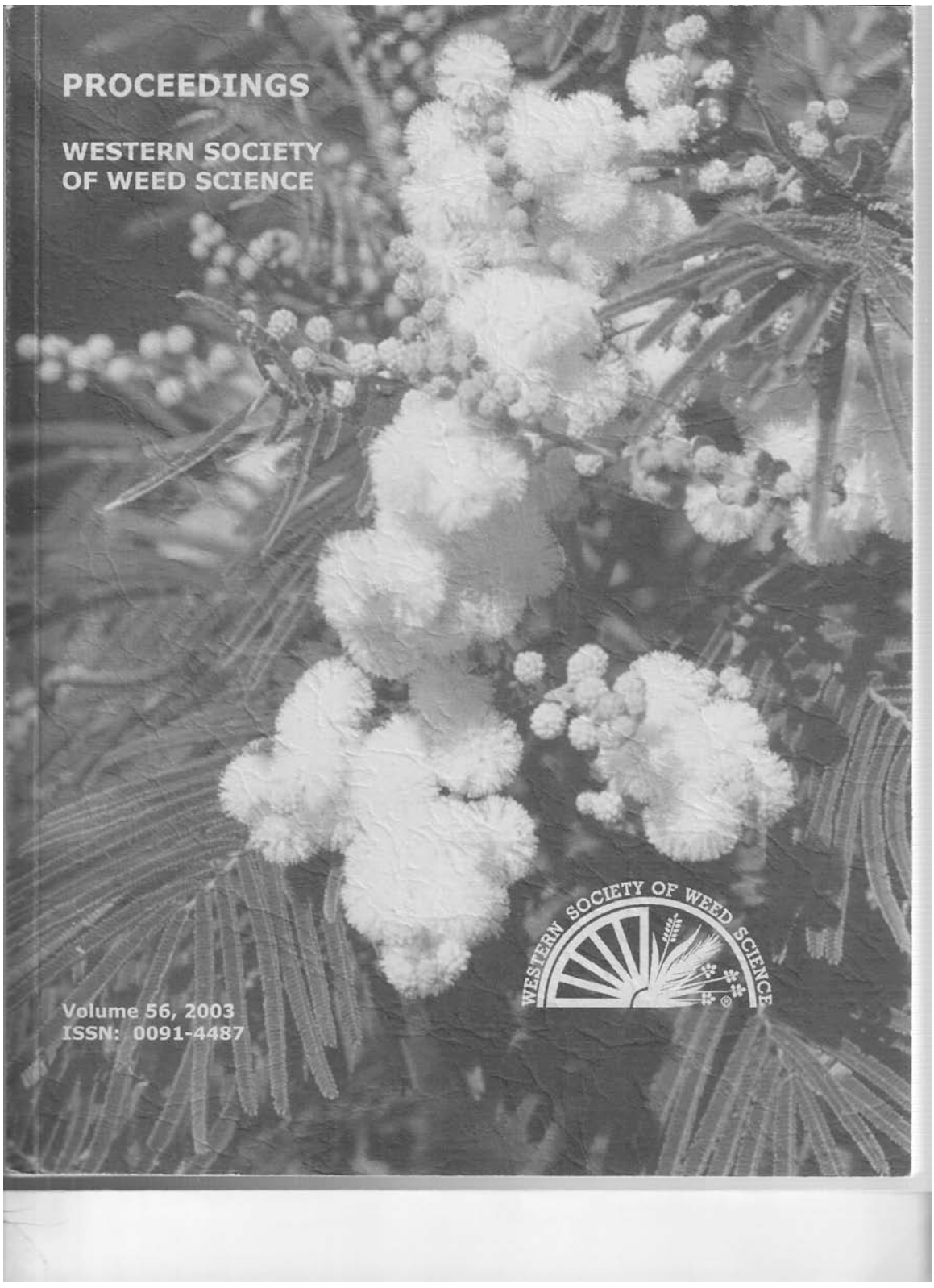
PROCEEDINGS
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2003

# PROCEEDINGS

# OF

# THE WESTERN SOCIETY OF WEED SCIENCE

VOLUME 56

PAPERS PRESENTED AT THE ANNUAL MEETING

MARCH 11-13, 2003

SHERATON KAUAI RESORT

KAUAI, HAWAII

## PREFACE

The Proceedings contain the written summary of the papers presented at the 2003 Western Society of Weed Science Annual Meeting plus summaries of the research discussion groups and of the business transacted by the Executive Board.

