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UTAH MOSQUITO ABATEMENT ASSOCIATION

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LITTLE AMERICA HOTEL AND TOWERS
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Edited by

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Political Status and Legislative Update for 1995

Kenneth L. Minson

UMAA Representative to the
Utah Association of Special Districts

South Salt Lake County MAD
Midvale, UT

The political arena that involved the Special Taxing Districts including Mosquito Abatements took on a national flavor this year as many Districts throughout the county felt the push from local legislative entities as we have in this state. For our purposes in mosquito control operations, we should be aware of our overall policies as stated by the American Mosquito Control Association (AMCA) in January of 1995. The following statements reflect the Associations' position on the named topics.

- Wetlands Management - The American Mosquito Control Association (AMCA) supports the need for conservation and management of wetlands that gives due consideration to preventing the spread of human disease, and favors the continued development of technology that permits public health concerns and production of pest mosquitoes to be addressed while protecting wetlands. Public education is encouraged and all future wetlands legislation should address disease vector/public health issues.

- Loss, Preservation, and Improvement of Public Health Pesticides - The AMCA supports the development of new biological, biotechnological and chemical pesticides that based on a risk/benefit balance are safe, environmentally sound and cost-effective. The AMCA opposes any notion that naturally-occurring biological control agents be subject to any state or federal registration, but encourages comprehensive testing and analysis of all new and currently, existing pesticides to ensure maximum protection of public health and safety.

- Funding for Mosquito Research/ Federal Support for Vector/Vector-Borne Disease Research - The AMCA supports the increased budget, appropriation and allocation of federal funds necessary to provide additional funding for mosquito and vector control research.

- Endangered Species Act - The AMCA strongly supports an Endangered Species Act that guarantees recognition of human health and freedom from pest mosquito species as important factors in biological conservation and protection. Caution is advised when placing a species on the "list" which could potentially eliminate

mosquito and other disease vector control programs, agents or technologies.

• Public Health and Mosquito Control - The AMCA acknowledges the fact that mosquito and other disease vector control practices are necessary to protect the public from the disease and havoc caused by mosquitoes and other disease vectors. However, these practices must: strive to minimize risks to human health; be based upon environmental regulations developed from scientific data; and in all cases consider cost effectiveness.

• The AMCA believes that mosquito control practices, when conducted according to manufacturers' instructions and other available information, are protective of human health and the environment. Notification procedures to inform the public should be undertaken and yet not be burdensome or too costly to the control entities.

• Tire Disposal/Scrap and Used Tire Shipping and Storage - The AMCA advocates the passage of a national policy focusing on proper and rapid disposal of scrap and used tires, and on recycling efforts that significantly reduce inventories of discarded tires. Appropriate penalties should be instigated against those who choose to ignore proper care and disposal procedures.

• Minor Use Pesticides - The AMCA distinguishes between minor use pesticides for public health requirements and those used to meet agricultural requirements. The AMCA supports legislation that accelerates the registration process of minor-use pesticides and in turn decreases regulation of minor-use pesticides.

The above policy statements give an excellent overview of the Associations position on most of the political issues facing us over the next decade. Current national legislation is being considered concerning the Minor-Use Pesticide bill, Senate bill 794 which is designed to amend the Federal Insecticide, Fungicide, and Rodenticide Act. This bill is very important to us and should be before the house now or will be shortly. Senator Bennett is the only one of our people not on board and he needs to be encouraged to support this legislation. Please call his office and let him know of our concerns.

On a state note, the 1995 legislative session was a trying session on Special Taxing/Special Service Districts. Over 60 pieces of legislation affected our organization in some way. Of these bills, three were onerous. Senate bills' 79 and 90 and House bill 254 caused some real concern and serious problems for several of our mosquito abatement districts (MAD's). SB 79, introduced by senator Brent Richards of Riverton, wanted to create a Special District Oversight Task Force to protect the public interests pertaining to Special Districts. The Utah Association of Special Districts (UASD) vigorously opposed this bill, calling in witnesses from both houses of the Legislature and testimony was given about regulations already in place that were very satisfactory in "over-

sighting" the Districts. The UASD was able to keep this bill in the House Rules Committee where it failed.

SB 90 became the hottest issue on the Hill, a bill curtailing the manner in which impact fees could be charged to the "new growth people" moving into cities and towns. Though this bill does not affect the MAD's directly, it could be a problem down the road. Much time and effort was spent to protect other local government entities from the effects of rapid growth and the consequences of this growth on the infrastructure of their communities. A special session of the Legislature addressed this problem and a compromise was reached that helped both sides.

The bill that hurt MAD's the most was HB 254, a bill that was introduced and passed late in the session, to prevent local taxing entities from taking advantage of the tax rebate by raising their taxing authority to compensate and recover some of this give-back by the Legislature. In creating this "hold-harmless agreement" of sorts, the Legislature put serious limitations on the way Boards of the various Districts could conduct the budget process of their Districts. No longer can we have a Board hearing and pass a tax hike above the certified tax limit. Any tax increase of this nature must be brought to a vote of the people of the District. This bill has and will affect MAD's and all other local taxing entities. The UASD did manage to get this bill on the special sessions agenda but it was never addressed.

A meeting held on September 25, 1995 by various members of the Legislature to discuss upcoming legislative concerns did discuss problems associated with HB 254. The discussion centered around two areas. One was to consider repealing the bill, and another thought was to make changes in the timing of the elections being held to better conform to local election schedules. Problems foreseen by the State Tax Commission pertain to Title 20. Information is being pursued that will help the lawmakers, hopefully, make some much needed changes.

The Importance of Legislative Networking

Elizabeth Ann Cline

Fresno Westside Mosquito Abatement District
Firebaugh, California

The need for developing relationships with your legislators has never been greater. Mosquito and vector control agencies were formed to protect the public health and in most areas of the country they were supported by the people and allowed to do their job. However, the political climate today has changed and all types of governmental agencies are looking for ways to increase their revenues. In more and more cases, they are looking at mosquito control programs as a good place to cut funding so that it can be shifted elsewhere. This results in decreasing dollars and increasing headaches for you and me.

There are many factors that combine with this to cause problems for us in our dealings with our legislators.

We have been very successful in our efforts in the past. Citizens look around and they don't see mosquitoes or disease to threaten them. Then they look at us and say, "We don't have these problems. Why do we need you?" To them, I say, "Thank-you very much! We appreciate the fact that you recognize the good job we are doing. The problems are <u>not</u> here because we <u>are</u> here."

The problems that created the original mosquito control agencies beginning back in the early 1900's are still with us. They are under control to a certain degree. But they still exist and, without us, they would eventually return with a vengeance. People must understand the public health importance of what we do!

Another problem that has come up, is the uneducated politician and his staff. With the increasing trend toward term limits in all levels of government in addition to the normal election schedule, we now may be faced with a turnover of politicians and staff members that makes it difficult for us to develop long term relationships and educate them as to what we do and WHY. This is the reason that our efforts at legislative networking must be continuous. We cannot assume that our message is known in our state capitols or in Washington, DC. We must continue to tell our story to anyone and everyone who might have an impact on us. We must be known to all of them.

When states are faced with a fiscal crisis, they will look for solutions at all levels. Unfortunately, we are easy pickings! According to the politicians, we have no constituency.

They do not have anyone coming into their office to complain about us. They also do not have anyone praising or defending us. That is because the public, in general, does not give us any thought, at all. They only complain about or defend those programs that are on their minds or have an immediate affect on their lives. If the playground shuts down and their child is used to going there after school, that is an immediate inconvenience to them and they will complain. If the politicians take money from us, the general public does not notice an immediate affect on their lives. By the time we have to cut services enough for them to notice and begin to complain, they have forgotten why we had to cut services.

Developing successful political relationships is a difficult and time consuming job. We must begin by remembering the golden rule, ALL POLITICS IS LOCAL. You better believe it. It all comes back to local politics one way or another. So, our first approach should be through the managers of our mosquito and vector control districts and their staff. They must have relationships with the city councils, city managers, counties, other local government staff people, etc. They must have these relationships in order to run the district. These same relationships can be used to develop a legislative network. You expand it by using the people you know to get to know the people that you don't yet know. You should encourage your district manager to get to know all of the local politicians and then to graduate to the state politicians and their staffs.

