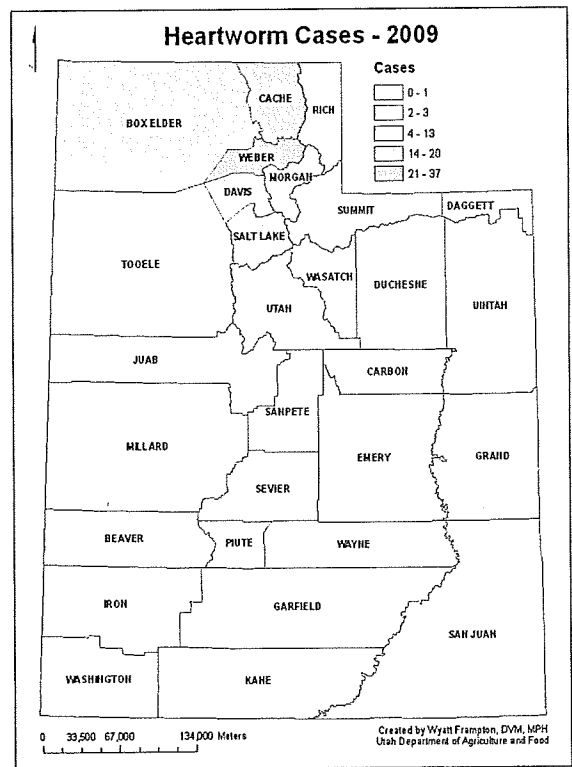
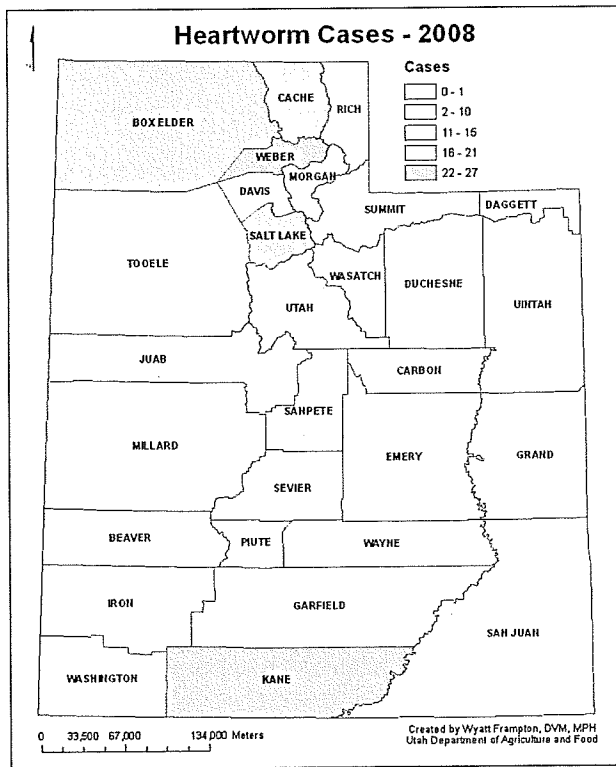
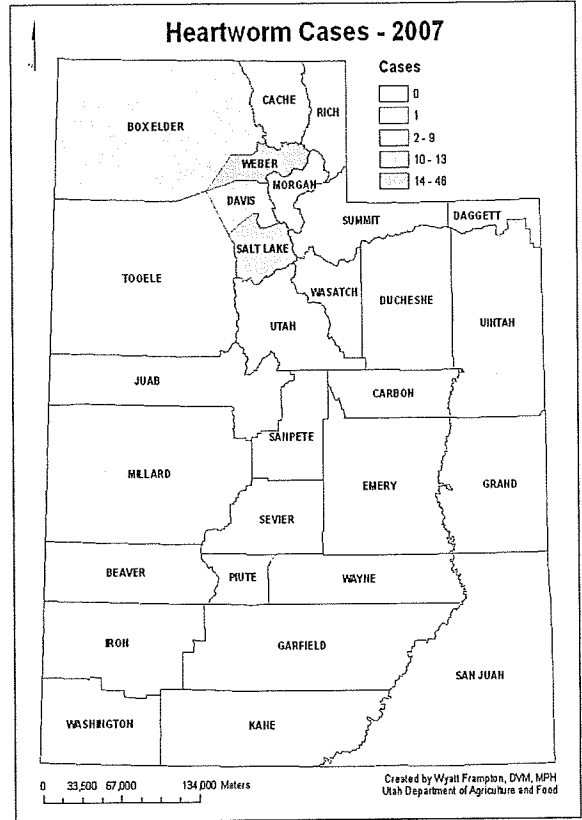
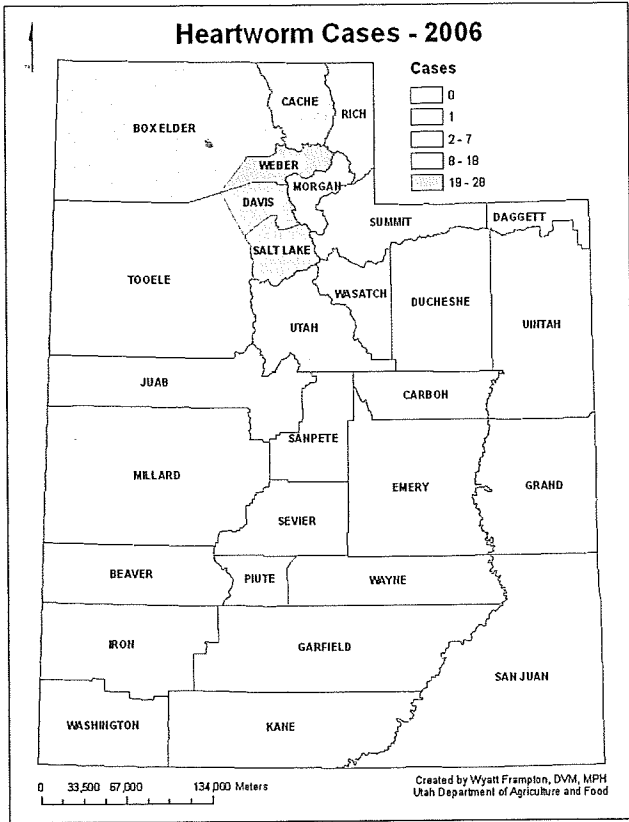


Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

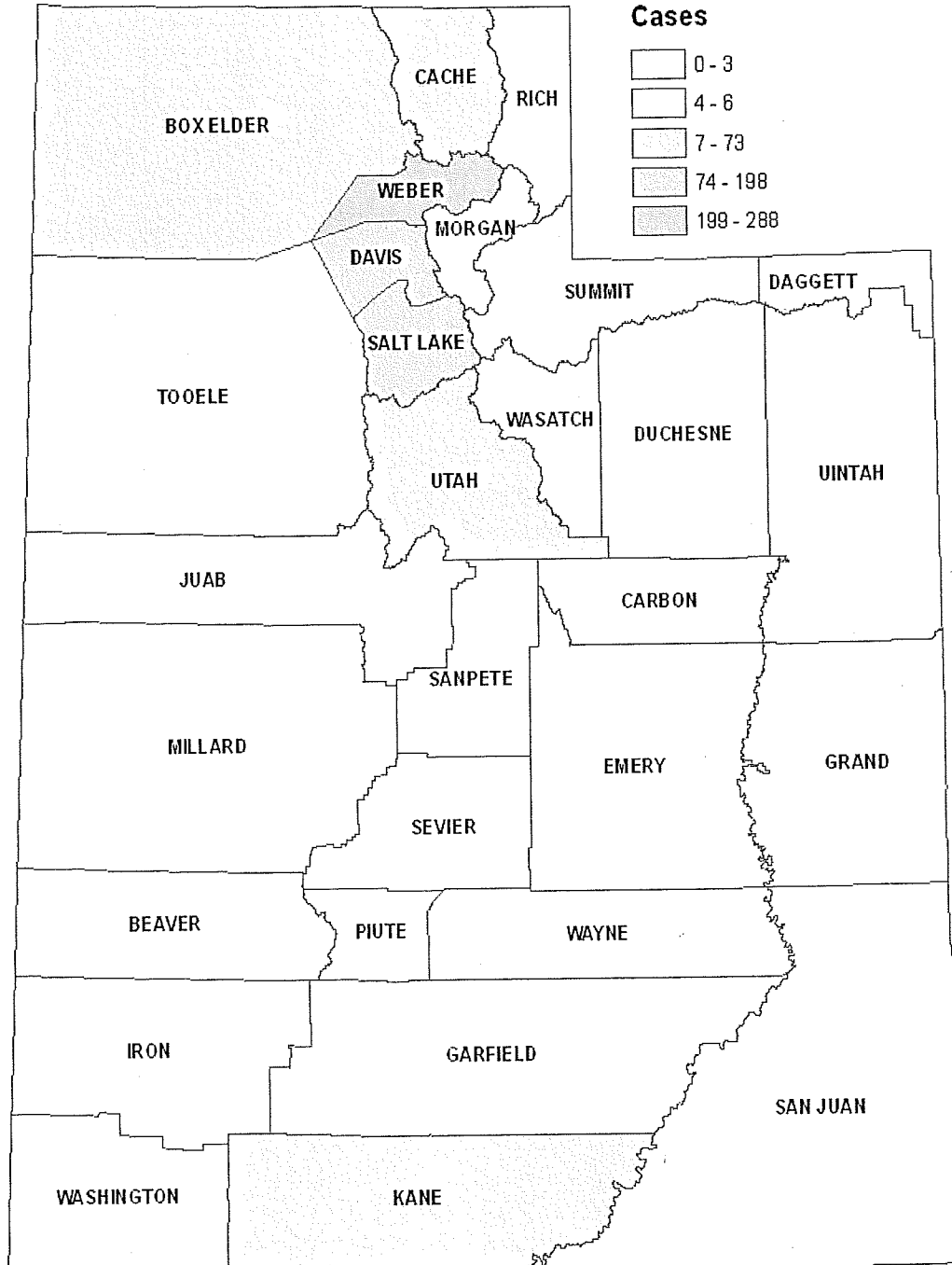
Cases of Heartworm in Utah from 2000 to 2009







Heartworm Cases 2000 to 2009



0 33,500 67,000 134,000 Meters

Created by Wyatt Frampton, DVM, MPH
Utah Department of Agriculture and Food

More Mosquitoes, More Data and More Insights

Danny M. Miler and Robert C. Mower

Utah County Health Department
Mosquito Abatement Division
2855 South State Street
Provo, UT 84606

For the past three mosquito seasons, a rotator trap has been used to collect data on when various species of mosquitoes are flying (Miller 2008, Miller and Mower 2009). The purpose of the study has been to compare flight time as it relates to temperature, wind speed and time of day to see if any trends can be detected.