The paper number located in brackets at the end of each abstract corresponds to the paper number in the WSWS Program.

In these Proceedings, herbicide application rates are given as acid equivalent or active ingredient unless otherwise specified. Chemical names of the herbicides mentioned in the text are given in the herbicide index. Botanical names of crops and weeds are given in the appropriate index and are not repeated in the text unless their omission may cause confusion. Common and botanical names follow those adopted by the Weed Science Society of America as nearly as possible.

Copies of this volume are available at $20.00 per copy from Wanda Graves, WSWS Business Manager, P.O. Box 963, Newark, CA 94560.

Cover photograph, Black wattle, *Acacia mearnsii*, by Clyde Elmore. Other photography by Kai Umeda and Phil Banks.

Proceedings Editor: Joan Campbell

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## GENERAL SESSION

**WSWS: SUCCESSES AND CHALLENGES**. WSWS Presidential Address, Jill Schroeder, Professor, New Mexico State University, Las Cruces, NM.

I would like to welcome everyone to the annual meeting of the Western Society of Weed Science. First of all, I would like to extend my thank you to all of the volunteers who have helped put this meeting together. I would also like to thank Phil Motooka and all of the volunteers who put together a wonderful informative tour yesterday.

The Executive Committee meeting was on Sunday and we covered a lot of ground. Between what I tell you today and what you hear at the Business Meeting on Thursday morning, I hope you will get a good sense of the current status of the WSWS.

As Gil Cook mentioned, I have been a member of the WSWS since 1988 and I had the opportunity to be involved in the organization from the very beginning. The first year I was at the WSWS meeting in Fresno, I went to my first discussion session in the Basic Sciences Section. Jodie Holt was the Chair for the section that year and was looking for a volunteer to run for Vice-Chair of that section. Not quite knowing what I was doing, I accepted the opportunity and learned a great deal about the discussion sections of this organization as a result. A few opportunities later, first Gus Foster and then Charlotte Eberlein approached me to see if I would be interested in participating in a set of workshops and serve on a coordinating committee organized by CAST. As a result, I have been active with the CAST Conversations on Change program since 1995. The whole purpose of the CAST Conversation on Change program was to evaluate our professional societies and the challenges that we are facing. It has been an interesting experience and I would like to share some of the things that I have learned with you this morning.

We spent time at these workshops engaged in activities designed to help us explore our thinking about professional societies. We used Lego's as one tool to examine the structure of our professional organizations. The Lego's were used to illustrate attributes of an effective organization and tools for working with diverse groups of people. We discussed problems our organizations are having including declining membership, how to define the vision for who and/or what the society represents, how to recruit diversity in our membership and thinking, and challenges in dealing with public opinion about agriculture and our particular disciplines. When I listened to the discussions, I had a difficult time putting the Western Society of Weed Science into the same framework of concerns expressed by other societies. To me, the strength of WSWS is the membership. We are increasing in size which is in contrast with many of the other professional organizations. We also have wonderful meetings keyed around our discussion sessions. Members are involved in society activities and volunteerism is at an all time high in this organization. We are fortunate because we have financial security. The sustaining members are supportive, which helps to keep the organization going, and we also have The *Weeds of the West*, which is an extraordinarily successful publication. I think over 100,000 copies have been printed and sold and, according to Tom Whitson, they continue to be sold at a rate of 1,000 copies a month. So, it is an extremely successful publication in terms of providing both financial stability and visibility for this organization.