Much of this can be accomplished regionally. One method of doing this that has been used successfully in California, is group meetings. The district managers in a given region of the state get together and make a list of the politicians and staff people that we need to get to know. We make appointments with them and go to see them, as a group. A group of two to five district managers can then have a roundtable discussion with that politician or staff person and more information is developed because there is more input. The person with whom you are meeting remembers the meeting better because it was a group and he does not have to remember each individual in detail. Then you drop by his office whenever you are in the neighborhood. Another helpful tool is a regional meeting. Politicians enjoy addressing groups of the citizens in their local districts. Call a regional meeting of managers, trustees and key staff people and invite a local or state politician to address your group. They will get to know all of you faster and better. You can begin educating them on the importance of mosquito and vector control and public health. Attend social or political functions where politicians are present whenever you can. You may not get to talk to them much, if at all, but they will see that you are there. Politicians are very good at remembering faces. Soon they recognize your face when you walk in the door. You are comfortable with them and they are comfortable with you. This is very, very important. Politicians view strangers who walk into their offices with suspicion. They will always be defensive with someone that they do not know. Make sure

they know you before you have to walk in and ask for a favor or make a complaint.

Now that we are getting to know our politicians and vice versa, we must also foster our other relationships. The fight for survival must utilize all resources. Public education is one area where we can increase the awareness of the people as to what we do, why we do it and how we protect our citizens and their families. We must educate the public and they then become an ally when an issue involving us becomes public. Public relations are also very important. Good service to the public in our districts is vital to developing their good will and loyalty. We need them to support us if we have to fight for our funding or perhaps for our existence.

Finally, we must become a resource to the people, other agencies, the media, the politicians and their staff. If an issue comes up that involves mosquito control, I want people to come to me with their questions. Only then can I be sure that they have accurate information and that we are portrayed in the proper light. At the same time, I am becoming a resource that makes their job easier. We all benefit. Our relationships are strengthened.

Trustee involvement in the process cannot be overemphasized. Politicians do not see our districts as having any constituents, but they look at trustees as politicians who may have constituents who can help or hurt them. Many times, I have been told that the politician would rather talk to a trustee than to me. Why? Because when they look at me, they see staff. When they look at you, they see another politician. Trustees must encourage the efforts of the manager of your district. Whenever possible, you should try to join in those efforts. Try to be present at meetings that your manager sets up when a politician will be there. Join your regional group in visits to politicians offices. Attend social and political events, so that you too can become known to that politician.

You, as a trustee, are already active in your community. There are many people with whom you already have a relationship that can help you in your efforts to become more involved politically. Talk to people about mosquito and vector control. Talk to people about the State and the actions that they take which have an effect on our programs. Who are your constituents? Everyone in your community and in your district. Everyone who does business with your community and in your district. Everyone who does business with the district itself. If the district suffers, all of these people will be affected. All of these people can be asked to help educate politicians, if they know the situation. Encourage communication between the district and your constituents, your constituents and the politicians, your constituents and the media, the media and the politicians, etc. Make sure that all of these people are educated and talking to one another. Promote the benefits of mosquito and vector control. Make sure everyone under-

stands the consequence, if mosquito and vector control should be lost or even just diminished.

When dealing with legislators, it also helps to know who their constituents are. If you cannot get through to your politician, rest assured that there is someone who can. Find out who his constituents are and you will know who to talk to when you need that politician to really listen. Who are the politician's constituents? They are the contributors to his campaign. Large contributors usually have even more influence despite assurances to the contrary. You can easily obtain this information from the elections office or his campaign committee. The politician's other constituents may be his advisors, the people in his district (especially in groups), the media, his family, his friends, etc. etc. etc. These are the people to whom a politician listens. ALL POLITICS IS LOCAL. Again, you want to encourage communication between all of these people and the politician. Make sure that they are all well versed in the message and let them deliver it. They will back you up and strengthen your position.

When you talk to any and all of the people that we have discussed, make sure that you offer yourself as a resource. Most of them will be very happy to know someone that they can call on for information or assistance on the subject of mosquito and vector control and public health. If your cannot answer their questions, make sure that you either get someone else to do it or get the information yourself and report back to them, quickly. You have helped them and they have helped you. You both benefit and they don't forget.

When all is said and done, we may not win all of the battles. But, if we fight valiantly and continuously, we will win some of them and future engagements will be all the easier for our past experiences. Get to know your local and state politicians. Above all, let them get to know you!

The Virginia Mosquito Control Association's Planning for the 1996 American Mosquito Control Association's Annual Meeting in Norfolk, VA and Virginia's Mosquito Situation

Thomas J. Gallagher

Virginia Mosquito Control Association
Yorktown, Virginia

The Virginia Mosquito Control Association (VMCA), with assistance from the Mid-Atlantic Mosquito Control Association, is hosting the 1996 American Mosquito Control Association (AMCA) meeting in Norfolk, VA. A local VMCA arrangements committee is involved with planning requirements pertaining to meeting facilities, program, audio/visual, publicity and volunteers. A checklist provided by the AMCA is being used to ensure that all requirements are met. The Norfolk Waterside Convention Center, as the selected meeting facility, has sufficient meeting rooms, exhibit space, and ballroom accommodations, in addition to being a centralized location. There is something locally for everyone to do amid an abundance of nearby restaurants, shops, cultural centers, world class attractions and available harbor cruises aboard the new "Spirit of Norfolk." For the general plenary session, plans are for a rousing opening ceremony involving the "Town Crier" accompanied by the "Yorktown Fife and Drum Corps." Another feature at the session is a visit by "Pocahontas" herself who will share the trials and tribulations of her tribe and those encountered by the first English settlers in 1607 at Jamestown. The banquet entertainment features a renowned strolling strings youth group and the Air Force's Air Combat Command's "Heritage of America Band." Ample opportunities exist for the sightseers and history buffs to visit nearby historical places such as Williamsburg, 1693 chartered College of William and Mary, Jamestown, Yorktown and others. The 1996 AMCA meeting promises to be one of the best and enjoyable for all those attending.

On the mosquito front, Virginia is blessed from March through October with a wide variety of fresh and salt marsh species. To contend with the infestation, local abatement efforts generally involve physical, biological and chemical control measures to reduce the annoyance and specter of vector borne diseases. The current contentious issue is how best to cope with the infamous container breeding Asian Tiger mosquito which is rapidly spreading throughout the state.

An Update and Report of Survey Findings for Hantavirus in Colorado

Ted Davis

Colorado Department of Public Health and Environment
Denver, CO.

Rodents were collected from the eight major ecosystems in Colorado between May and July, 1994. Twelve surveys were conducted in these ecosystems to determine prevalence of antibodies to Sin Nombre Virus (SNV) in the rodent population. Sin Nombre Virus is responsible for Hantavirus Pulmonary Syndrome (HPS) in people. The work was supported by a grant from the Centers for Disease Control and Prevention (CDC).

A total a 6,595 traps were set. Traps used were the collapsible Sherman for small rodents and collapsible Tomahawk Model 201 for larger rodents. The most common bait used was rolled oats. The habitat dictated the trapping scheme. Line or transect trapping was done in large consistent habitats. Station trapping was done when suitable trap sites were scattered. These stations consisted of three to five Sherman traps and one Tomahawk trap being set at each location. Fewer Tomahawk traps were deployed where transects were established because of minimal habitat for larger rodents. Surveys were conducted by a team of four people. Traps tabulated as sprung but empty, animal dead in trap, traps lost, non-rodent captures and escapes were subtracted from the total traps set to arrive at the adjusted trap rate.

Table 1 is a summary of the trapping activity by site and ecosystem. It shows seropositive animals in those areas. Animal Processing involved anesthetizing with metofane or occasionally chloroform. Blood samples were taken by heart puncture or from the retro-orbital sinus using a capillary tube. Lung, liver, spleen, kidney and heart tissues were also collected. All specimens were stored in dry ice and later shipped to The Museum of Southwestern Biology at the University of New Mexico (UNM). Animal carcasses were stored in 10% buffered formalin for five days, drained and shipped to The Museum of Southwestern Biology as voucher specimens.

Table 2 lists the species as determined by the UNM with the numbers collected and antibody prevalence. Seropositive *Peromyscus,* species are infected with SNV, a known human pathogen. While *Perognathus fasciatus* and *Reithrodontomys megalotis* are seropositive for SNV, it is believed by researchers at CDC and UNM that each is infected by a different Hantavirus closely related to SNV and probably are not human pathogens. (Personal Communication).

All positive traps were soaked in a disinfectant solution of household bleach, washed, rinsed and air dried as a part of the processing operation each day. Personal protection involved wearing gloves to retrieve positive traps, double gloves, tyvek gowns, half or full face respirators equipped with high efficiency particu-

late air (HEPA) filters and goggles while processing. At the end of each day all gowns, gloves, plastic bags and anything coming in contact with the animals or processing were double bagged in hazard bags to be autoclaved. All capillary tubes, syringes and needles were put in heavy plastic sharps containers. Scissors and forceps used in dissection were soaked in Lysol disinfectant, rinsed, air dried, an then flamed prior to use.