Data on flight times of the various mosquito species was collected using a John W. Hock Company Rotator Bottle Trap in association with a Clarke ABC trap baited with CO₂. In 2010, the number of trap nights was increased to forty-three. The trap was set up three times per week from June through September. In previous studies the trap had been set up just once each week. Over the season 35,902 mosquitoes were collected in the trap.

It became very clear that between 9:00 PM and midnight was the optimum flight time for nearly all species of mosquitoes in our area (Fig. 1). The percentage of adult mosquitoes trapped, in this three hour time frame, in all summer months from 2008 through 2010 ranged from a low of 60.1% in August 2008-09 to 90.4% August 2010.

The time slot between 9:00 to 10:00 PM collected the most adult mosquitoes, 28.35% of all mosquitoes trapped (Fig. 2). The collections from 2:00 to 7:00 AM, 26.75% of the total, was less than the 9:00 to 10:00 PM hour.

Temperatures during June were unusually cool and definitely had an effect on flight time behavior. When evening temperatures dropped below 50°F mosquitoes of all species stopped flying (Fig. 4). Similarly, less activity was observed when sustained wind speeds were above 2 mph (Fig. 5).

The three *Culex* species captured in the rotator trap showed definite seasonal trends. *Culex pipiens* were present in early summer and fall, *Culex tarsalis* early and mid-summer and *Culex erythrothorax* in the late summer and fall (Fig. 6).

This project will be continued in 2011. The focus will be to look at mosquito species flight times based on weather, temperature and wind speed, as well as day length. Since the rotator bottle trap only has eight collections jars, two traps will be used in tandem so that sixteen time slots per day can be sampled. To better define flight times, intervals of one-half hour will be used.

References Cited:

- Miler DM. 2008. Observations from using a collection bottle rotator trap. Proceedings of the 61st Annual Meeting of the Utah Mosquito Abatement Association, pp 34-38.
- Miller D and RC Mower. 2009. Mosquito Activity, Two Years of Trapping and Data Insights. Proceedings of the 62nd Annual Meeting of the Utah Mosquito Abatement Association, pp 6-7.

Figure 1. Grouped flight times for all species throughout the season, 2008-09 and 2010

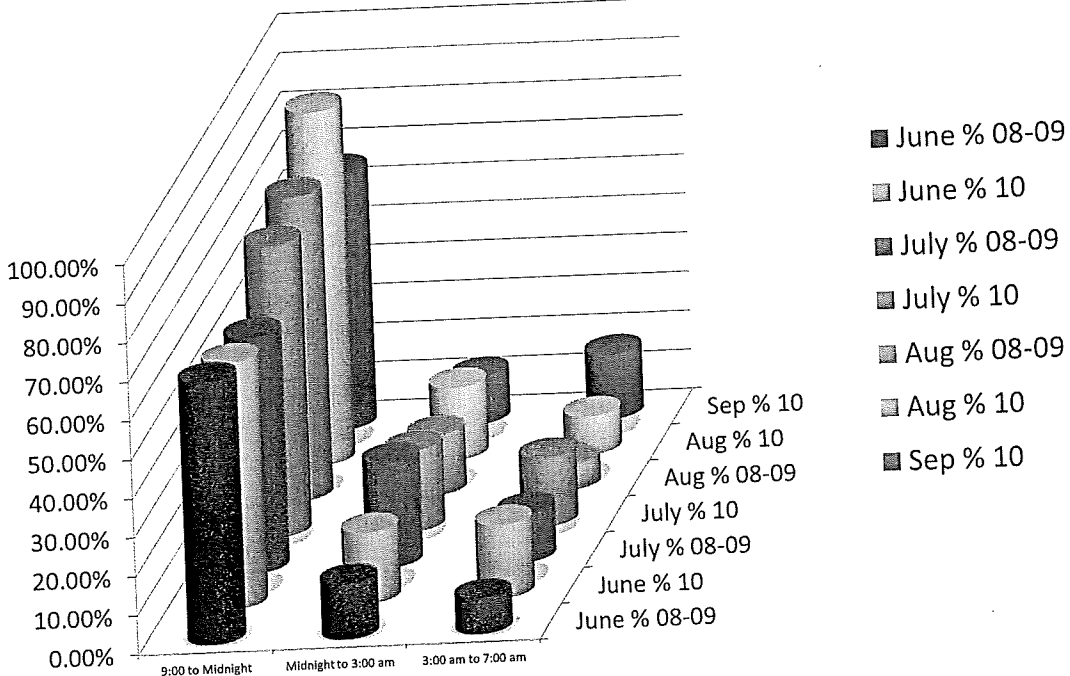


Figure 2. Percent of total mosquitoes collected in rotator traps in each hourly interval between 6:00AM and 7:00 AM. Note that two intervals were for multiple hours, 6:00 -8:00 PM, 2 hours, and 2:00 AM to 7:00 AM 5 hours.

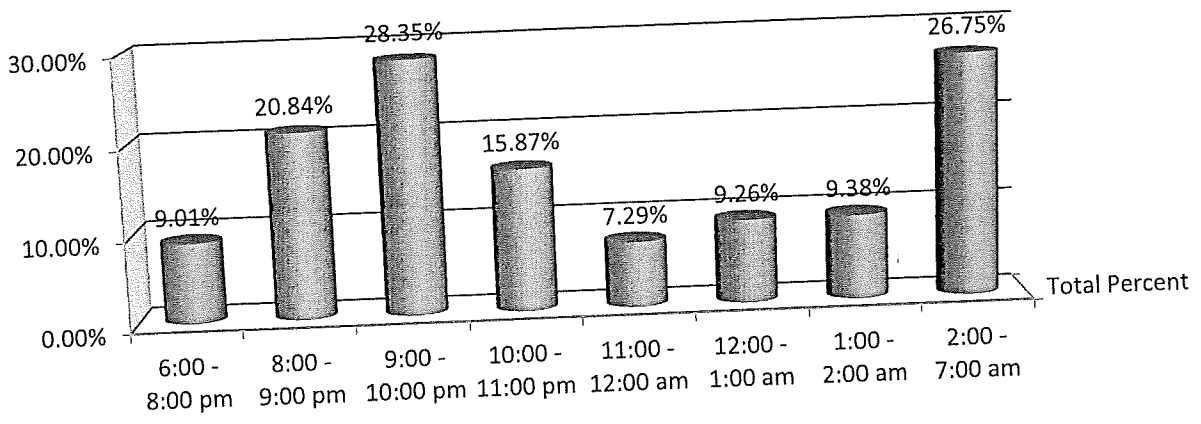


Figure 3 . Percent of adult mosquitoes collected by time interval and month with time of sunset.

Date	Trap Time Interval							sunset
	6:00 – 8:00 PM	8:00- 9:00 PM	9:00 – 10:00 PM	10:00 – 11:00 PM	11:00 PM to midnight	Midnight to 1:00 AM	1:00 - 2:00 AM	
June 10	6.3	4.4	12.2	40.1	14.5	13.5	9.5	8:59
July 10	10.0	1.1	7.3	41.0	19.9	9.1	9.5	9:00
August 10	7.7	4.2	19.7	36.5	16.7	7.0	8.5	8:52
September 10	13.4	10.9	21.1	15.5	23.8	6.4	9.0	7:45

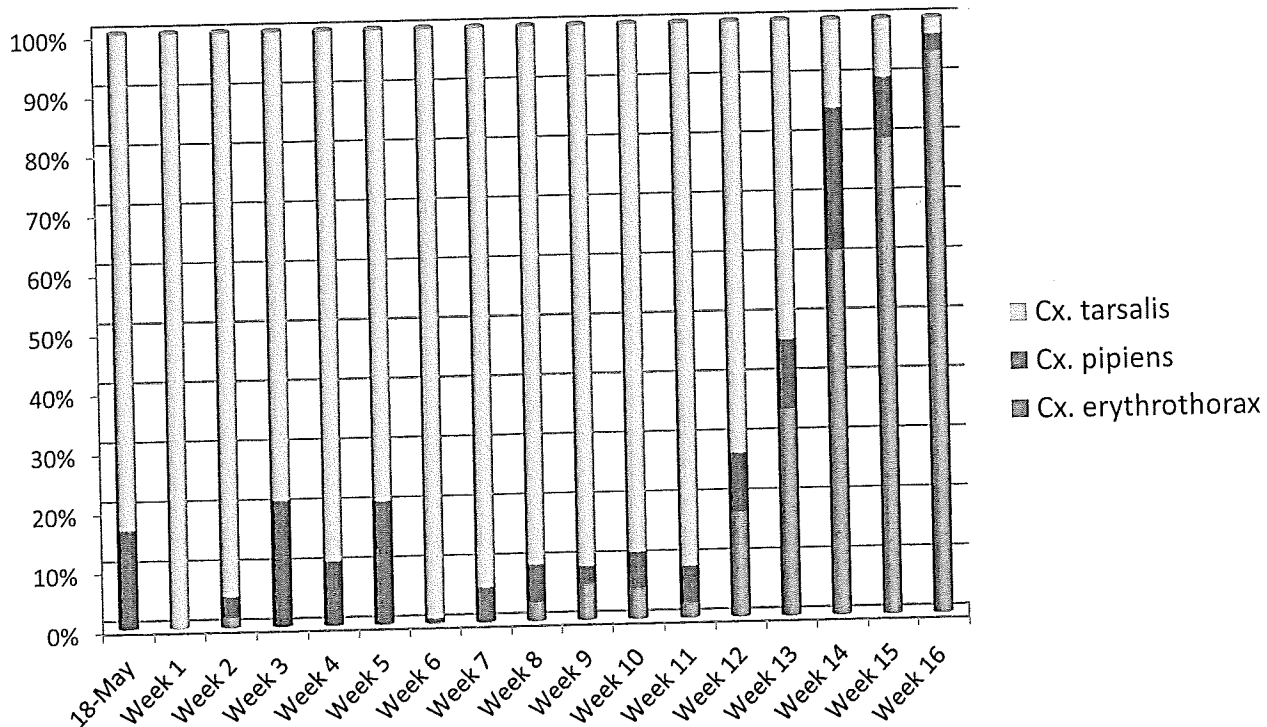
Figure 4. Temperature and number of mosquitoes trapped at hourly intervals through the night. Shaded area indicates periods with temperatures below 50° F.