However, there have been tremendous changes in our country and industry over the last few years. Rapid change in technology and the economy is causing changes in our industry, government, and the way we think about our discipline. So I would like us to ask ourselves whether we are continuing to take advantage of the strengths that we have as an organization. One of the things that concerns me, because we are a more diverse group and we are all busy with many obligations, is how do we remain connected with our society and with the Executive Committee? The Executive Committee meetings, especially the summer meetings, are not well attended by Committee Chairs and other society members. Summer meetings are not even attended by some of the Executive Committee! I wonder if we need to think about how we conduct these meetings and how we manage some of our society functions so that we can maintain the level of participation that we traditionally have had in the society. We also need to think about ideas for new funding mechanisms for WSWS. We are secure financially, but with the changes in industry and the possibility that *Weeds of the West* will not sell forever, we need to think about our financial future.

I would like to present three ideas related to how we might build on our current strengths as an organization. First, I think the professional development offered at the meetings has been excellent. A strength of WSWS is the fact that our publicity committee works to secure continuing education units for those who attend meetings. But, we need to consider whether there are other training opportunities that we can develop to help our members professionally.

Secondly, we need to evaluate our placement service. Traditionally our placement service has served the early career professionals in our society. When 'traditional' weed science jobs were plentiful, the notebooks were full and students had many opportunities to talk to the people making the job decisions. This year, the committee

reported that the number of entries into the placement service were few. We need to determine if this is because few jobs are available, or if most jobs are now advertised electronically. Job opportunities are down in industry; however, a number of jobs are available in the Federal and State organizations. One problem is that in many of these organizations, Weed Science is not a 'name' discipline. In fact, many of us are not called a weed scientist in our professional job title. Our challenge is to help members find weed science job opportunities. I think that within our membership, there is a great deal of knowledge concerning how the different government systems and how the different industry systems work. How can we network more effectively to help each other identify job opportunities and how to decipher the job titles and descriptions.

Third, I think that engaging our student members is critically important to WSWS. I think that the student members are the future of this organization. They are the next weed science professionals and they can bring a fresh new perspective to this organization by helping us think differently and look at issues differently as we continue to grow and evolve as a society. Based on suggestions from the meeting last year, Wanda put a red sticker on name tags of the students in the organization. I would like to urge us more 'seasoned' members of the organization to seek out the student members and to welcome them and to introduce ourselves to them. Last year I appointed a Student Activities Ad-hoc Committee because of an idea brought forward by Steve Dewey at the Salt Lake City meeting. Steve suggested that we initiate a 'Student Night Out' at our annual meeting to provide students with an opportunity to meet new people. Steve Dewey and Lisa Boggs have done a lot of work to develop this project and I would like to invite you to take a student to dinner one of these evenings. Steve is recruiting hosts to take a student out for an evening. Lisa is serving as a student representative to the board and recruited most of the students to participate. The whole purpose of this activity is to introduce people to each other, hosts and students shouldn't necessarily know each other before they meet for dinner. The goal of the evening is to get to know each other and for the students to find out what you do professionally and what you do with the WSWS. I think it is a wonderful opportunity and I hope that you will take advantage of it and see Steve Dewey at the Registration Desk this afternoon.

I would now like to present two ideas related to how we might move forward as an organization; these ideas are a little more subtle than placement services and taking the students to dinner. First, I think we need to think about the 'Institutional Memory' of this organization. As a new person on the Executive Committee, it struck me as I think it struck many other people who have had an opportunity to serve on the board that, we spend a lot of time every year rehashing what we did last year or two years ago or three years ago. I think that we, as members, elect people to our Executive Committee to make decisions and to address the future of the organization rather than to discuss the past. Because of some of these frustrations and because of some discrepancies that we found in the Constitution and By-Laws, I recruited volunteers who were willing to evaluate these two documents. Vanelle Carrithers (Chair), Nelroy Jackson, Phil Banks, Peter Dotray, Charlotte Eberlein and Gus Foster are the members of the Ad-hoc Committee for the Constitution and By-Laws, and I would like for you to recognize the fact that they spent a tremendous amount of time looking at these documents that govern our organization. They addressed discrepancies in those documents and also discussed how to maintain our institutional memory. Several copies of the proposed changes to these documents are available at the registration desk, and an outline of the changes that they are proposing were printed in the last newsletter. The Executive Committee approved the changes prior to Christmas. Most of the changes resolve the discrepancies in the documents, but I would like to present a few additional proposed changes today. Please take some time to review and think about the documents. Seek out these members of the committee if you have any questions because we are going to vote on these changes at the Business Meeting on Thursday. The committee recommended that we change the name of the Executive Committee to the Board of Directors to make our terminology consistent with other organizations. They also recommended a change in the term of office for the secretary from one year to two years. They did this to help provide more continuity on the board. The other thing that they recommended is that the non-voting board members include the chair-elect for the Research and the Education and Regulatory Sections. They recommend that these people should be on the board in that first year so that they can learn how the society operates. Finally, the committee recommended that the board include a Representative for Constitution and Operating Procedures. This would be a non-voting position on the board and the role of this individual would be to ensure that the board adheres to the Constitution and By-Laws of the organization and to serve as the memory of the board.