These data are representative of rodent populations and virus activity at the time of the survey for each site. Colorado State University, with a CDC grant, is studying the dynamics of rodent populations and the virus at three sites. These sites are sampled at set intervals. These are trap and release studies with 145 numbered trap sites. Traps are set in a circular web configuration consisting of 12 lines of 12 traps with one trap in the center. Captured rodents are identified, measured, weighed and a blood sample is taken from the retro-orbital sinus. They are returned to the numbered site of capture and released. Each captured rodent is identified with a numbered ear tag.

The ecosystem surveys support the conclusion that SNV is widely distributed and that diligent effort would reveal it's presence throughout Colorado. While HPS is a rare disease, it has a high mortality rate. Colorado has had seven confirmed cases, but only one survivor. The CDC reports 52% mortality in 114 cases nation wide (Personal Communication).

The deer mouse, *Peromyscus maniculatus,* occurs in all areas of Colorado. It is the most abundant species and presents the greatest risk of infection. It will readily enter buildings and dwellings. Risk reduction is accomplished by controlling mice in and around the home and work place. Rodent proofing of structures can be effective and inexpensive. It is not feasible or desirable to have widespread use of rodenticides for control. Selective use of rodenticides, trapping and exclusion techniques will significantly reduce the risk of exposure to SNV.

It is recommended that precautions be taken when cleaning and removing mouse nests and droppings. These include using a disinfectant spray to wet the nests, droppings and trappings mice until soaked, allow a minimum on ten minutes and then remove them while still moist. All should be placed in double plastic bags and disposed of with household trash or buried two feet deep. Vacuums can be used to remove moist materials. Vacuums equipped with HEPA filters can be used to remove dry materials where sprays can not be used. Buildings that can not be adequately ventilated prior to entry present a problem. It is advisable to consider the use of a respirator with a HEPA filter in these instances. Always wear gloves and whatever protective clothing is deemed necessary. If you err do it on the side of safety.

Table 1. Ecosystem Trapping Summary - Colorado 1994.

ECOSYSTEM	SURVEY SITE	TRAPS SET		CAPTURES		SPRUNG/ EMPTY		DEAD IN TRAP		TRAPS LOST		Adjusted Trap Rate %	# of pos.	% pos.	COMMENTS
		S	T	S	T	S	T	S	T	S	T				
Grassland	Comanchi National Grassland - Baca	396	62	54	3	10	5	0	0	3	0	13.0	2	3.5	2 rabbits 2 salamander
	Pawnee National Grassland - Weld	456	41	46	0	23	5	0	0	1	0	9.8	4	8.7	1 escaped
Pinion-Juniper	Costilla County	302	49	65	3	14	5	6	0	2	1	19.0	19	31.1	1 escaped
	N.W. Moffat Cnty.	268	29	80	1	4	1	3	0	0	0	27.5	6	7.7	
Semi-Desert Shrub	West Rio Blanco County	286	48	72	5	5	2	13	0	0	0	20.1	3	4.7	
Montane Shrub	N.W. Douglas County	478	30	66	2	43	2	7	0	0	0	13.4	2	3.3	1 rabbit
Montane Forest	USAF Academy El Paso County	829	35	24	0	16	2	0	0	0	0	2.8	0		1 rabbit escaped
	N.E. Routt County	669	30	43	0	8	0	6	0	1	0	6.3	0		1 weasel
Mountain Meadow	Gunnison County	420	40	96	3	14	3	15	0	1	0	19.7	8	9.5	
Sub Alpine Forest	Slumgullion Pass Hinsdale County	972	70	29	1	24	9	1	0	0	0	3.0	0		
	S.E. Jackson County	498	47	22	3	9	1	9	0	0	0	4.8	0		
Alpine Tundra	Hoosier Pass Summit County	500	42	18	0	2	1	0	0	0	0	3.3	0		
TOTALS		6,074	523	615	21	172	36	60	0	8	1	10.1	44	7.7	

Legend: S - Sherman
T - Tomahawk

Table 2. 1994 Rodent Trapping Summary by Species for Hantavirus in Colorado.

SPECIES	#	# Positive	SPECIES	#	# Positive
Clethrionomys gapperi	10		*Peromyscus nasutus*	1	
Dipodomys ordii	15		*Peromyscus truei*	12	2
Lamiscus curtatus	1		*Reithrodontomys megalotis*	7	2
Microtus longicaudus	24		*Reithrodontomys montanus*	2	
Microtus montanus	9		*Sigmodon hispidus*	3	
Microtus ochrogaster	1		*Sorex monticolus*	1	
Microtus pennsylvanicus	3		*Sorex nanus*	1	
Mus musculus	4		*Spermophilus lateralis*	11	
Neotoma cinerea	7		*Spermophilus spilosoma*	3	
Neotoma mexicana	3		*Spermophilus variegatus*	1	
Neotoma micropus	3		*Tamiasciurus hudsonicus*	1	
Onychomys leucogaster	11		*Tamius minimus*	39	
Perognathus fasciatus	2	1	*Tamius quadrivittautus*	9	
Perognathus (Chaetodipus) hispidus	3		*Tamius rufus*	3	
Peromyscus boylii	1		*Tamius umbrinus*	3	
Peromyscus leucopus	2		*Thomomys talpoides*	1	
Peromyscus maniculatus	344	39	*Zapus princeps*	30	

Species Collected	34	Number of Positives	44
Total Number Processed	572	Percentage of Positives	
Adjusted Trap Rate	10.1%	All Species	7.7
High Trap Rate	27.5%	*Peromyscus*	11.4
Low Trap Rate	3.0 %	*P. Maniculatus*	11.3

Detection of Anti-WEE and SLE Using Dry Blood Spots, the Affect of Specimen Quality on Test Results

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In the summer of 1993, the enzyme immunoassay (EIA) in use at the Utah State Health Laboratory to detect antibody to Western Equine (WEE) and St. Louis Encephalitis (SLE), was modified to use dry blood spots (DBS) on filter paper according to a protocol developed by the California Department of Health. This was done to facilitate the use of DBS on filter paper rather than serum specimens collected from sentinel chicken flocks. This modification was done to simplify specimen collection and transport.

The benefits of the modified procedure are primarily to those working in the field.

1. The collection of serum samples requires venipuncture. Collection of DBS requires minimal equipment and can be accomplished with relative ease compared to venipuncture.

2. The DBS samples can be transported to the laboratory through the mail in a standard envelope. Serum specimens needed to be transported to the laboratory via courier.

Converting to DBS as a test specimen has come at a price. There are some significant disadvantages to using DBS as a sample.

1. The DBS assay negates the use of automation that was available with the serum based assay. This, along with the extra steps required in processing the DBS in preparation for testing, along with additional steps required in the assay itself has increased the labor costs of the assay. The extra steps required in the assay also lead to increased costs for reagents and disposables used in the test. The end result is that the test using DBS is significantly more expensive than that using serum.

2. We have not been able to collect enough data to validate the use of DBS as a specimen in a confirmatory assay. Because of this, any sentinel chicken found reactive by the EIA screen must have a specimen collected by venipuncture for confirmatory testing. This causes a significant delay in reporting.

3. Any EIA that has been modified to use DBS as a specimen looses sensitivity. In this case, sensitivity is defined as the ability of an assay to detect the presence of a disease when that disease is present. This loss of sensitivity results in an increased number of false negative results.

4. Additional loss of sensitivity occurs due to inadequate or inconsistent specimen collection. This loss of sensitivity can only be controlled in the field at the time of specimen collection. The lack of consistent specimen quality is a major concern with many assays that use DBS as specimens.

The remainder of this paper will emphasize the importance of specimen quality on the performance of the EIA to detect anti-WEE or SLE from sentinel chickens.

To illustrate the problem of inadequate DBS specimens, five specimens were chosen representing the different qualities of DBS samples submitted to the laboratory during the 1995 season. The first sample represented an optimal specimen. The filter paper was saturated completely through. Even though the other four specimens appeared similar, close examination reveals that they were a little lighter than the optimal specimen. When we examined the reverse side of the filter papers, we saw a significant difference in the appearance of the DBS.

The optional specimen appeared the same on the reverse side as it did on the front side. This specimen represents the type of DBS that the EIA in use at the laboratory was designed to test to obtain the highest possible sensitivity. The second specimen represents the majority of specimens received at the laboratory. Even though it looked saturated, the color on the reverse side was lighter and mottled. Numbers three and four which were even lighter and more mottled represent the next most common samples received.