	Provo Bay 6-14		RR 6-16		SR 6-21		SRS 8-9		Vine 8-10		SRS 8-23		Vine 8-31	
	#	Temp	#	Temp	#	Temp	#	Temp	#	Temp	#	Temp	#	Temp
6:00 - 8:00 pm	3	73.40	3	57.75	28	104.84	1	83.94	0	78.13	2	91.95	1	68.81
8:00 - 9:00 pm	6	73.33	0	53.98	110	81.47	12	73.98	1	65.45	125	64.60	86	62.90
9:00 - 10:00 pm	1	56.88	32	52.80	50	62.53	282	61.55	3	55.58	174	55.25	85	57.05
10:00 - 11:00 pm	5	52.85	8	50.00	24	57.60	269	58.08	0	52.20	70	52.98	24	56.80
11:00 - 12:00 am	0	50.33	0	45.30	11	54.57	37	54.60	1	51.43	10	48.85	5	48.80
12:00 - 1:00 am	0	48.83	0	46.15	6	50.13	8	51.40	0	51.08	6	48.48	1	43.35
1:00 - 2:00 am	0	47.03	0	48.38	20	48.63	3	50.88	0	48.58	7	47.48	1	42.20
2:00 - 7:00 am	0	45.01	0	41.49	0	47.33	7	46.88	0	48.21	14	43.66	7	39.27

Figure 5. Wind Speed (mph) and number of adult mosquitoes trapped at hourly intervals through the night. Shaded area indicates periods with sustained wind above 2 mph.

	RR 6-9-10		RR 6-16-10		RR 6-30-10		Vine 7-20-10		RR 8-11-10	
	#	Wind	#	Wind	#	Wind	#	Wind	#	Wind
6:00 – 8:00 PM	2	3.8	3	8.4	0	4.8	5	0.0	3	5.1
8:00 – 9:00 PM	1	4.9	0	4.3	1	2.5	10	0.0	13	0.4
9:00 – 10:00 PM	6	5.4	32	3.1	111	3.0	3	0.8	356	0.0
10:00 – 11:00 PM	1	5.8	8	0.0	63	1.6	12	1.7	165	0.0
11:00 PM - midnight	0	7.1	0	0.0	7	3.3	60	0.0	77	0.0
Midnight – 1:00 AM	33	2.2	0	1.9	2	2.0	34	0.0	38	0.3
1:00 – 2:00 AM	17	0.0	0	3.7	0	6.2	26	0.0	57	0.0
2:00 – 7:00 AM	90	0.1	0	0.8	2	5.6	94	0.0	143	0.28
Total Caught	150		43		186		244		852	

Figure 6. Percentage of *Culex* species May through September .

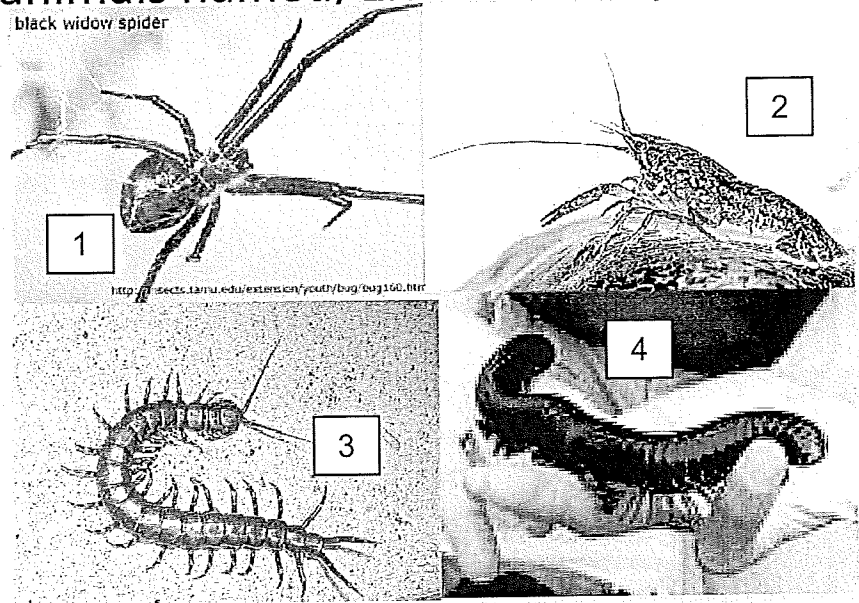


Arthropods, A Story Of Success
Secondary Education Program

Robert C. Mower
Utah County MAD
2855 S. State Street
Provo, UT 84606

What are arthropods?

- Jointed feet, exoskeleton, segmented
- 80% of all animals named, 1.5+ million species named
- Arachnida
- Crustacea
- Chilopoda
- Diplopoda



1 - Arachnida
2 - body parts
4 - pairs of legs

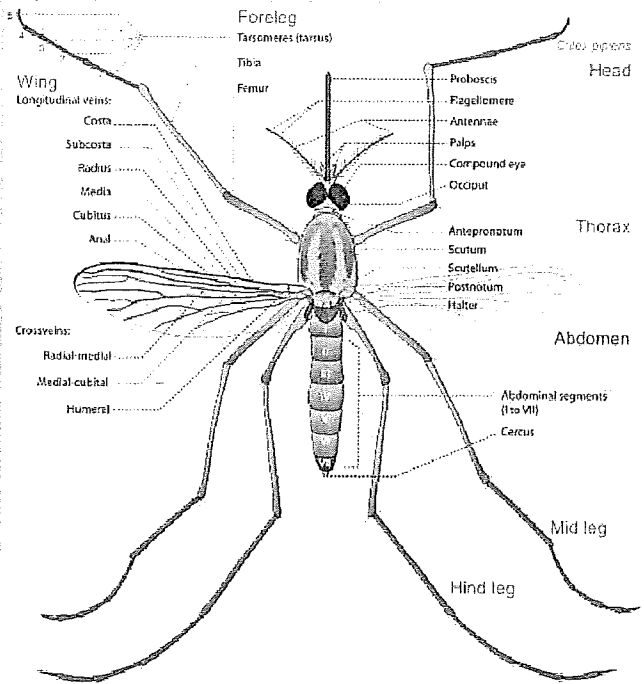
2 - Crustacean
Head and cephalothorax
5 - pairs of appendages

3 - Chilopoda
1 - pair legs per body segment flattened

4 - Diplopoda
2 - pair legs per body segment rounded

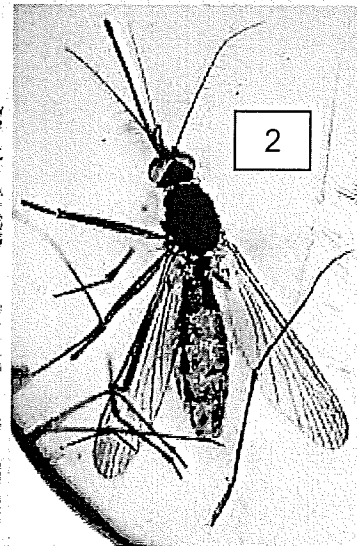
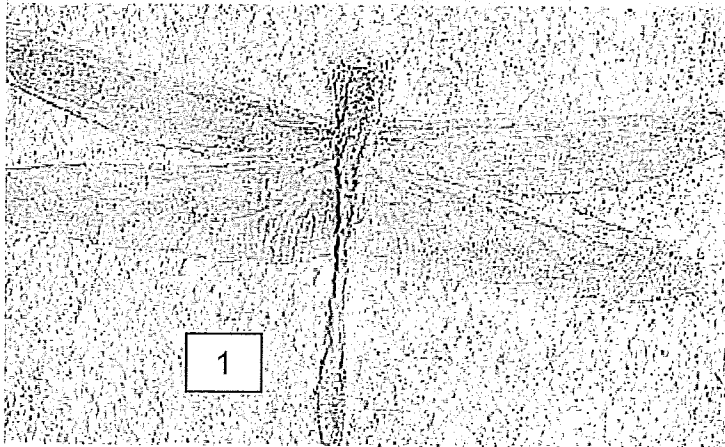
Hexapoda (Insecta) -largest class

- Three body parts
 - Head
 - Thorax
 - Abdomen
- 1 pair antenna
- 1 pair mandible
- 2 pair of wings
- 3 pair legs



Reasons for success

- Geologically old group, transition to terrestrial habitat
 - 420 mya Silurian (hexapods)
 - 390 mya Devonian (NA)
 - 350 mya Carboniferous (winged)



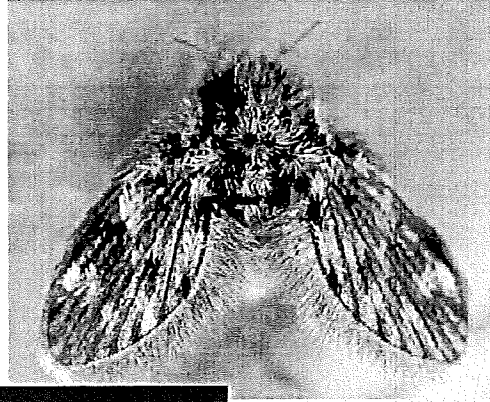
1. Fossil Dragon fly (protodonata) 27" wing span. 2. Amber fossils of mosquitoes (Jurassic Park).