Why do we need this? I've already mentioned that we spent too much time reinventing the wheel. But another reason why we need better continuity on the board is the fact that we were audited by the IRS this winter. Wanda received notification of the pending audit in November, 2002. The audit covered the tax year ending on March 31, 2000. The issues that they asked us to be prepared for included compensation for Wanda Graves' services as Business Manager, an expense paid to WSSA for services of the Congressional Science Fellow and AESOP, and expenses related to the *Weeds of the West*. They requested copies of the Articles of Incorporation,

Constitution and By-Laws, tax documents for Wanda Graves, samples of all publications, records of expenses for *Weeds of the West*, and an explanation of the expense for AESOP. One of the things that Wanda and I found when we were pulling this information together was that while it was fairly easy to find the information on some of these items, much of the information could not be found in the minutes of the organization. Tom Whitson provided the documentation on the expenses for the *Weeds of the West* that year. We had a difficult time finding any information that documented why we provided an expense to WSSA in support of AESOP services agreement. I would like to thank Rob Hedberg and Joyce Lancaster of WSSA for helping us with this documentation. Wanda met with two representatives from the IRS on December 10, 2002. The good news is that the auditors were very satisfied that we were working within the guidelines of a nonprofit organization. However, we need to refile for our tax exempt status with the Federal Government because we filed for incorporation in the state of California in 1990. The audit concluded that Wanda's classification was incorrect and that she is an employee of our organization, not an independent contractor. This determination was made because we very clearly specified what her duties are in the Constitution and By-Laws, there is no formal contract for services between WSWS and Wanda, and WSWS provides funds for travel to meetings and for office supplies and equipment.

After reading the findings and consulting with the accountant who handles our tax returns, we replied to the IRS. We agreed to reclassify Wanda as an employee and provided an explanation as to why we had treated her as an independent contractor. On the 27th of February, 2003 the IRS responded with a Classification Settlement Program offer consisting of two items. We were eligible for the Classification Settlement Program because we had acted in good faith, we are a nonprofit organization, we had filed all the required documentation that was necessary based on Wanda's current classification, and Wanda had paid all of her taxes. The settlement offer was in two parts: the calculated tax deficiency was over $800, but they reduced our tax to $274.99 which was 25% of the calculated tax deficiency. Second, as of the 1st of July, 2003, we must begin paying Wanda as an employee and withhold the proper social security and FICA taxes. After consulting the accountant, we presented the information to the board with the recommendation to accept the offer. The board voted unanimously on Sunday to agree to the offer. We are going to comply with their requests, pay these past deficiencies and begin paying Wanda as an employee as of the 1st of July. The bottom line is that our nonprofit status is secure and we owe less than $300 to the IRS.

I recommend the proposed changes to the Constitution and By-Laws based on these issues. If you vote to accept the proposed changes to the Constitution and By-Laws on Thursday, I am going to recommend the appointment of Dr. Steve Miller as our first Representative for Constitution and By-Laws. I make this recommendation for three reasons: Dr. Miller has a lot of experience with our society, he cares about this society, and he is willing to serve in this capacity.