During the processing of a DBS in preparation for testing, a ¼ inch punch is removed and the blood is eluted from the disk with test buffer. To determine the relative amount of specimen contained in each of these specimens a ¼ inch punch was removed and placed in 200 ul of phosphate buffered saline and incubated 18 hours at 4°C. This eluate was then compared spectrophotometrically with a set of hemoglobin standards.

Because the amount of hemoglobin in the specimen is directly proportional to the amount of total sample, this data can be used to compare the relative amount of specimen in each of these samples.

Specimen number one contained approximately 700 mg/dl of hemoglobin, two had 350 mg/dl, three, 200 mg/dl, and number five had 170 mg/dl. To compare the relative amount of specimen in each DBS, the hemoglobin concentration was converted to a percent of sample one (the optimal specimen).

To put this in perspective, specimen number two, which represents the most commonly received specimen, contained only half (50%) as much sample as the test was designed to use. Specimens three, four, and five contained approximately 1/4th (29%, 27%, and 24% respectively) as much sample as sample number one.

This means that if the chickens bled for samples one through five were all infected, and chicken number one contained antibody at just the detection level of the assay, the chicken used for number two would have to have twice as much antibody to obtain equivalent results. Chickens number three, four, and five would have to have approximately four times as much antibody for an equivalent reaction.

Antibody levels rise with time after infection. What this means is that it would take longer to detect an infection with poorer quality specimens than with optimum quality specimens. The testing schedule used in the arbovirus surveillance program requires that the chickens be bled every two weeks, this could mean at least a two to four week delay in obtaining a positive screen in an infected animal whose specimen was inadequate. If the infection occurred toward the end of the season, the infection could be missed entirely.

The bottom line is; because of the nature of the DBS as a specimen, the final sensitivity of the assay is dependent on the quality of the samples collected in the field. Careful attention should be paid when the chickens are bled to insure that the quality of the DBS are optimal leading to final results that are as accurate as possible.

FIFRA Reregistration of Naled (Dibrom®) Insecticide

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Naled, the active ingredient in Valent's DIBROM® concentrate insecticide, is currently undergoing reregistration by the US Environmental Protection Agency under the Federal Insecticide, Fungicide and Rodenticide Act, as amended (FIFRA). A question frequently asked by our customers in the mosquito abatement business is, "Will naled continue to be available for adulticiding programs, and will Valent continue to defend naled's reregistration?" Following is a brief history of naled's reregistration, and efforts to support the registration, with emphasis on mosquito control use.

DIBROM concentrate was first registered May 28, 1962 by USDA to California Chemical Company. In 1972, responsibility for pesticide registration was transferred to EPA, and the concept of reregistration was first introduced in amendments to FIFRA. The purpose of reregistration was to ensure that data supporting older pesticide registrations would be upgraded to current scientific standards, and that new data requirements would be addressed for older chemicals in a timely manner.

The first registration action affecting naled was EPA's issuance of a call-in for chronic, cancer, developmental and reproductive toxicology data in 1981. This was followed in 1983 by publication of the Registration Standard for naled. The Registration Standard was a complete assessment by EPA of all naled uses and all data supporting the registration; it included another major data call-in addressing product, residue and environmental chemistry, as well as additional toxicology requirements. In 1988, the reregistration process was completely revamped in amendments to FIFRA, primarily due to Congress' frustration with the slow pace of reregistration. As a result, EPA issued one final data call-in for naled in 1991, addressing additional residue chemistry, mammalian and environmental toxicology, worker exposure and spray drift.

A major milestone in the reregistration process as defined in 1988 is the reregistration eligibility decision (RED). As its name suggests, the RED is a determination by EPA as to whether a chemical can be reregistered, based on completeness of the supporting data base, and on EPA's assessment of whether the chemical may cause unreasonable adverse effects to man or the environment. The answer may be an unqualified yes or no, but in most cases, the RED is conditional; conditions might include fulfillment of additional generic or product-specific data requirements, or restrictions to the chemical's labeled use. EPA will not reregister the

chemical until the registrant complies with the conditions of the RED (generally 12-18 months after publication of the RED document). EPA has delayed publication of the RED document for naled several times, but is currently targeting the end of 1996.

A unique feature of the naled registration is the federal tolerance established for naled residues in or on all food and feed crops resulting from wide area mosquito/fly use. This means that any crops containing measurable residue of naled (less than 0.5 ppm) resulting from wide area mosquito/fly applications according to label directions may be legally sold and distributed in commerce. This tolerance was established in 1977, and was supported with crop residue data generated from 17 field trials at a cost of over $100,000.

First Chevron Chemical Company, then Valent USA, have vigorously supported the registration of naled for over 15 years, and we will continue to do so. We have invested upwards of $5 million to date since the naled Registration Standard issued in 1983, and $2 million since the last EPA data call-in in 1991. We expect that significant additional sums will be spent before reregistration is complete. However, Valent remains committed to keeping DIBROM available, in a manner that is protective of people and the environment. We thank the customers and users who have stood by us to support DIBROM in the face of regulatory pressure, and who have helped to educate the public regarding its benefits and responsible use.

Mosquito Control Record Keeping Using A Bar-code Scanning System

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Many mosquito control agencies across the nation are employing computers as record keeping and management tools. Our district began using computers for record keeping about ten years ago, and have been expanding their use in management since then.

The mosquito control technicians are the backbone of any mosquito control program. They develop their own feeling or intuition for mosquito control based upon their own observations and experiences. That is very important for any program. Managers have to remember that the computer inside the technician's head is much more sophisticated than the one sitting on the desk in the office. Therefore, the computer system in the office should be used as the technician's helper and not his boss.

Let me briefly explain the very basic system that we use. Record keeping at our district begins with a daily report form filled out by the technician in the field. This form chronicles the observation and activities of the technician at each suspected mosquito breeding source he encounters each day. Each record includes the condition of the source, mosquito species and stages found and what actions were taken at the site. The accuracy of the daily report is the key to being able to use the data in any type of management system.

The information from the daily report form is transferred to a database in the computer which is set up to receive the data. At the same time, in our system, each entry from the daily report is checked by the computer to see if it matches a mosquito breeding source that we are keeping track of in an inventory program. If the source number from the daily report matches one of the 800 or 900 breeding sources we are tracking in the inventory, that source record is updated with the information from the daily report. That pretty much concludes the record keeping part of the system.

The real value of the computer is being able to utilize the information collected to aid the primary function of the district which is to control mosquitoes. One of the columns on our daily report form is for a reinspection date. For each potential breeding source visited, the technician may put in the date he wants to visit that source again. Each day, the database is queried to see which technician wants to visit which source during that day. We call that our reinspection report. Each technician receives a copy of the report for his zone and the foreman receives a copy for all the zones in his

area. The reinspection report does not tell the technician where to go each day, it reminds him of where he said he wanted to go. It also reminds him when he was there last and what he did at the source last time he was there. It also gives the foreman an idea of what the technician wanted to check that day. That is especially important if the technician is sick or otherwise absent.

Districts in California are required to submit a pesticide use report to the state every month listing the amount of each pesticide used during the month and the number of sources treated with each pesticide. That information is easily extracted form the database.

Many districts like to include a monthly summary of their activities for their Board of Trustees or others. That information is also readily extracted from the database.

If the source information is in a township-range-section format or some other format that ties the source to some geographic area, an annual work summary can be generated showing how much work was done in each area each year. We use a township-range-section-source number system in our district. This allows us to prepare an annual work summary which lists the amount of work done and the amount of pesticide used in each square mile within the district. That can be a valuable aid in adjusting zone boundaries for the upcoming season.

The source inventory can be used for a number of things and I would like to mention two of them at this time. Since the inventory is updated each day that the daily report information is entered, it is an up-to-the-minute record of activity on each targeted source. The technician is allowed to select a rating for each source in the inventory. That rating is the frequency that the technician feels the source should be visited. In this example, the technician has selected 15 days as the proper interval for checking this property. The computer "counts" the number of days since the technician last visited the site and, when it exceeds the amount of time the technician felt was appropriate, it generates a late reinspection report reminding the technician he has not been back to that source in the interval he selected. This is especially helpful for sources that only breed intermittently and are easily forgotten in the heat of the mosquito battle.

The source inventory can also be easily queried to determine how much activity and cost has been expended on individual properties within the district. This is an important tool for the manager in deciding when to approach a particular land owner or when to initiate legal abatement.

That is a basic overview of how we use the computer to enhance our mosquito control capabilities. Now let me tell you about some of the inefficiencies of our system and how we are attempting to improve them.