Size-occupy micro niches

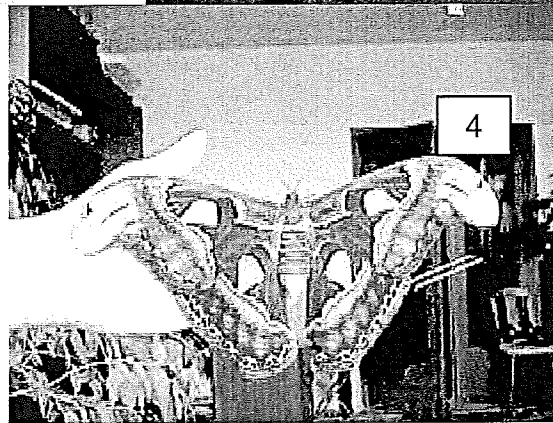
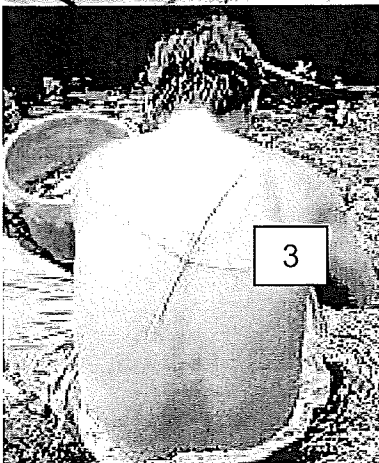
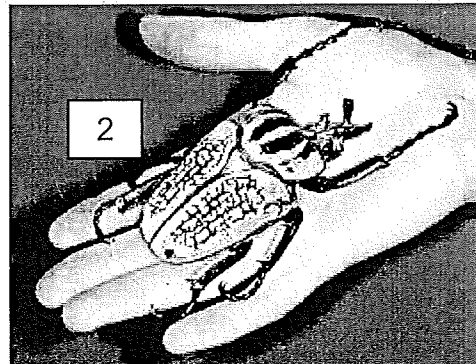
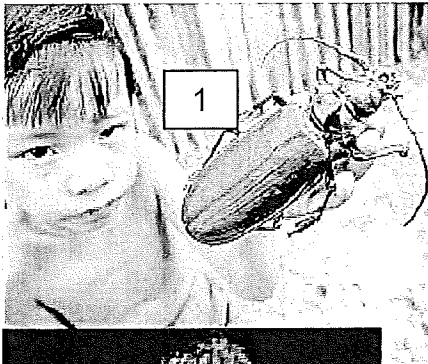
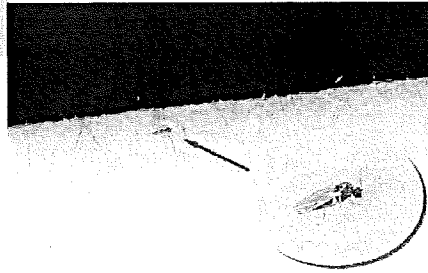


Mymaridae
fairyfly .25 mm

Psychodidae
moth fly

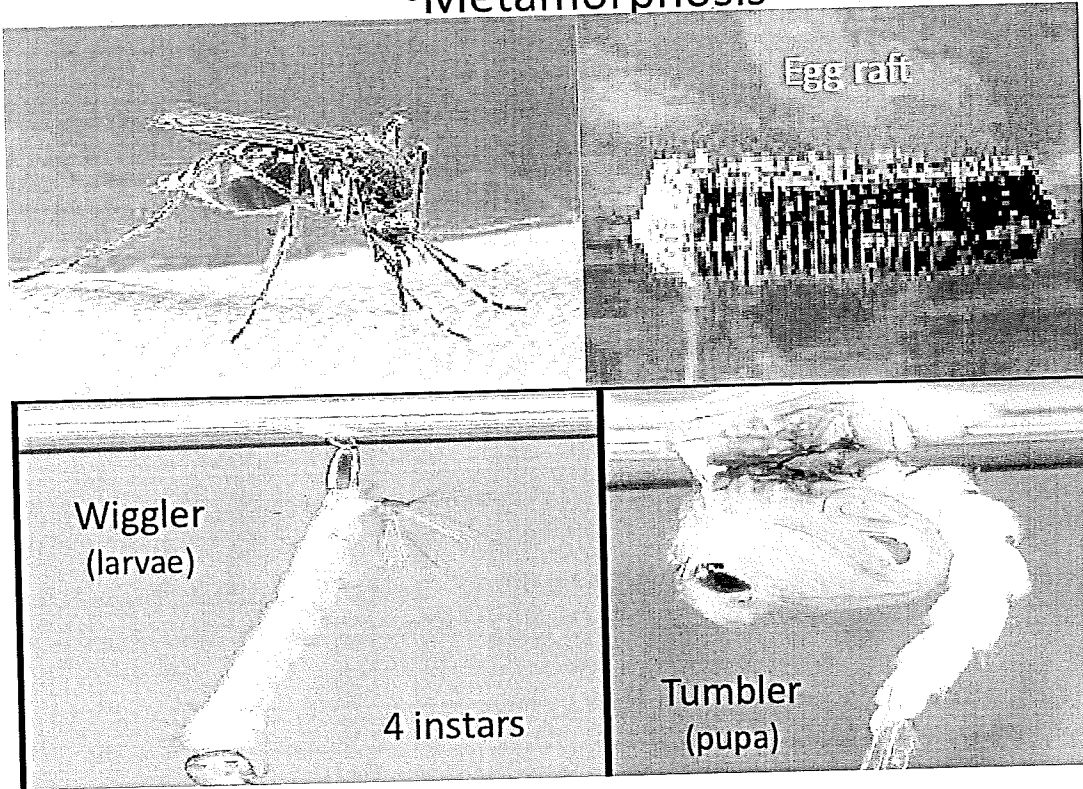


Ceratopogonidae
"no see-ums"



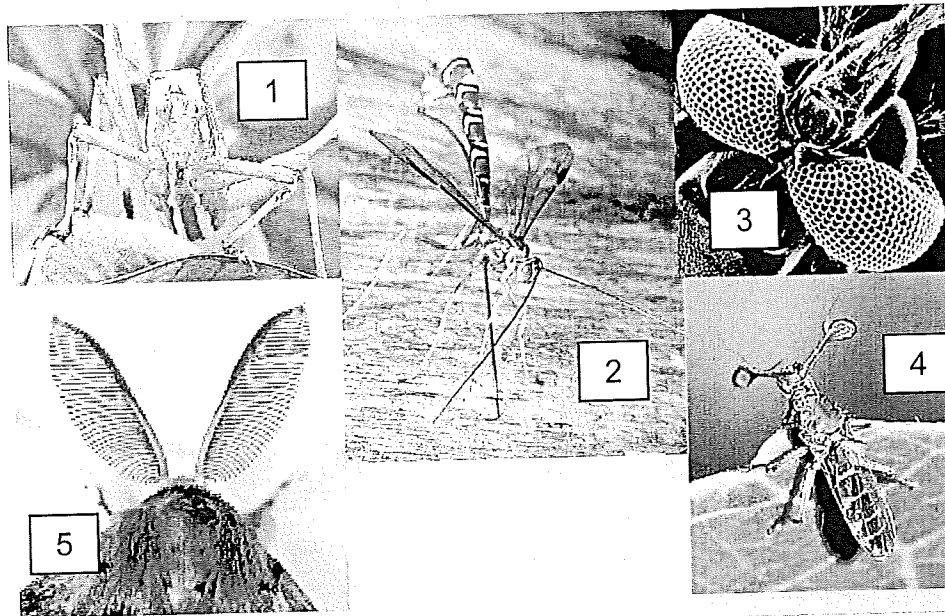
1. *Titanus giganteus* 6.5" long beetle; 2. Goliath Beetle (1/4) pound); 3. Walking stick(22" including legs); 4. Atacus moth, *Thysania agrrippa* (10-12" wong span).

•Metamorphosis



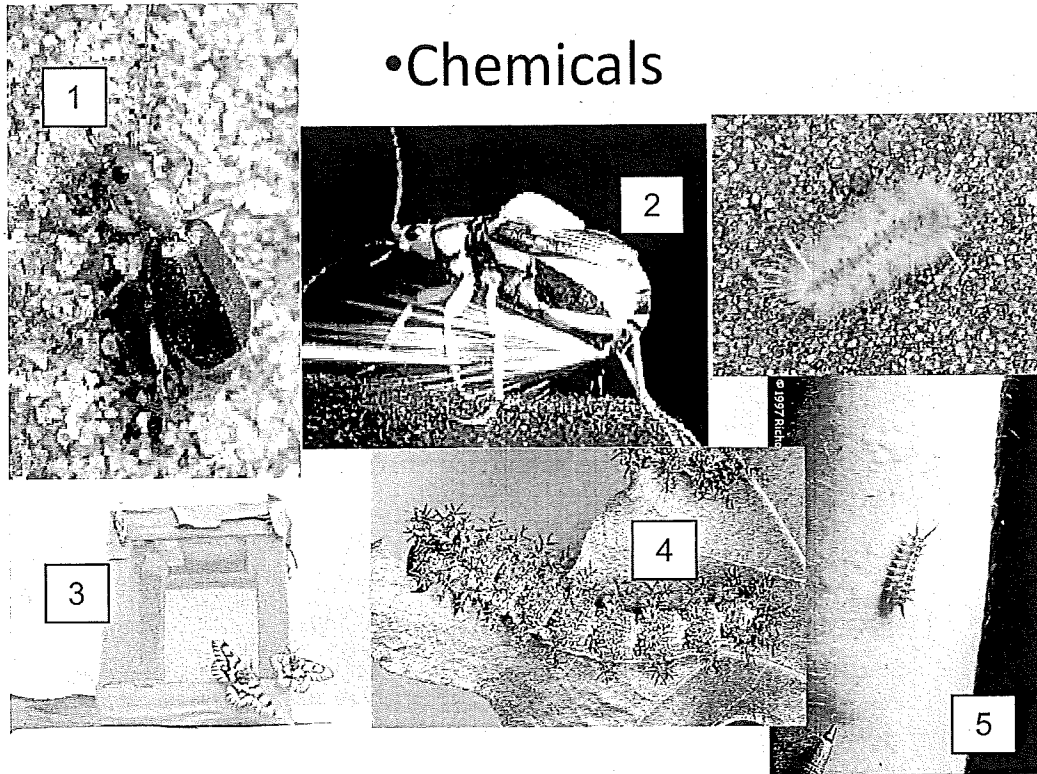
Complete metamorphosis results in reduced competition between immatures and adults for resources.