I have a second idea regarding how we can move forward as an organization. I think that we need to continue to think progressively in terms of what the WSWS is and should be as an organization. My personal vision of the WSWS, is that the WSWS is recognized as "the place to go" to find weed science expertise in the western United States. Based on what I have learned over the last few years, I feel very strongly that our voice is much stronger as an organization than as individuals, particularly when we are dealing with the public and policy makers. I think that our meetings offer a wonderful opportunity to exchange ideas and to discuss issues, to learn new skills, and to make contact with each other. I think that our discussion sessions are a key to our continuing success and one of the major strengths of our organization. I think that we need to do whatever we can to maintain our strengths because that is where we learn from each other and how we generate new ideas. I also think that the Business Meeting Breakfast is a very important component to our organization. Our Business Meetings are better attended than any other organization that I have been affiliated with. I think that maintaining our commitment to the breakfast meeting is very important to help keep all of us informed as to what is going on in WSWS.

Please continue to attend and participate in the WSWS. I think that questions that we need to consider are: how do we stay in contact over the rest of the year and are there things that we need to do to remain financially secure. In order to help members stay in contact with the WSWS, we need to maximize our use of the website. This last year has been frustrating because of some problems we have had with the website, particularly towards the end of the year. We need to thank Joan Campbell for her work to make sure the site was available for abstract submission. At the board meeting on Sunday, we made the decision to hire a new host for the website which I think will provide opportunities to enhance and improve our website. A second aspect of communication is the need to continue to improve our record keeping. Our secretaries must keep good minutes of all of our meetings plus a record of decisions made during the year via email and/or telephone. In 2002, we began publishing all of the minutes of the organization in the proceedings (previously only the business meeting minutes were published) which will improve access for everyone in the society.

Finally, I think that we need to engage everyone in our discussions of the future of the WSWS. I would like to challenge you to think about your vision of the Western Society of Weed Science. I would like to urge you to

discuss WSWS issues and communicate your thoughts to the board members since these are the people that you have elected and entrusted with the policy making decisions of our organization. We put a suggestion box at the registration desk and if you have ideas, write them down and put them in the suggestion box. Otherwise, use e-mail, use snail mail, or whatever tool you need to make sure that people know what your ideas and concerns are. I think that we should also use the WSWS listserv or website for communication.

The Conversation on Change committee developed our vision of the 'ideal society'. The figure shows circles identifying the public, the WSWS as a whole, our committees, and our board of directors. What is most important is that the diagrams show arrows going in both directions among all of these groups. I think that effective communication is the key to maintaining a viable organization and to generating ideas within the organization. One thing to remember is that we are all volunteers except for Wanda. Unfortunately for Wanda, she 'has the opportunity' to train a new group of volunteers every year to handle the meeting and to handle the functions of the organization. I think that if we improve our communication, we can help each other accomplish the activities that are important to the organization. I think that we need to respect the fact that we are all busy people and, if we work together and everyone participates, we can be far more effective. So, I would like to conclude by saying that I think that we have a sound, relevant society and I think that our challenge is to maintain what we do so well, and keep moving forward. Thank you very much for your attention, and have a good meeting. [Paper number 43]

**AN OVERVIEW OF THE BIOLOGICAL CONTROL OF WEEDS IN HAWAII.** Kenneth K. Teramoto, Head of Biocontrol Program, Hawaii Department of Agriculture, Honolulu, HI.

The government of Hawaii has utilized classical biological control to suppress plant pest infestations in the Hawaiian Islands for more than a hundred years. Prior to 1890, attempts had been made by private individuals to control pests through the introduction of animals. The earliest recorded example of biocontrol by private citizens was the introduction by Dr. William Hillebrand in 1865 of the Indian myna bird to feed on armyworms (Funasaki et al., 1988). The most infamous example mentioned today by uninformed residents in response to any plans for biocontrol is the introduction of the mongoose from Jamaica to prey on rats. Hamakua plantation owners on the island of Hawaii made the introductions in 1883 and 1885. The mongoose, native to India, became established on the islands of Hawaii, Maui, Molokai, and Oahu (Funasaki, et al., 1988). As everyone is now aware, the mongoose is active during the day, while rats are nocturnal, and the mongoose preferred ground-nesting birds because they were much easier prey than rats.