The old "garbage in - garbage out" syndrome that affects all database systems is true in our system also. As I said before, the daily report is the key to the whole system. If source numbers are logged incorrectly or codes for the various activities or pesticides are incorrect or names or addresses are misspelled, the management abilities of the computer will be compromised. It is vital for the technician to enter correct information on his report.

"Garbage in - garbage out" also applies to entering the daily report into the computer. That particular job is generally done by someone other than the technician who must try to decipher the technician's handwriting on a report often stained by water, mud, and Golden Bear® oil. The person entering the data generally is not a field person, so generally does not know the property owners names or is not familiar enough with proper pesticides for proper applications to make a judgment on the correctness of what they think they see on the daily report. Any items entered correctly but illegibly on the daily report are entered incorrectly into the computer.

The other problem in using a computer system for record keeping is that it takes a great deal of time to enter all of the records from the daily reports to be able to use the management system on a daily basis.

To try to rectify these inefficiencies, we have followed the lead of the Sacramento-Yolo Mosquito and Vector Control District and the San Joaquin County Mosquito and Vector Control District in employing bar-code readers in collecting the daily report data and transferring it to the computer.

We chose the Videx Timewand® bar-code reader which is a small, hand-held, programmable scanner. Instead of filling out a daily report each day, each technician now enters the data directly into the Timewand in the field. He is led through the data by following a series of prompts which vary depending on the data he entered on the previous prompt. Data can either be entered from the keypad on the face of the Timewand, or by scanning the data from bar-code information.

When we began storing our field data on the computer, we changed the form of the data we collected from a narrative form to a code. For instance, instead of a technician writing "Altosid sand" on the section of his report on pesticide used, he would write "612" which is our code for Altosid sand. It was then an easy step to set each code in a bar-code format which could be scanned into the Timewand. Nearly everything that a technician could write on his daily report can now be scanned in instead. We don't require the technician to scan in the data; he is free to enter it in from the keypad. But we prefer him to scan it in because it reduces the chances for error in entering the data.

Each technician has developed a sheet of bar-codes for the codes he enters most frequently. In addition, each map, which our technicians use in identifying mosquito breeding

sources, has a facing page containing information on each source in narrative and bar-code formats. All of the information a technician needs to enter his daily report data in the Timewand is available to him in bar-code symbology. With practice, he can enter the information about as quickly as he can write it.

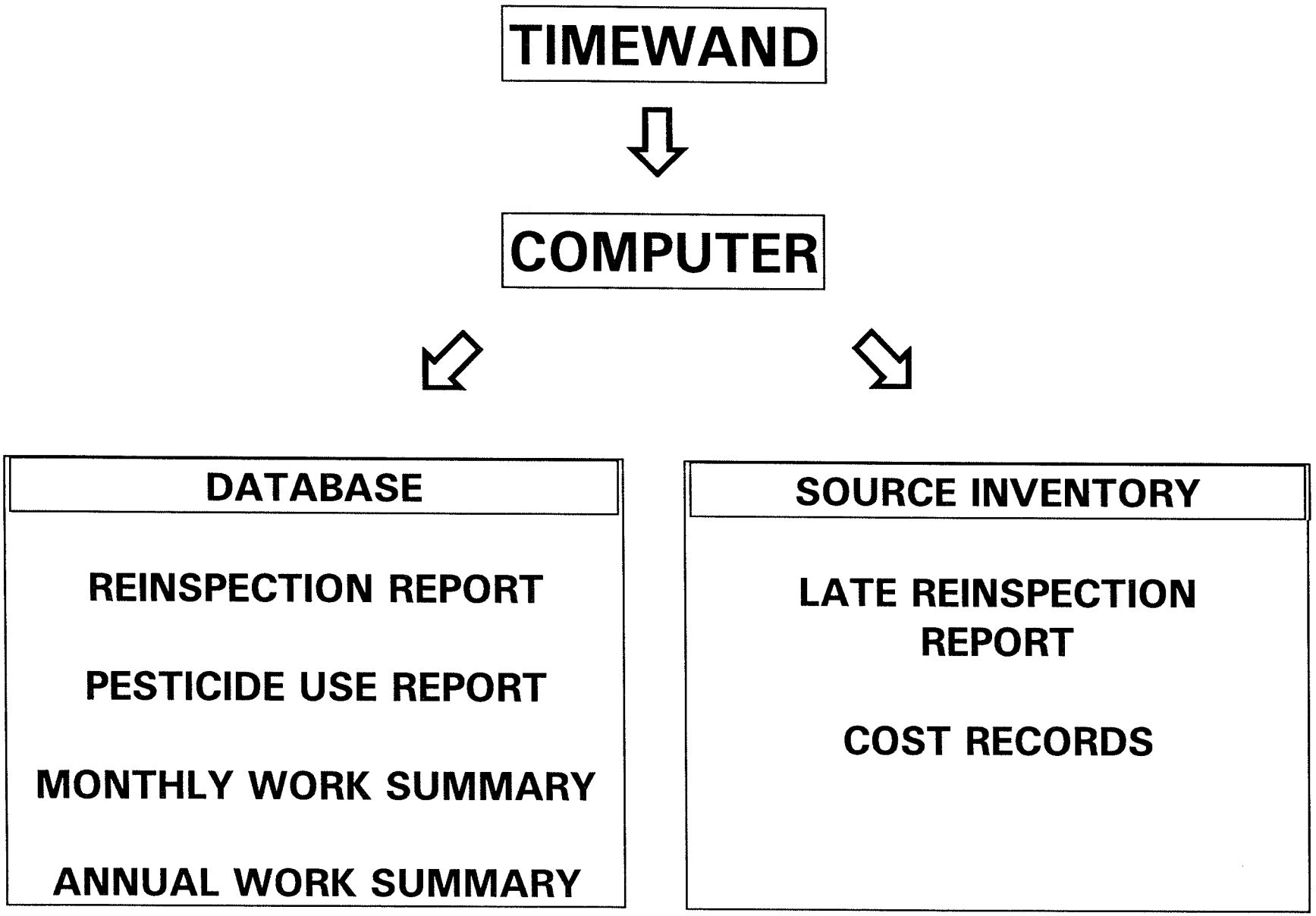
At the end of each day, the technician sets the Timewand into its download-recharger which is cabled to the computer. A program is run on the computer which downloads the information into the database and the inventory files, clears the formation out of the Timewand, and recharges it for the next day's use. This whole process takes three to five minutes for the entire bank of bar-code readers. We then print a daily report for the technician to check and to file. We also print out the reinspection report and the others I mentioned before.

The results of using the Timewand have been vastly improved accuracy in our record keeping system, vastly reduced time in entering the data, and increased ability to use the data in a management system on a daily basis.

The cost of the system might seem excessive at first glance. Our system of nine Timewands with their download-rechargers, a bar-code generator, software, and programming was about $12,000. But let me remind you, this is a one-time expense. A district that hires a part-time person to enter data would chew up this amount in the first year or two. Videx offers a reasonable annual maintenance agreement that extends the warranty of the Timewands indefinitely. The download-recharger can be cabled to the computer, or can be hooked to a modem for downloading from remote sites.

You can even get real creative with the Timewands if you wanted to. Each Timewand has a real-time clock which is reset by the computer each time it is downloaded. The time of each data entry is recorded by the Timewand, so if the time of day a technician is at particular source is important to you, you could have him enter the data for that source as soon as he has finished his inspection or treatment. If you needed further proof that a technician is at a particular source at a particular time, you could put a bar-code on a post at the site that the technician would scan in. The exact time of the scan would be recorded.

We have encountered the usual bugs in getting the system working as we wanted it to do. But after one year under our belt, we are pleased with the system and with our improved management capabilities.


TIMEWAND
COMPUTER
DATABASE
REINSPECTION REPORT
PESTICIDE USE REPORT
MONTHLY WORK SUMMARY
ANNUAL WORK SUMMARY
SOURCE INVENTORY
LATE REINSPECTION REPORT
COST RECORDS

Predicting Mosquito Breeding in a Restored Owens Lake, California

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Because of diversion of water from the Owens River, in Inyo County, California to the Los Angeles Basin, Owens Lake was gradually transformed from a terminal alkaline lake to a dry lake bed. This has led to problems with air-borne dust particles which are capable to being transported great distances where they may impact communities located many miles from the Owens Valley. This has led to an edict from the U.S. Environmental Protection Agency that some form of dust abatement program be implemented at Owens Lake under their nationwide program of abatement of air-borne PM-10 (less than 10 microns in diameter) particles. The Great Basin Consolidated Air Pollution Control Board began an experimental plan in 1994 consisting of flood irrigation of the surface of Owens Lake using poor quality well water. The flooding was to be only to a depth of a few centimeters. Because of the concern that this irrigation might result in the production of large populations of mosquitoes, an ecological study was begun to predict the likelihood of this happening.