•Structures



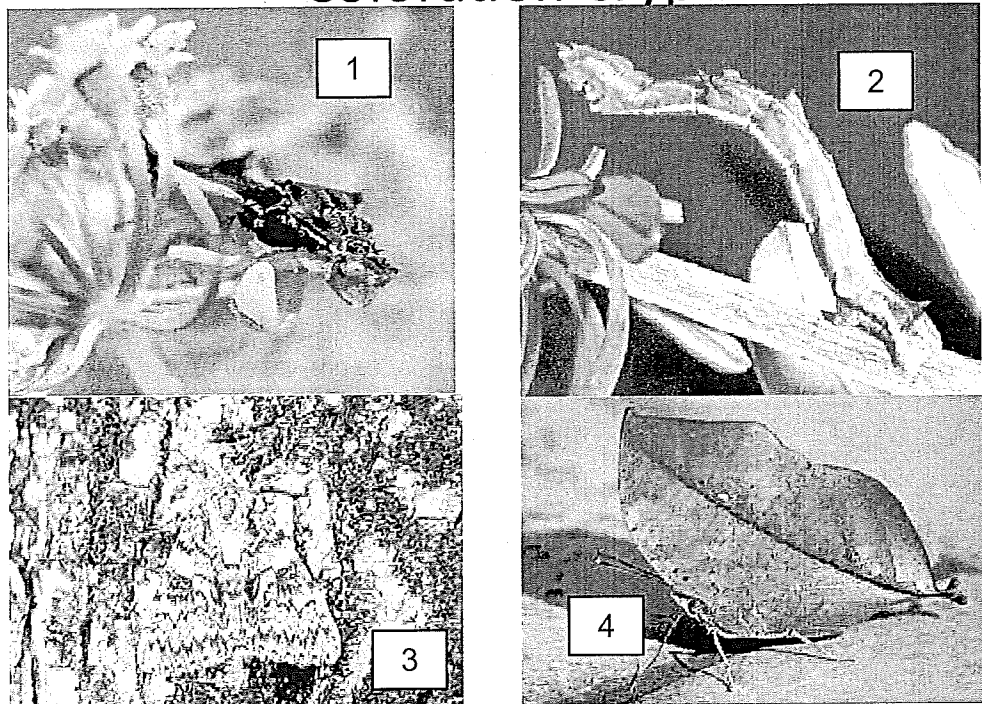
1. The front legs of a Katydid act as ears; 2. Ovipositor of an Ichneumonid wasp; 3. Mosquito compound eyes; 4. Dopsidae, stalk eyed fly; 5. Antennae of male *Spilosoma vagans*.

•Chemicals



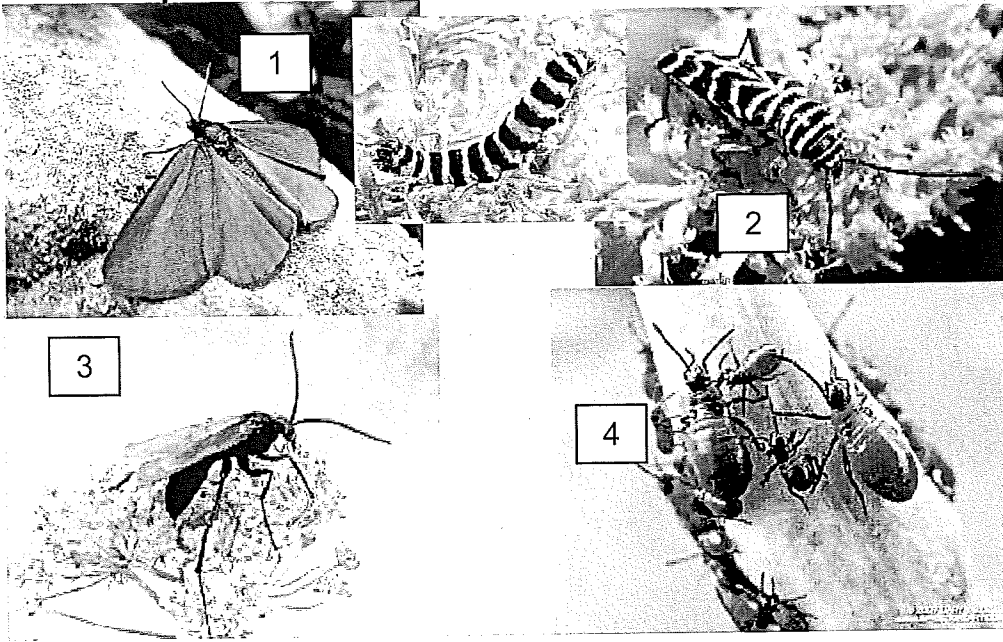
1. Carabidae : 2. bombidier beetle mixing hydroquinone & hydrogen peroxide with catalyst, explosive hot spray; 3. Pheromones to attract *Hemileuca hera*; 4. Sycamore tussock moth hairs and *Hemileuca maia* spines; 5. Skin reactions.

•Coloration-cryptic



1. Phymatidae – ambush bug; 2. Geometridae – *Nemoria* looper; 3. Noctuidae – *Catocala*; 4. Nymphalidae – dead leaf butterfly with petiole and midrib.

•Aposematic coloration-warning



1. Cinnamon bar *Tyria jacobae* & larvae; 2. Cerambycidae – locust borer wasp mimic; 3. Pompilidae – tarantula wasp 4. Lygaeidae – milkweed bugs.

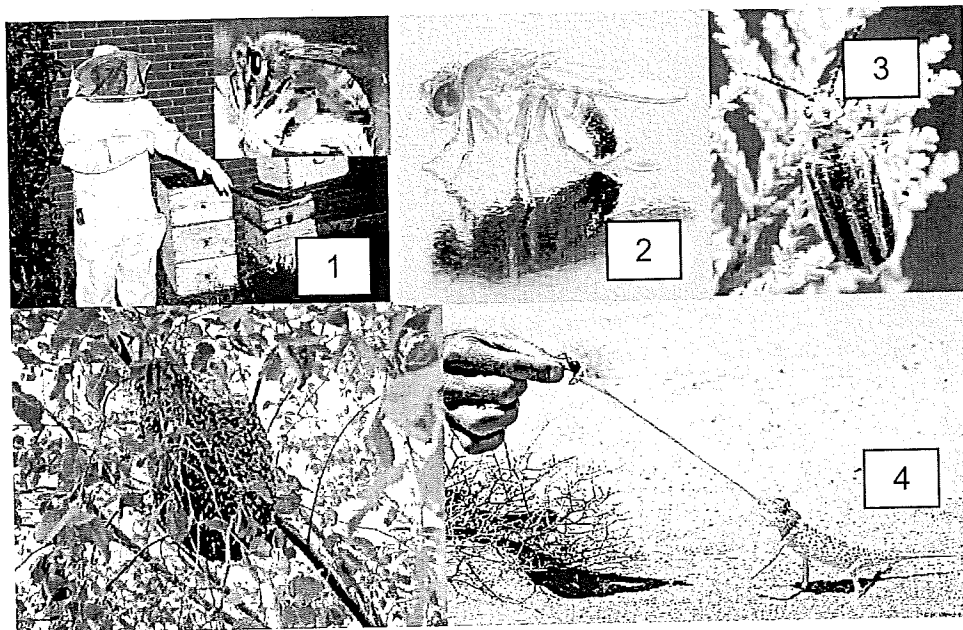
Others

- Mouth parts, stingers
- Overwintering strategies , ethylene glycol
- Insect/plant host, interactions, mimicry
- Predation/parasitism
- Reproductive potential



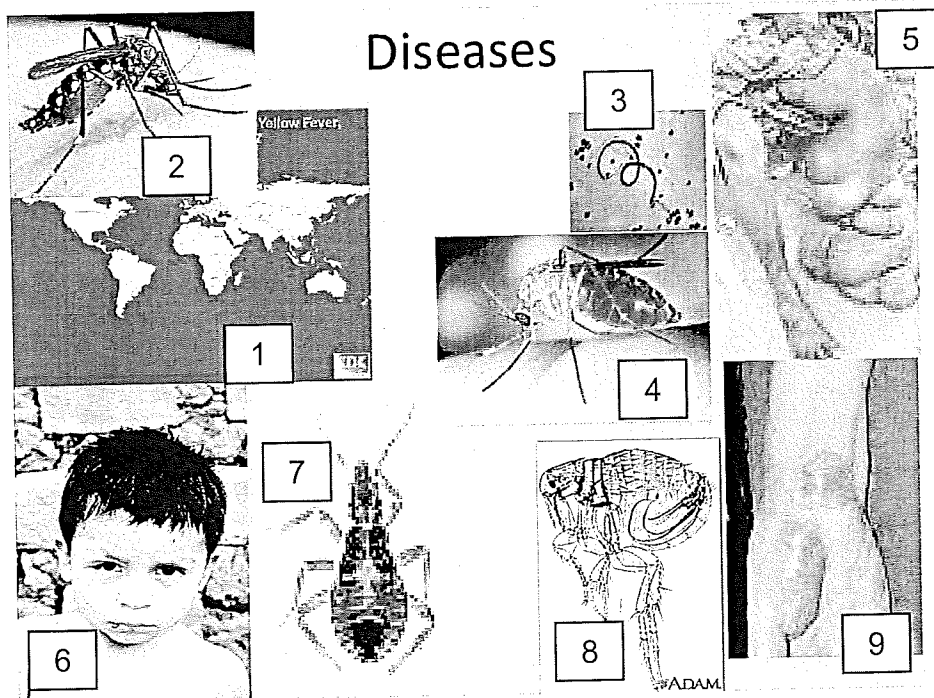
What does 10,000 mosquitoes look like?