The earliest introductions were made with no planning and evaluation because none were required. There were no laws or regulations restricting or prohibiting the importation of any plant or animal into Hawaii. The reigning Hawaiian government did not sanction the practice of biological control until 1890, when the Kingdom of Hawaii under the reign of King David Kalakaua enacted the "Laws of the Hawaiian Islands" to prevent the introduction of pestiferous insects and to eliminate those that were already established (Funasaki, et al., 1988). Two years before that eventful date, a preeminent milestone was recorded in the history of classical biological control. Albert Koebele, a naturalized German immigrant, was sent by Charles V. Riley, Chief of the Division of Entomology (U.S. Department of Agriculture) from California to Australia as an explorer to search for natural enemies of the cottony cushion scale, *Icerya purchasi* Maskell (Homoptera: Margarodidae). In 1887, massive infestations of this scale were threatening the destruction of California's infant citrus industry. The introduction by Koebele of the vedalia beetle, *Rodolia cardinalis* (Mulsant) (Coleoptera: Coccinellidae), from Australia in 1888 is universally recognized as the validation of classical biological control as a definitive method of pest control (Doutt, 1964).

As a result of the notoriety gained through the biocontrol project that suppressed infestations of the cottony cushion scale and saved the citrus industry in California, Koebele was contacted by the Hawaiian government for assistance in controlling infestations of the scale in Hawaii. In 1890, he shipped the vedalia beetle to Hawaii from California with highly successful results (Funasaki, et al., 1988).

In 1893, after the Hawaiian monarchy was overthrown, Albert Koebele was appointed Entomologist of the provisional government of the Republic of Hawaii and was given the responsibility of biologically controlling the many species of immigrant insects that were significant pests at that time. Hawaii became a U.S. Territory in 1898 and Koebele was appointed Entomologist of the Board of Agriculture and Forestry. In 1903, the Territorial Legislature enacted a law which organized the Board of Commissioners of Agriculture and Forestry and provided for buildings and materials to obtain, propagate, study, and distribute beneficial insects to control pest species of insects and weeds (Funasaki, et al., 1988). The law also provided for a quarantine system to prevent entry of new immigrant pests. Subsequently, Koebele was placed on the staff of the Hawaiian Sugar Planters' Association as a consulting entomologist (Swezey, 1925).

The importation and release of phytophagous insects to control weeds were initiated in Hawaii in 1902 against lantana, *Lantana camara* L., an invasive ornamental plant that had escaped cultivation and taken over large areas of range lands. According to J. K. Holloway in "The Biological Control of Insect Pests and Weeds" (DeBach, 1964), the first published report on the deliberate use of insects to control an unwanted plant species was made by Perkins and Swezey in 1924. The report was on the work undertaken in Hawaii in 1902 to suppress infestations of lantana. Albert Koebele was sent by the territorial government to Mexico and Central America to search for insects destructive to lantana. R. C. L. Perkins received the insects collected by Koebele and propagated, tested, and released them. More importations against lantana were made fifty years later. Many of these species had been observed and collected by Koebele but had not survived transport to Hawaii (Holloway, 1964).

According to Funasaki, et al. (1988), 27 species of lantana-feeding insects were released, 15 of which were successfully established. The Bishop Museum's "Hawaiian Arthropod Checklist" (Fourth Edition, 2002) lists the establishment of two species, a cerambycid beetle and a noctuid moth, that were previously not known to be established following introduction from Mexico in 1955 and 1962, respectively. Thus, 17 species of purposely introduced insects for biocontrol of lantana are now believed to be established in Hawaii. Today, lantana can still be found in dense stands in certain localities on each island, mainly in lowland dry to mesic forests and arid range lands, but it is no longer a significant pest of pastures as it had been when first targeted for biocontrol.

During the period 1902 to 1999, 21 species of invasive plants were targeted for classical biological control. A total of 84 species of potential biocontrol agents were released, 60 of which are now established. Of the total number of biocontrol agents established, there are 55 insects, 1 mite, and 4 fungi. Of the total number of insects established, there are 25 Lepidoptera, 17 Coleoptera, 7 Diptera, 2 Heteroptera, 2 Thysanoptera, 1 Homoptera, and 1 Hymenoptera.

The following table provides a detailed account of all of the introductions into Hawaii for biological control of invasive weeds from 1902 to the present. The most recent release was made in 1988 for biocontrol of ivy gourd. Currently, potential biocontrol agents for suppression of fireweed, Senecio madagascariensis Poiret, are being tested in quarantine.