First various lentic aquatic habitats in the vicinity of Owens Lake were surveyed and mapped, and mosquito fauna and associated insects and vegetation were collected, identified and characterized. Water samples were collected from each site and analyzed for temperature, salinity, *p*H, conductivity and ionic content. Information from these mature sites was used to compare with the same data collected at the experimental flood site located on the dry lake bed of Owens Lake. Data were analyzed using common resemblance functions and certain differences in the comparisons were definitive. On the basis of comparison with existing natural spring habitats at several locations on the periphery of Owens Lake, and monthly inspection of the flood irrigation site (Fig. 1), it was concluded that populations of *Culex tarsalis* and *Culiseta inornata* would be produced unless steps were taken to avoid pooling of water due to uneven depressions in the lake bottom. Both species were found to tolerate the highly saline conditions produced from the experimental flooding. However, *Aedes melanimon*, a common species in the Owens Valley, was found only in association with habitats having water with salinity much lower than the experimental flood area. It was concluded that this species would probably not breed under the circumstances of flood irrigation. These data should assist in predicting future breeding of mosquitoes and other biting insects at Owens Lake should large-scale flooding be implemented as part of an overall dust mitigation policy. Operators of such programs

should pay particular attention to mosquito species such as *Culex tarsalis* because of its potential public health importance as a vector of western equine encephalomyelitis virus.

Figure 1. Presence of mosquito species at sites sampled at an experimental floor irrigation site and several comparison sites in the Owens Valley, CA.

Site	*Cx. tarsalis*	*Cs. inornata*	*Ae. melanimon*
1	Present	Absent	Absent
2	Present	Present	Absent
3	Present	Present	Absent
4	Present	Present	Absent
5	Absent	Absent	Present
6	Absent	Absent	Present

Keys to sites:

1. Upper Flood Irrigation Site (northern edge of Owens Lake)
2. Lower Flood Irrigation Site (northern edge of Owens Lake)
3. Dirty Socks Well (southern edge of Owens Lake)
4. Cartego Springs (southwestern edge of Owens Lake)
5. Irrigated pasture north of Owens Lake (northern edge of town of Big Pine)
6. Irrigated pasture north of Owens Lake (3 km north of Big Pine)

Aedes sierrensis Control in Salt Lake City

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Aedes sierrensis is a relatively newly recognized species to Utah. The first collections of this species in Utah were made in 1965 in Weber County. Extensive surveys in the late 60's and early 70's indicated that the distribution was restricted to Davis and Weber Counties. However, in 1987, a single female *Ae. sierrensis* was collected in a Salt Lake City MAD light trap. This was an interesting find, but since it was only a single specimen it appeared to pose no special concern. Looking back on that collection we should have had more insight as to what was coming. By 1991, the District was receiving complaints about *Ae. sierrensis* throughout the city. Later that year the first larval collection of the species was made in Salt Lake City, which began the current control.

A little background on *Ae. sierrensis* is necessary before explaining the control program. *Ae. sierrensis* is a member of the *Aedes variapalpus* complex. This is a group of closely related species found in an area encircling the Great Basin. *Ae. sierrensis* occupies the west and northern portions of that circle. *Ae. sierrensis* is now known to occur as far south in Utah as Salt Lake County. Conversely, *Ae. varipalpus* is found as far north as Utah County. Apparently the distribution of the two species does not overlap.

Ae. sierrensis is commonly called the 'western tree hole mosquito'. Since this species is only found in the western United States, that part of the common name is obvious. The term 'tree hole mosquito' is derived from the species behavior. Unlike most *Aedes* species that lay their eggs in moist soils at the edges of water, *Ae sierrensis* prefers to lay its eggs in tree holes. The tree holes at some time fill with water, the eggs hatch and the larvae develop within the tree hole. Tree hole is a term which describes holes or cavities in trees that hold water.

There are at least three ways that tree holes are formed: The most common tree hole occurs when a branch is cut or broken off. The remaining stump slowly rots leaving a cavity. This type of tree hole is very common in Maple, Cottonwood, Box Elder, Chestnut and Linden trees. A second type of tree hole occurs in box Elder trees, when large scar-like growths form at the site of lost limbs. These growths often contain small difficult to find holes. The third and less common form of tree hole occurs when two or more branches divide from the trunk of a tree at the same spot. While technically not a tree hole this type of cavity can easily hold water long enough for mosquito larvae development. This type of cavity is

most common in older large trees such as cottonwoods and elms.

The District began its tree hole program by setting two goals: 1) To determine the extent of the distribution of *Ae. sierrensis* in the city and 2) to eliminate all potential breeding sources for the species. We knew that both goals would be difficult and we set five years as the time frame to meet those goals.

To determine the distribution of *Ae. sierrensis* in the city, four surveillance methods were used. All MAD's receive complaints. When complaints are received at our District, a Vector Control Technician is sent as soon as possible to talk to the person making the complaint. The technician asks a series of questions to get some clue as to what mosquito species may be causing the problem. The employee then inspects around the area to see if they can locate the larval source, such as standing water in a curb and gutter, catch basin, etc. *Ae. sierrensis* usually stays within 100 feet of the tree hole from which it hatches out of. Therefore, when answering complaints within the city, technicians began to routinely inspect trees within a 100 foot radius of the home.

The second means of surveillance was the standard New jersey light trap system that was already in place. This was the way that the first *Ae. sierrensis* was found in the city back in 1987. Unfortunately, this species is not strongly attracted to New Jersey traps. CO_2 baited CDC light traps have been used in areas where there have been complaints but the mosquito species unconfirmed. These traps are very good at collecting tree hole mosquitoes.

The third method of surveillance was to examine individual trees in the city. In 1991, we began by having technicians who completed weekly inspections in their assigned areas to look for tree holes. The fourth method of surveillance was the placement of artificial tree holes in various areas of the city to act as egg traps. We tried this in 1992 only.

The Salt Lake City Urban Forester estimates that there are over 100,000 trees in the parking strips next to the streets and in the parks alone. That number can be at least tripled if you count trees in back yards and along the four creeks and one river that flow into the city.

The inspection of individual trees is very time consuming. Our assignment of personnel only after completing their other duties was resulting in unsatisfactory progress. Thus, in 1992, a technician was hired for the summer, with tree hole inspection as his only assignment. From 1993 to present two employees have worked full time on this project. Additional employees may be needed as we begin house to house surveys.

Salt Lake City covers an area of roughly 100 square miles. During the past 4 years about 70% of the trees in front lawns and parks have been inspected. It will take at least 2 more years just to finish the rest of the city. The next step is to go door to door throughout the city to inspect trees in

back yards. I believe that it will take another 10 years to do that.

Tree holes come in all shapes and sizes, and require different techniques to eliminate future mosquito production. Small holes are easily filled with caulk. Usually a brown colored caulk that blends in with the tree color is used. Tree holes repaired in this manner have remained sealed for the past two years. A card file is maintained of all tree holes filled so that they can be rechecked at a later date to make sure repairs are holding up. Larger holes are filled with sand and sealed with concrete. It was found that the concrete will sometimes shrink from the edges of the tree hole and must later be caulked to form a complete seal. This year a product called Permachink® was used instead of concrete. Permachink® is a putty-like material that is made to fill in the gaps between logs in log homes. It is very easy to work with, does not completely harden and forms a good seal. Large holes require a backing such as fiberglass insulation to be stuffed into the hole before the Permachink® is applied. Next summer we will re-evaluate the effectiveness of this new product.

Some trees have holes so large they are nearly impossible to repair. Usually we will recommend that the property owner cut down the tree. Other tree holes have been found that are too high up in a tree to be repaired. We have not yet found a suitable means to reach them and we'll appreciate any suggestions you might have.

A total of 769 tree holes have been filled in the last four years. Of those, 150 or 19% have had *Ae. sierrensis* larvae in them at the time they were inspected. The number of tree holes filled each year is declining. This is a result of starting our surveillance program in areas of the city where there were mature trees and working outwards to newer subdivisions where the trees are fewer and younger. This trend will reverse when we begin to inspect the back yards of the older neighborhoods.

After four years of intensive surveillance we a starting to see some patterns. Larvae have been found in only eight types of trees. No larvae have ever been found in evergreens. Maple trees have accounted for 57% of those trees with larvae. Box Elder trees make up an additional 22%. Both Maples and Box Elders belong to the genus *Acer*. Maples have been planted extensively in the east side of the city, while Box Elders occur in abundance along waterways.