Beneficial



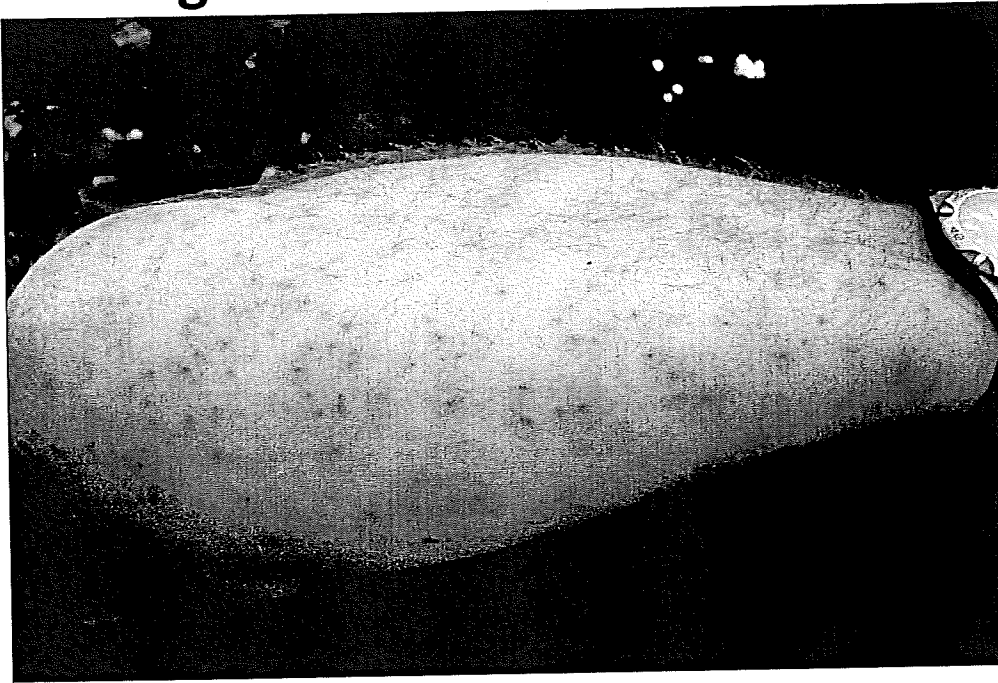
1. Pollination of crops, honey and wax; 2. *Drosophyllia* research in genetics, forensics, development; 3. Biological control – Chrysomelidae (*Diorhabda* and *Tamarix*); 4. Food chain for arthropods, amphibians, reptiles, birds & mamals.

Diseases

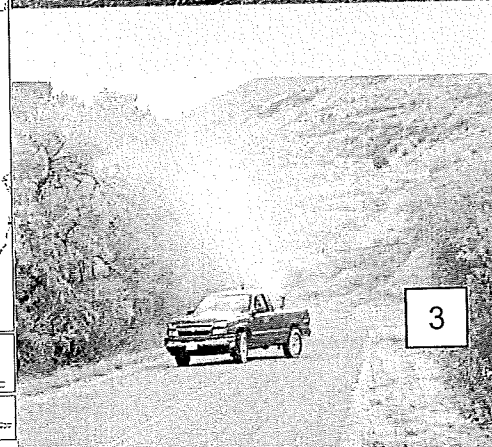
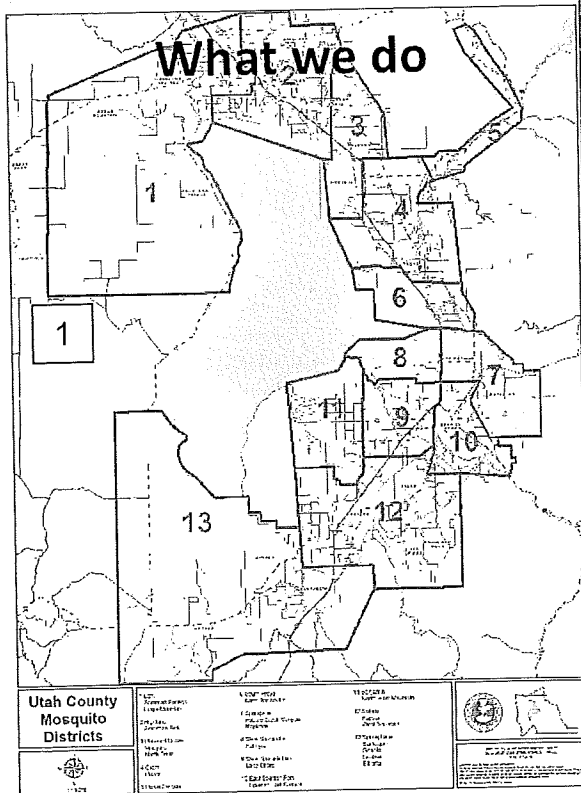


1. Yellow fever, dengue distribution 2. *Aedes aegypti*; 3. arbovirus RNA; 4. Vector of malaria - *Anopheles*; 5. *Filaria* infection, over 90 million people in 76 countries; 6. Chagas disease caused by protozoan *Trypanosoma cruzi*; 7. Reduviidae - vector of Chagas disease; 8. Flea - *Xenopsylla cheopis* vector of plague; 9. Buboos of palgue.

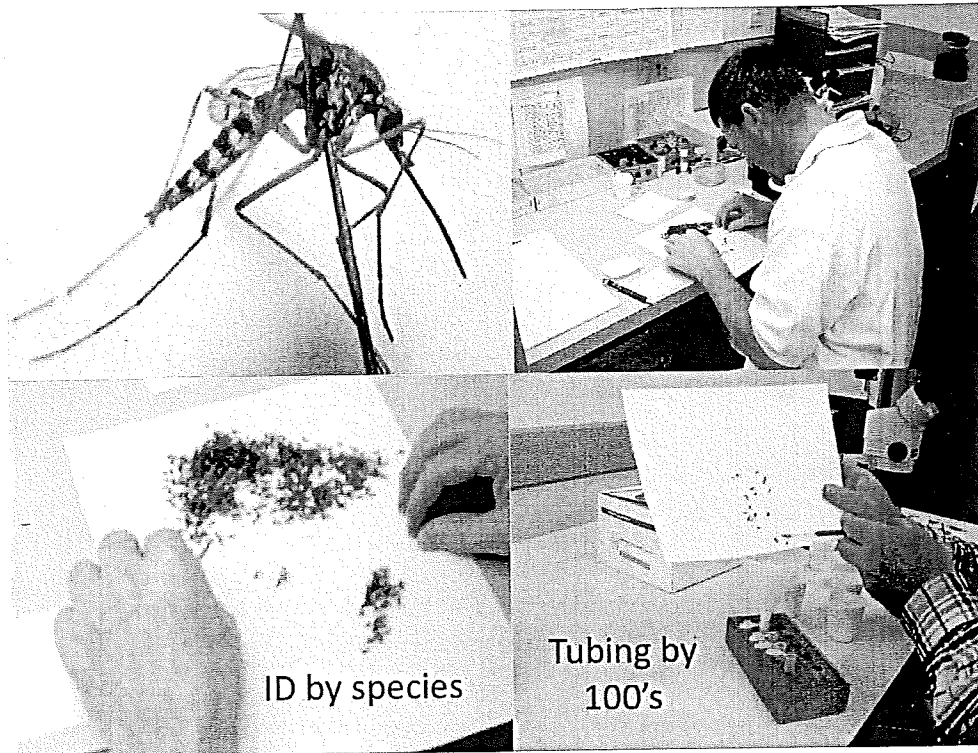
Significant irritations



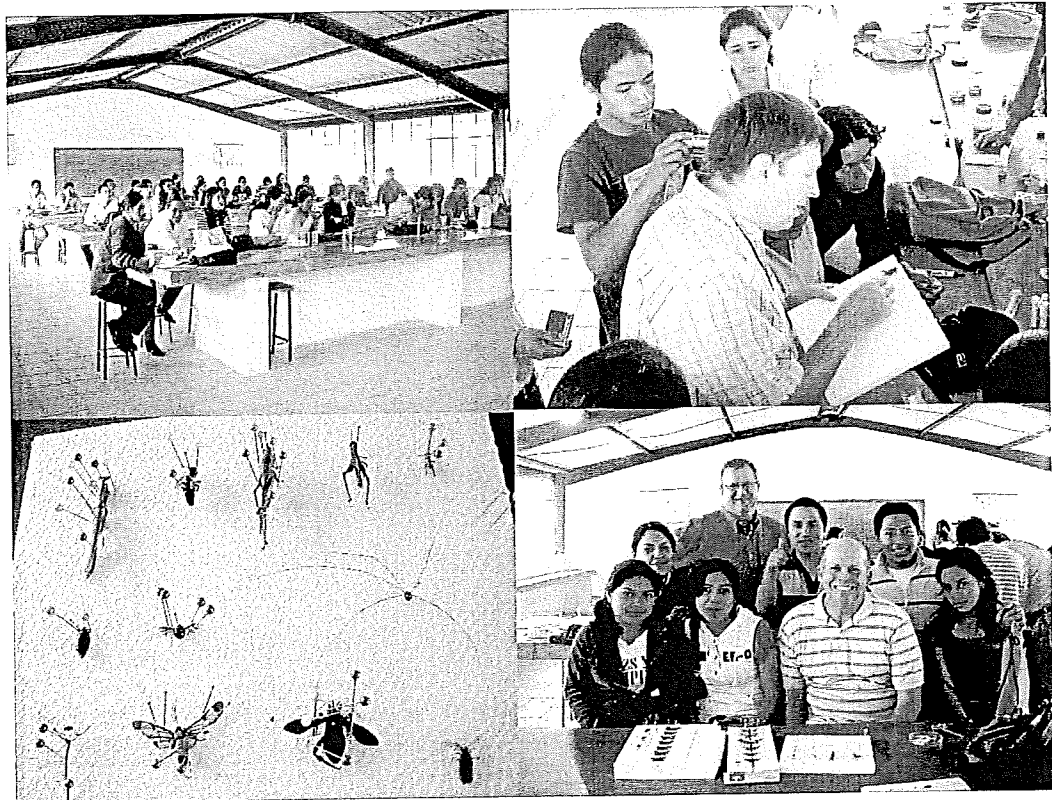
Some insects can bite and/or sting causing significant irritations.