LIST OF ORGANISMS INTRODUCED INTO HAWAII FOR BIOLOGICAL CONTROL OF WEEDS (1902 TO 1998)

**Lantana**
*Lantana camara* L.
Family Verbenaceae
Introduced 24 species (Lepidoptera 11, Coleoptera 8, Diptera 3, Heteroptera 2)
Established 17 species (Lepidoptera 9, Coleoptera 4, Diptera 2, Heteroptera 2)
Initial introduction 1902 (13 species introduced, 9 established)

*Apion* spp.
(Coleoptera: Apionidae)
Mexico 1902

Unidentified Cecidomyiidae
(Diptera: Cecidomyiidae)
Mexico 1902

*Cremastobombycia lantanella* Busck
(Lepidoptera: Gracillariidae)
Mexico 1902 (est)

*Crocidosema* (=*Epinotia*) *lantana* Busck
(Lepidoptera: Olethreutidae)
Mexico 1902 (est)

*Eutreta xanthochaeta* Aldrich
(Diptera: Tephritidae)
Mexico 1902 (est)

*Hepialus* sp.

(Lepidoptera: Heliodinidae)
Mexico 1902

*Lantanophaga pusillidactyla* (Walker)
(Lepidoptera: Pterophoridae)
Mexico 1902 (est)

*Octotoma scabripennis* Guerin-Meneville
(Coleoptera: Chrysomelidae)
Mexico 1902, 1953, 1955, & 1959 (est)

*Ophiomyia lantanae* (Froggatt)
(Diptera: Agromyzidae)
Mexico 1902 (est)

*Parevander* (=*Evander*) *xanthomelas* (Guerin-Meneville)
(Coleoptera: Cerambycidae)
Mexico 1902

*Strymon bazochii* (Godart)
(Lepidoptera: Lycaenidae)
Mexico 1902 (est)

*Teleonemia scrupulosa* Stal
(Heteroptera: Tingidae)
Mexico 1902, B. Honduras 1952, Cuba 1952 & 1953,
Brazil, Florida, & Trinidad 1954 (est)

*Tmolus* (=*Strymon*) *echion* (L.)
(Lepidoptera: Lycaenidae)
Mexico 1902 (est)

*Octotoma gundlachii* Suffrian
(Coleoptera: Chrysomelidae)
Cuba 1953

*Pseudopyrausta* (=*Blepharomastix*) *acutangulalis* (Snellen)
(Lepidoptera: Crambidae)
Mexico 1953 & 1965

*Octotoma championi* Baly
(Coleoptera: Chrysomelidae)
Honduras 1954

*Plagiohammus spinipennis* (Thomson)
(Coleoptera: Cerambycidae)
Mexico 1954, 1959, & 1960 (est)

*Aerenicopsis championi* Bates
(Coleoptera: Cerambycidae)
Mexico 1955 (est)

*Neogalea sunia* (Guenee) (=*Catabena esula* Druce)
(Lepidoptera: Noctuidae)
California 1955 (est)

*Salbia* (=*Syngamia*) *haemorrhoidalis* Guenee
(Lepidoptera: Crambidae)
Florida & Cuba 1956 (est)

*Hypena* (=*strigata*) l*aceratalis* Walker
(Lepidoptera: Noctuidae)
South Rhodesia 1957 & Philippines 1964 (est)

*Uroplata girardi* Pic
(Coleoptera: Chrysomelidae)
Brazil 1961 & Australia 1974 (est)

*Diastema tigris* Guenee
(Lepidoptera: Noctuidae)
Mexico 1962 (est)

*Leptobyrsa decora* Drake
(Heteroptera: Tingidae)
Australia 1969 (est)

**Purple nutsedge (nut grass)**
*Cyperus rotundus* L.
Family Cyperaceae
Introduced 2 species, 2 established

*Athesapeuta cyperi* Marshall
(Coleoptera: Curculionidae)
Philippines 1922 & 1925 (est)

*Bactra venosana* (Zeller)
Lepidoptera: Tortricidae)
Philippines 1922 & 1925 (est)