A record is kept of all mosquito complaints. *Ae. sierrensis* have gone from being the cause of no complaints before 1988 to about one out of every three this year. This species can be a serious pest, biting throughout the day. Not only is *Ae. sierrensis* a severe pest, but is a vector of canine heartworm.

The District is making some progress at reducing the habitat for this species. Unfortunately it has been spreading through the valley faster than we can eliminate its habitat. The

tree hole program will be necessary for the foreseeable future, but we should ultimately see fewer complaints and a reduced incidence of heartworm in Salt Lake City.

Camouflage and Mimicry in Arthropods

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This is a story of eat or be eaten, a story told with close-up photography. Camouflage helps both insect and spider predator or prey escape detection by blending into the background. In mimicry an insect may avoid being eaten by resembling another insect that has a bad taste, sting, bite or noxious secretion. In 1962 I took leave from the Thai Malaria Eradication Project to join Edward S. Ross, California Academy of Sciences, for 2 weeks in Malaysia to learn close-up photography. Ideally, the specimen covers 3/4 of the field and is in perfect focus with no shadows which are eliminated by holding a small electronic flash above the subject. Initially, I used an Exacta with close-up tubes and ASA 12 film. I now use a Canon with macro lens and 2X teleconverter and ASA 200 film. Since there is little depth of field in close-up photography, much film is wasted. Slides were shown of 18 arthropods of which 16 resemble the background and 22 insects that are mimics or models. The first 3 photos from Malaysia and Ecuador are Ross' and succeeding photos are mine.

At Gombak Valley, near Kuala Lumpur, Malaysia, an immature Orchid Mantid blends into an Orchid and later feeds on a Neptis Butterfly. A Leaf Mantid at Alinahui, Ecuador resembles a leaf and a short-winged Mantid matches the red clay soil of Kolob Canyon, Zion National Park, Utah. At Snow Canyon State Park, Utah, a Walking Stick resembles a twig (Fig. 1) and a Grasshopper blends with the rocky texture of the sandy soil. Another Grasshopper at Zion National Park is an example of obliterative coloration (Fig. 2) and a green Bush Katydid at Salt Lake City, Utah resembles a leaf. An immature black Katydid at Gombak Valley mimics a predatory Tiger Beetle which mimics a Blister Beetle with a bad taste so both prey and predator are protected. Models are a green Tiger Beetle at Zion National Park and a black Blister Beetle on Sunflower at Big Cottonwood Canyon, Salt Lake County, Utah. Blister Beetles have a noxious secretion and usually a warning coloration as the red-headed Blister Beetle on Hawksbeard at Capitol Reef National Park, Utah. Similarly, distinctive-colored Soldier Beetles on Rabbitbrush at Big Cottonwood Canyon have a bad taste. Microlepidops on Aster at Grand Canyon National Park, Arizona mimic Soldier Beetles. A Leaf Moth at Chiangdao, Thailand is protected on a leaf and a Spangled Anglewing Butterfly at South Willow Canyon, south of Grantsville, Utah, is hidden on bark. Is a brightly colored Checkerspot at Kolob Canyon a mimic or a model? There are many

Checkerspots; some are mimics and some are models but biting the Butterfly tells the difference. Which is mimic and which is model for a black Butterfly at Penang, Malaysia and a black Scape Moth at Chiangmai, Thailand? The Scape Moth was chased from human feces so biting is not desirable. A Common Gray Hairstreak Butterfly at Red Butte Garden, University of Utah, has a false head on the end of the wing so a predator desiring a quick kill may obtain only a piece of wing.

An Aegeriid Moth at Big Cottonwood Canyon mimics a Wasp. Most Hymenopteran mimics are Dipteran Flies with short antennae and a single pair of wings, held at right angles, but Wasps and Bees have long antennae and a double pair of folded wings. Examples of Wasp mimics are 2 Syrphid Flies, one on Aster at Red Butte Garden and one on a Carrot flower at Glacier National Park, Montana. Models are 2 Wasps, one on a Carrot flower at Glacier National Park and one on Hawksbeard at Capitol Reef National Park. Examples of Bee mimics are 2 Bee Flies, one on Aster at Millcreek Canyon, Salt Lake County, Utah and one on Potentela at Big Cottonwood Canyon. Models are 2 Bees, both on Rabbitbrush, one at South Willow Canyon has a bright warning coloration and one at Kolob Canyon is yellow so obtains added protection on Rabbitbrush.

A Crane Fly matches the granite wall of Kolob Canyon and a Robber Fly that resembles the sandy floor of Capitol Reef National Park eats a Muscoid Fly. A bad-tasting Box Elder Bug on Butterfly Weed at Kolob Canyon is mimicked by the Milkweed Bug on the same flower and the Imitation Box Elder Bug on Sunflower at Salt Lake City. An Ambush Bug at Salt Lake City blends into Rabbitbrush to await a prey and a predatory Odonatan Damselfly at Kolob Canyon resembles a tree limb (Fig. 3). A light-colored Crab Spider hides on a White Chrysanthemum at Salt Lake City and a Spider at Hawaiian National Park, Hawaii blends into volcanic lava (Fig. 4).

A small Fly was abundant on Scarlet Globemallow at Capitol Reef National Park until Ants climbed the stems and captured the flies but the Ants were too quick to photograph. Later, on Fleabane at Big Cottonwood Canyon, I got the story. An Ant caught a Fruit Fly and a Crab Spider caught the Ant. Some Ants taste bad, sting, bite or eject a foul-smelling fluid but the predatory Ant is also a prey.

That is my story which is eat or be eaten, a story of natural selection. If a genetic variation is advantageous, individuals that lack the variation are eaten or fail to catch prey and in a few generations, the entire population shows the variation.

Figure 1. Walking Stick, Snow Canyon State Park, Utah.
(Photo - R.E. Elbel)

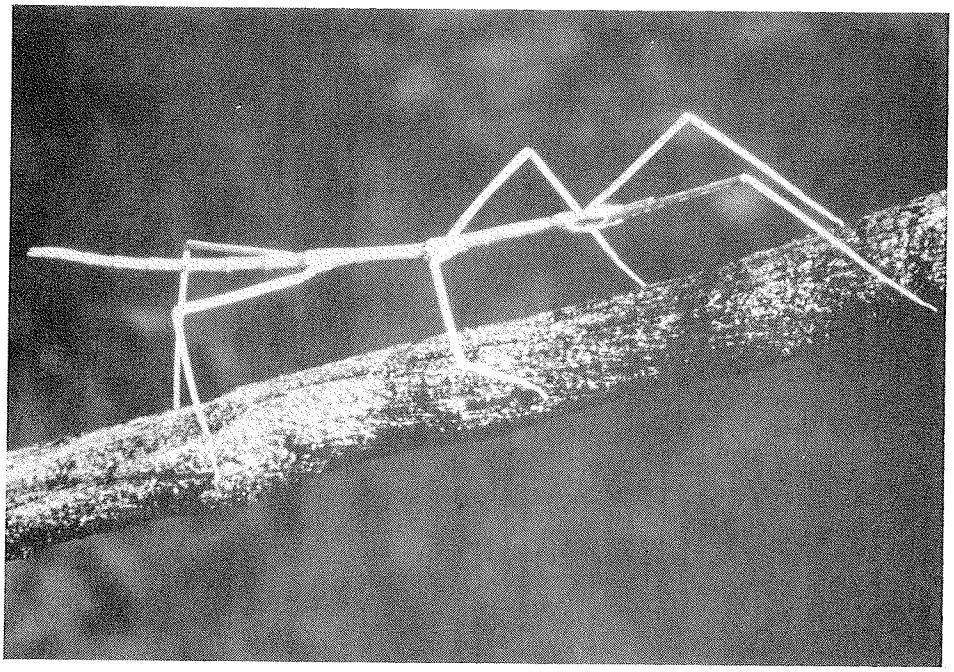


Figure 2. Camouflaged Grasshopper, Zion National Park, Utah.
(Photo - R.E. Elbel)

Figure 3. Odonatan Damselfly, Kolab Canyon, Zion National Park, Utah (Photo - R.E. Elbel)