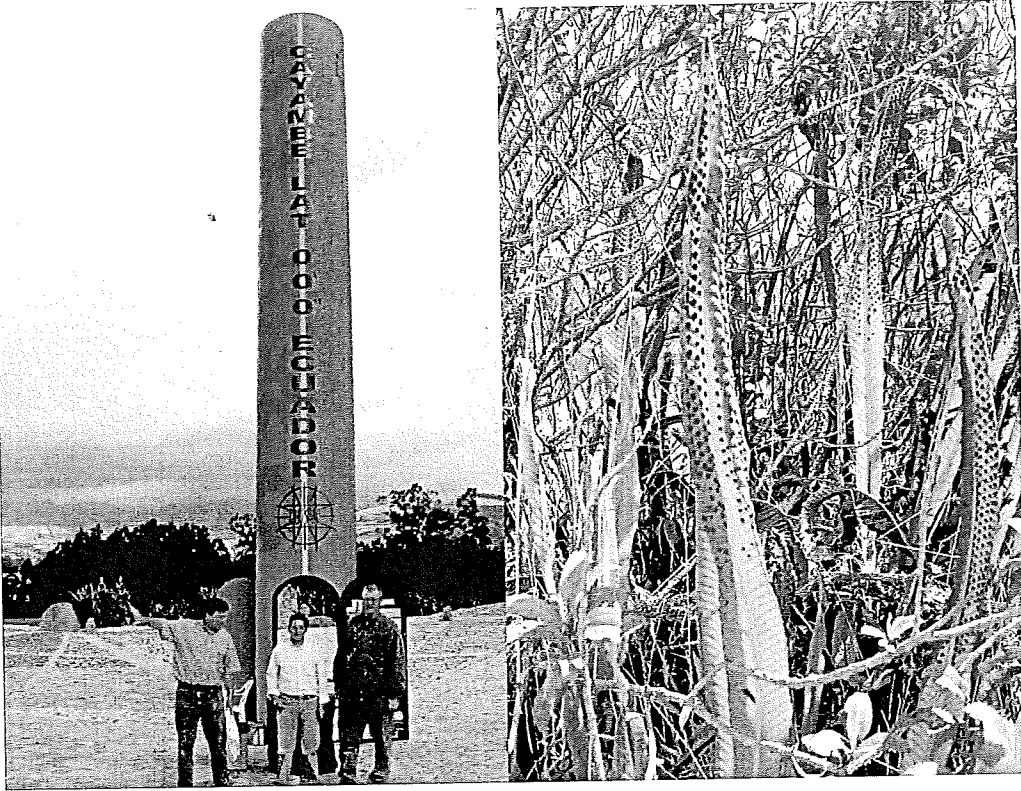
1. Mapping mosquito breeding sources , 2. surveillance for larval mosquitoes and, 3. spraying for adult mosquitoes (ULV).



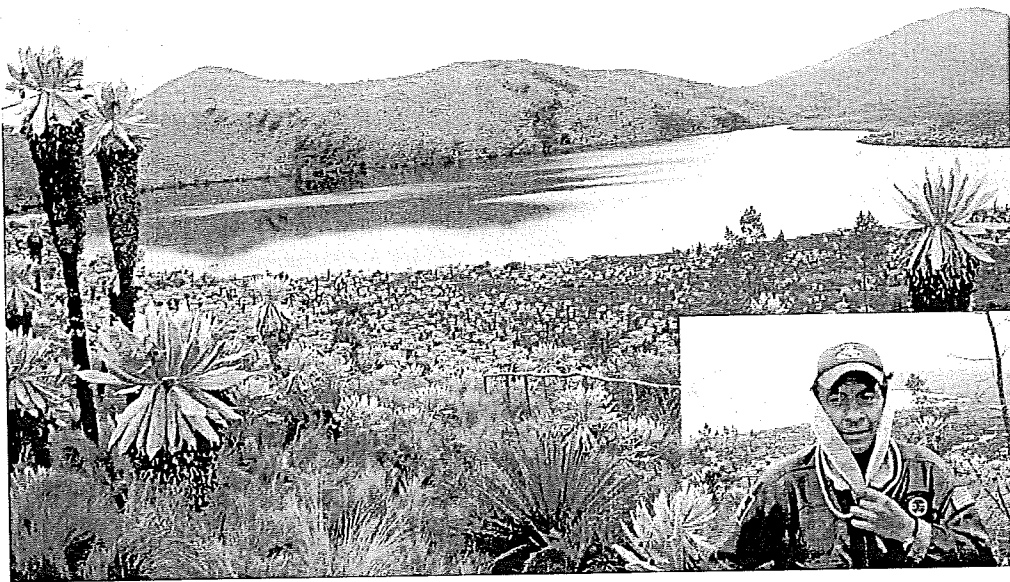
Mosquito control agencies collect live mosquitoes, anesthetize them, identify them by species, separate out disease vectors such as *Culex tarsalis* and place 50 -100 of them in tubes which are called 'pools' for testing for vector-borne diseases.



I had the opportunity to help teach a short course in entomology to college students at the University de Ecuador.



At the equator, 0⁰0'0"



High elevation lake in Ecuador, showing how to keep ears warm with plant leaves.



Bolivian children at market and farm.

Be cool stay in school

- Take advantage of opportunities
- Work hard in your classes – Math, Science, Technology, Language
- Education usually means increased earnings
- Many doors may close/open because of decisions you make while in school
- We live in an amazing world

REVISED CONSTITUTION OF THE UTAH MOSQUITO ABATEMENT ASSOCIATION

- Adopted at the 8th Annual Meeting of the Association
- Revised at the 13th Annual Meeting
- Revised at the 25th Annual Meeting
- Revised at the 28th Annual Meeting
- Revised at the 30th Annual Meeting
- Revised at the 41st Annual Meeting
- Revised at the 53rd Annual Meeting
- Revised at the 63rd Annual Meeting

ARTICLE I. NAME

The name of the organization, an unincorporated association, shall be the "UTAH MOSQUITO ABATEMENT ASSOCIATION," also known as "UMAA."

ARTICLE II. OBJECTIVES

The objectives and purposes of the Association shall be to promote close cooperation among those concerned with, or interested in mosquito control and related work, to increase the knowledge and advance the cause of mosquito abatement in an efficient and effective manner compatible with the goals of a sound environment. The Association may also encourage and undertake such other insect control problems as the Association may determine.

ARTICLE III. MEMBERSHIP

Section A. The membership of the Association shall consist of three classes: Regular Members, Contributing Members, and Honorary Members.

Section B. Regular Members shall consist of two categories: Agency Members and Individual Members.

1. Agency Members shall be any active dues paying mosquito abatement program supported with an annual budget from public funds.

2. Individual Members shall be any dues paying person interested in or concerned with mosquito abatement who desires affiliation with the Association.

Section C. Contributing Members shall be any dues paying commercial or other organization that desires affiliation with the Association.

Section D. An Honorary Member shall be any individual who has performed outstanding service in the interest of mosquito abatement and who has been elected to honorary membership for life by two-thirds majority of voting members present at the time of voting.

Section E. Approval of Membership. All applications for membership shall be subject to approval by a simple majority of the Board of Directors at any Association meeting of the Board of Directors at which a quorum is present.

ARTICLE IV. REVENUES

Section A. The revenue of the Association will be derived from dues paid by members, from the sale of publications, from donations and contributions, and from such other sources as may be approved by the Board of Directors.

Section B. The dues for members shall be established annually by the Board of Directors of the Association. Members shall be notified by November 15th following the Annual Meeting of any changes in the amount of dues from those assessed the previous year and approved by the Board of Directors.

Dues shall cover membership from the beginning of one Annual Meeting until the start of the following Annual Meeting.

ARTICLE V. OFFICERS, BOARD OF DIRECTORS AND EXECUTIVE DIRECTOR

Section A. The elective officers of the Association shall be the President, President-elect, Vice-President, Past President and a Secretary\Treasurer.

Section B. One representative shall be appointed by the governing body of each Agency Member to serve on the Board of Directors. This will be in addition to any employee or Trustee of an Agency Member that is a current duly elected Officer. These representatives will be known as directors.

Section C. An Executive shall be appointed at the discretion of the

elected officers and directors. The Executive Director's salary will be established by the Board of Directors.

Section D. The elected officers, directors, and executive director shall constitute the Board of Directors.

ARTICLE VI. DUTIES OF THE OFFICERS, BOARD OF DIRECTORS, AND EXECUTIVE DIRECTOR

Section A. Duties of the President.

1. Preside at all meetings of the Association;
2. Maintain and exercise general supervision over the affairs of the Association, subject to the authority of the Board of Directors;
3. Discharge such other duties as usually pertain to the office of President;
4. Appoint members of the standing committees with consent and approval of the Board of Directors at the first Board of Directors meeting during his term of office;
5. In the absence of the Secretary/Treasurer, sign checks to pay for bills approved by the Board of Directors.

Section B. Duties of the President-elect.

1. Exercise the powers and perform the duties of the President in the absence or disability of the President;
2. Serve as the Chairman of the Program Committee.

Section C. Duties of the Vice-President.

1. Assist the President and the President-elect with the duties of these offices as directed;
2. Serve as the Chairman of the Policy, Finance, and Bylaws Committee;
3. Serve as Chairman of the Auditing Committee.

Section D. Duties of Past-President.

1. Chairperson of the Awards Committee.
2. Chairperson of the Nominating Committee.

Section E. Duties of the Secretary\Treasurer.

1. Keep full and accurate minutes of all meetings of the Association;
2. Be responsible for the maintenance of all membership records;
3. Conduct the correspondence of the Association;
4. Issue all notices of meetings;
5. Prepare Board of Directors Meeting agendas under the direction of the President;
6. Collect and receipt for all dues, assessments and other income;
7. Deposit promptly all funds of the Association in such depositories as

shall be approved and designated by the Board of Directors;

8. Sign checks in payment of obligations of the association;
9. Pay all bills and make such other disbursements as are necessary and incidental to the operations of the Association as approved by the Board of Directors;
10. Prepare monthly financial statements of the financial condition of the Association that will be presented at the Board of Directors and Annual Business Meetings;
11. Perform other duties as are usually incident to the office of Secretary\Treasurer and as assigned by the Board of Directors.

Section F. Duties of the Board of Directors.

1. Fill any vacancy among the elected officers of the Association;
2. Appoint other committees as is necessary or useful in conducting the business of the Association;
3. Prescribe the duties of officers of the association not otherwise prescribed in the Constitution of the Association;
4. Prescribe rules and regulations for the conduct of the affairs of the Association, as are not consistent with the provisions of the Constitution of the Association;
5. Determine the number and price of each publication which shall be

distributed to the members of the Association, and to others; to approve lists of non-members who may receive publications without charge, and;

6. Accept or reject applications for memberships in the Association, prescribe rules and procedures in relation thereto.

Section G. Duties of the Executive Director.

1. Coordinate the content of the Annual Meeting with the Program Committee;

2. Coordinate with the Local Arrangements Committee hotel requirements associated with the Annual Meeting;

3. Aid in the promotion of the Annual Meeting and obtain commercial exhibitor participation;

4. Serving with officers and Directors to promote the Association to various Local, State, and Federal agencies regarding environmental concerns and issues;

5. Monitoring and working with the Legislative Committee on Matters, that impact mosquito control, which come before the State Legislature;

6. Coordinate the bidding for chemicals for the Association;

7. Represents the Association at the Annual Meetings of the American Mosquito Control Association and the Mosquito & Vector Control Association of California, and any

other meetings, which the Board of Directors may deem necessary;

8. Assists in the development and coordination of the annual workshop;

9. As editor is responsible for working with the Publications Committee and Webmaster to publish an electronic (digital) association newsletter semiannually and additional issues as may be deemed necessary;

10. Submits an Annual Report during the Annual Business Meeting;

11. Serves ex officio on all standing committees;

12. Other such duties as the Board of Directors may direct.

ARTICLE VII. NOMINATION AND ELECTION OF OFFICERS

Section A. The Nominating Committee shall determine its nominees for elective officers of the Association. It shall present the names of the nominees selected in the opening session of the Annual Meeting of the Association. It shall also present at this time, on request, any nominations made in writing and signed by three or more members of the Association. Election of officers will be conducted at the Annual Business Meeting where nomination for officers may be made from the floor.

Section B. Officers of the Association shall be elected by majority vote at the Annual Business Meeting of the Association, and shall serve until the next Annual Meeting.

C. The Executive Director shall be appointed at the discretion of the Association Board of Directors by a simple majority vote.

ARTICLE VIII. MEETINGS

Section A. There shall be an Annual Meeting of the Association, for the presentation of papers and discussions on mosquito abatement and related subjects, and such other business as may be properly considered. Such meetings shall be held at such times and places, as the Board of Directors shall prescribe. At the conclusion of the Annual Meeting, an Annual Business Meeting will be held for the purpose of electing new officers and conducting any other pertinent business.

Section B. Special Meetings of the Association may be held whenever the Board of Directors deems such meetings necessary, or whenever ten or more Members shall make a written request thereof, presented to the Secretary-Treasurer. Such request shall be presented to the Board of Directors, which shall designate a time and place for such Special Meetings. The Secretary-Treasurer shall give written notice of all special meetings of the Association to all members at least seven (7) days prior to the date of such special meeting.

Section C. A monthly Board of Directors meeting shall be held once during each month, when there is sufficient Association business to warrant such a meeting. The nature of this meeting is to discuss and conduct the business of the Association and discuss any items of an operational nature. The time and place for these

meetings shall be designated by the Board of Directors during the first monthly Board of Directors meeting after the Annual Meeting. The schedule of meetings may be changed as needed throughout the year. Although the majority of the Board Members participating in the meeting must be physically present at the time of the meeting, those who wish to attend via electronic means may do so with all privileges as if physically present, including the ability to vote and be counted as part of the quorum.

ARTICLE IX. COMMITTEES

Section A. The standing committees of the Association shall be:

Auditing,
Awards,
Computer/Data Processing,
Encephalitis Surveillance Program,
Environmental Impact,
Legislative,
Local arrangements for Annual Meeting,
Nominating,
Operational,
Pesticide,
Policy, Finance and Bylaws,
Program,
Publications,
Public Education,
Utah Mosquito Control-Fish & Wildlife
Management Coordination,
Workshop

1. All standing committees, except the nominating committee, shall consist of at least three (3) members.
2. The nominating committee will consist of five (5) members, one of

which shall be the immediate Past-President.

ARTICLE X. VOTING

Section A. Monthly Board of Directors Meeting.

1. Only current members of the Board of Directors shall be eligible to vote.
2. Each member of the Board of Directors shall have only one vote. However, if a member is both an elected officer and the designated representative of a Member Agency, they shall have two votes.
3. A quorum shall exist when at least half of the Agency Members have a representative present.

Section B. Annual Meeting and Annual Business Meeting.

1. One representative from each Agency Member, Individual Members, Honorary Members and Association Officers shall each have one vote.
2. A quorum shall exist when at least 10 of the individuals named in Article X, Section B. 1. are present.

Section C. Special Meetings.

1. Only current members of the Board of Directors shall be eligible to vote.
2. Each member of the Board of Directors shall have only one vote. However, if a member is both an elected officer and the designated

representative of a Member Agency, they shall have two votes.

3. A quorum shall exist when at least half of the Agency Members have a representative present.

ARTICLE XI. OFFICER VACANCIES

President: If a vacancy occurs in this office during the year, this office will be filled by the President-elect.

President-elect: If a vacancy occurs in this office during the year, this office will be filled by the Vice President.

Vice President: If a vacancy occurs before August 1 of any year, the President will instruct the Nominating Committee to select one nominee. The Chairman of the Nominating Committee will report this selection to the Board of Directors, the nominee will be officially declared to be the Vice President. If the Board of Directors should reject the proposed nominee, the Nominating Committee will select another nominee and continue this procedure if necessary until one is approved by the Board of Directors. If the vacancy occurs after August 1, the President and the President-elect will assume the duties of the Vice President.

ARTICLE XII. AWARDS

Section A. Don M. Rees Memorial Award. This award is presented to individuals who:

1. Have made significant contributions to mosquito control in Utah and the Utah Mosquito Abatement Association.

2. Have significantly contributed to our knowledge of mosquitoes in ways that have improved control procedures and reduced the threat to human health.

3. Recipients of this award automatically become honorary members.

Section B. Glen C. Collett Meritorious Service Award. This award is presented to individuals who have distinguished themselves in administrative or technical service to mosquito control in Utah.

Section C.

1. Any member of the Association may make nominations for these awards. Nominations will be reviewed by the Awards Committee who will make recommendations to the Board of Directors. Candidates must then receive a majority vote of approval by the Board.

2. Awards will be made when suitable candidates exist. Presentations will be made at the Annual Meeting of the Association.

3. The Awards Committee will be appointed by the incoming president of the Association and will consist of three members in good standing each year. The chairperson will be the immediate Past-President. The Awards Committee must make their recommendations at a monthly Board of Directors meeting at least 30 days prior to the Annual Meeting.

ARTICLE XIII. REPORTS AND PUBLICATIONS

Section A. The Association shall publish an annual report. The report may contain the proceedings, papers, and business transacted at the Annual Meeting. It may also include any other matter deemed by the Board of Directors to be essential to the general welfare.

Section B. Editors.

1. The Board of Directors shall appoint official editors for all publications.

2. The Executive Director will serve as editor of the newsletter unless otherwise directed by the Board of Directors.

3. The Proceedings editor shall publish and distribute the Proceedings of the Association's Annual Meeting with the aid of the Publication Committee.

ARTICLE XIV. PARLIAMENTARY PROCEDURES

In the absence of rules in this Constitution of the Association, the proceedings of the Board of Directors' meetings as well as the Association meetings shall be conducted in accordance with established parliamentary procedure.

ARTICLE XV. AMENDMENTS

This Constitution may be amended at any Annual Business Meeting of the Association at which there is a quorum, by a two-thirds vote of the members present. The chairman of the Policy, Finance, and Bylaws Committee shall provide a copy of the proposed changes

to the Board of Directors thirty days prior to the Annual Business Meeting of the Association.

ARTICLE XVI. FINANCIAL
RESPONSIBILITY

Except by the specific direction of the Board of Directors under their

personal individual financial responsibility, no debt or other financial obligation of this Association shall be incurred by this Association beyond the amount of the funds (over and above all liabilities) then in the hands of the Secretary-Treasurer.