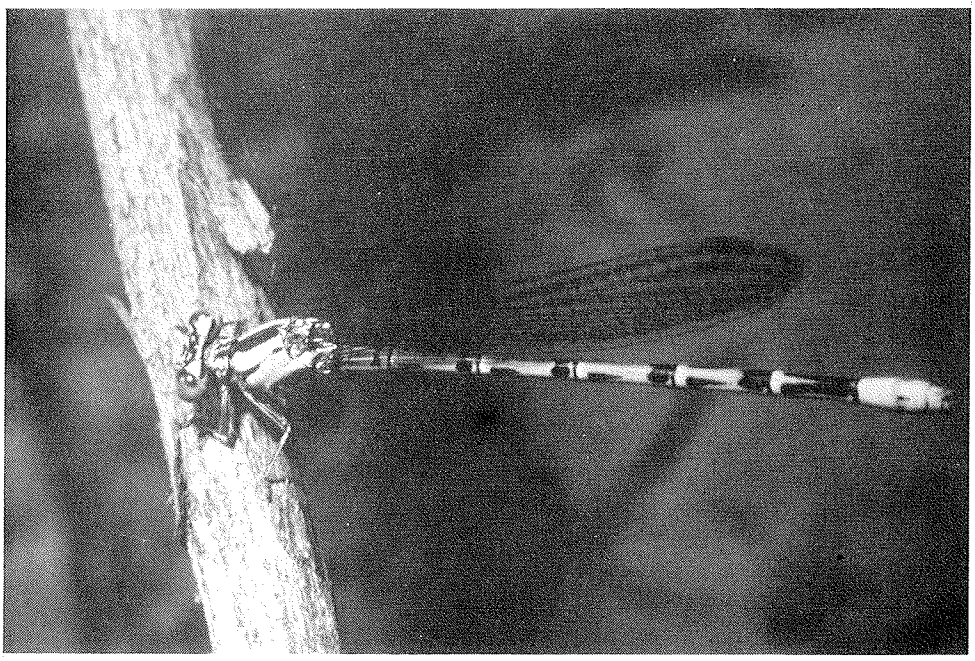
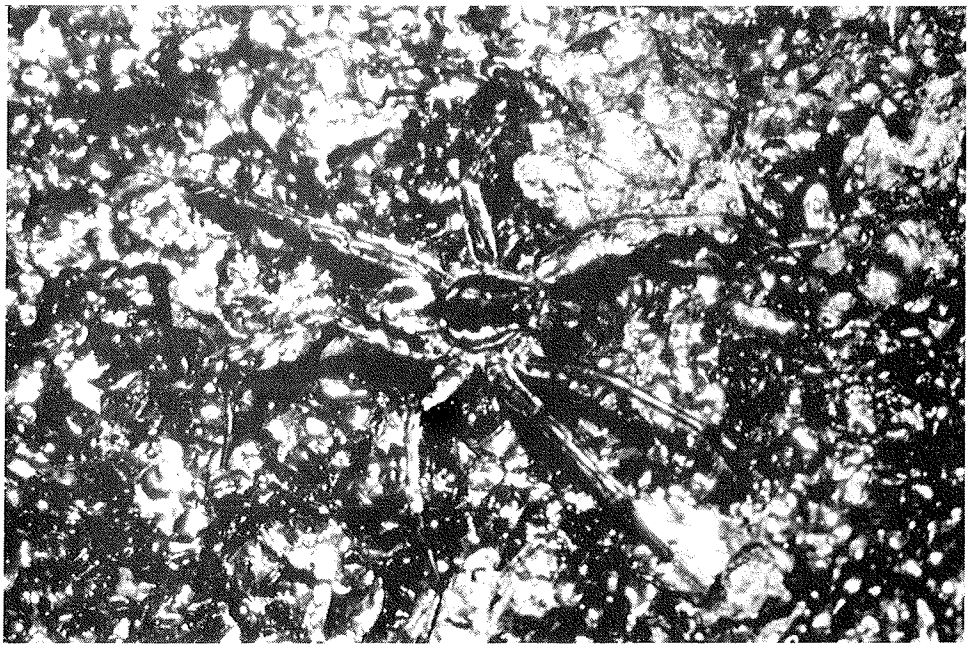


Figure 4. Lava Spider, Hawaiian National Park, Hawaii. (Photo - R.E. Elbel)



The Use of Geographic Information Systems in Utah County Mosquito Abatement One Year Later, Progress and Problems

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The use of Geographic Information Systems (GIS), specifically ArcInfo version 7 and ArcView version 2, in Utah County's Mosquito Abatement Division has enhanced several elements of the program. This would include an updated mapping system, increasing efficiency of the data collection system, and broadening statistical analysis within the program. GIS is, simply stated, the linking of stored data and computerized mapping. The use of a GIS greatly increased the capabilities for statistical analysis within Utah County's MAD, making it possible for the division to "see", in map form, the results of field inspector efforts and make scientific deductions about mosquitoes and other aspects of mosquito control.

Background

The first step towards using a GIS was to reorganize and update the data collection, mapping and data analysis systems. Utah County MAD printed maps from aerial photos on plates that were updateable about as often as the aerial photos were updated (approximately every ten years.) The MAD was entering data into a separate computer tied to the county's mainframe system from which basic population, species, and area larval population statistics were obtained These statistics were transferred to a separate spreadsheet program for developing charts and graphs for analysis.

The implementation of GIS enabled the MAD to use one system for all three aspects of data entry, retrieval and analysis, as well as adding new capabilities by making available or usable information form other divisions within the county as well as outside agencies.

When the mapping and data collection systems were updated, the breeding site maps were entered on the GIS by digitizing. The maps were digitized from county aerial photo quads onto a coverage, or file, on the GIS. (A GPS Magellan Navpro 5000 was used for canyon sites which are presently, being added to the breeding site coverage). Next, the data entry list was updated and added to the map. Each date set was associated with its own breeding site spot number. These numbers were later linked to a point within each polygon representing a breeding site. Inspector data is now entered directly into ArcView via menus and is immediately added to existing data, including the addition, deletion, or reshaping of a breeding site.

Present Uses of GIS for Data Analysis

At this point it was possible to conduct data analysis. Since ArcView had the capability to create graphs and charts on demand, all former capabilities for MAD data analysis were available. The initial goal was, then, to "see" in map form, the information seen only previously as graphs and charts. A spatial distribution of the mosquitoes found in Utah County was created by assigning a specific color to each species and highlighting the breeding site polygon the color the associated species. This map could be used in considering placement of sentinel chicken flocks adjacent to high populations of *Culex tarsalis* breeding sites in the Western Equine Encephalitis surveillance program. Next, a graph of larval dip counts at each breeding site was developed. From the graph, a map with larval dip counts assigned a graduated circle size was created. This showed dip count trends and concentrations of high mosquito populations across Utah County. It was also possible to query ArcView about which areas in the county had been treated by any or all inspectors in a given week.

After ensuring the continued use of previous forms of data analysis, new ideas were implemented. The first addition was a computer file and map of all recorded complaints. Address matching was used to generate a point at the location of each complaint. A record of all ULV sprays was the next addition. A coverage of areas that had been sprayed with the ULV sprayers was developed. The coverage included address matching, and linking the spray time to graduated circles showing an approximated account of areas sprayed in a week's time. The graduated circles were colored according to treatment type: air spray-green, ground-pink, and ATV-blue. The circles were rotated to the side of the center point the direction of the recorded wind direction on the ULV spray map. This figure also included a special ArcView feature called "Hotlink" which is the capability to link a photo, video or other file to a specific point. A photo link of a breeding spot could be shown on screen and printed out with a map. This record of photos would be very useful in tracking hard to find and unique spots.

Setbacks

The implementation of a GIS has not been without its problems. It was necessary to contact the GIS producer (ESRI) to solve problem with address matching Utah's all number addresses. Because technology is progressing so rapidly, we found ourselves changing from an ArcInfo system to an ArcView program which was better suited to a MAD's needs. However, using a GIS has increasingly paid for itself by boosting efficiency, expanding statistics, and streamlining the record keeping process.

The Future of a GIS in a MAD

As society becomes more information oriented, it will be necessary to communicate with non-technical persons about Mosquito Abatement practices. A GIS offers the capabilities of showing a complicated topic to ex-

plain, in a simpler picture or map, form. District board members, congressmen, or taxpayers may need to be shown in simple terms, why specific Mosquito Abatement practices are necessary. A GIS can show proximity to higher populations in a city or district, it can show numbers of service requests in a given area, and it can show the amount of work that is contributed by a MAD in one, or several years. As society becomes more information oriented, a GIS may be a key factor in the persistence of Mosquito Abatement.

Conclusion

The use of GIS in Utah County's MAD has improved our capabilities for accuracy in mapping and record keeping, and expanded our mobility in retrieving and analyzing stored data. These increased capabilities are adding to the division's efficiency and ability to communicate or relate with the public about our program. Acquiring and implementing a Geographic Information System could determine a MAD's success in the future.