**Gorse**
*Ulex europaeus* L.
Family Fabaceae
Introduced 8 species, 4 established

*Exapion* (=*Apion*) *ulicis* (Forster)
(Coleoptera: Apionidae)
England 1927 & 1949 (est)

*Exapion* (=*Apion*) sp.
(Coleoptera: Apionidae)
Portugal 1958

*Apion scutellare* Kirby
(Coleoptera: Apionidae)
Portugal 1961 & 1989

*Agonopterix ulicetella* (Stainton)
(Lepidoptera: Oecophoridae)
England 1986 & Portugal 1988 (est)

*Sericothrips staphylinus* Haliday

(Thysanoptera: Thripidae)
England 1987 & Portugal 1991 (est)

*Tetranychus lintearius* Dufour
(Acari: Tetranychidae)
Oregon 1995 (est)

*Pempelia genistella* (Duponchel)
(Lepidoptera: Pyralidae)
Portugal 1996

*Uromyces pisi* (DC.) Otth f. sp. *europaeus* Macd.
(Uredinales: Pucciniaceae)
England 1999

**Christmas berry (Brazilian peppertree)**
*Schinus terebinthifolius* Raddi
Family Anacardiaceae
Introduced 3 species, 2 established

*Lithraeus* (=*Bruchus*) *atronotatus* (Pic)
(Coleoptera: Bruchidae)
Puerto Rico 1932 (est)

*Episimus utilis* Zimmerman
(Lepidoptera: Tortricidae)
Brazil 1954 (est)

*Crassimorpha infuscata* Hodges
(Lepidoptera: Gelechiidae)
Brazil 1954 & 1961

**Maui pamakani (crofton weed)**
*Ageratina adenophora* (Spreng.) R. King & H. Robinson
(formerly *Eupatorium adenophorum* Spreng.)
Family Asteraceae
Introduced 1 species, established

*Procecidochares utilis* Stone
(Diptera: Tephritidae)
Mexico 1944 (est)

**Panini (prickly pear)**
*Opuntia ficus-indica* (L.) Miller (formerly *Opuntia megacantha* Salm-Dyck)
Family Cactaceae
Introduced 4 species, 3 established

*Dactylopius opuntiae* (Cockerell)
(Homoptera: Dactylopiidae)
Australia 1949 (est)

*Moneilema armatum* LeConte
(Coleoptera: Cerambycidae)
Texas 1950

*Archlagocheirus funestus* (Thomson)
(Coleoptera: Cerambycidae)

Australia 1951 (est)

*Cactoblastis cactorum* (Berg)
(Lepidoptera: Pyralidae)
Australia 1959 (est)

**Prickly pear**
*Opuntia* spp.
Family Cactaceae
Introduced 1 species, not established

*Melitara bollii* (Zeller) (=*M. prodenialis*)
(Lepidoptera: Pyralidae)
Texas 1949

*Melitara prodenialis* Walker
(Lepidoptera: Pyralidae)
Texas 1949

**Clidemia (Koster's curse)**
*Clidemia hirta* (L.) D. Don
Family Melastomataceae
Introduced 7 species, 7 established

*Liothrips urichi* Karny
(Thysanoptera: Thripidae)
Fiji 1953 (est)

*Ategumia ebulealis* (Guenee)
(Lepidoptera: Crambidae)
Trinidad 1969 (est)
*Colletotrichum gloeosporioides* f. sp. *clidemiae* Trujillo et al
(Melanconiales: Melanconiaceae)
Panama 1986 (est)

*Lius poseidon* Napp
(Coleoptera: Buprestidae)
Trinidad 1988 (est)

*Antiblemma acclinalis* Hubner
(Lepidoptera: Noctuidae)
Trinidad 1995 (est)

*Mompha trithalama* Meyrick
(Lepidoptera: Momphidae)
Trinidad-Tobago 1995 (est)

Carposina bullata Meyrick
(Lepidoptera: Carposinidae)
Trinidad-Tobago 1995 (est)

**Pluchea (sourbush)**
*Pluchea symphytifolia* (Mill.) Gillis (formerly *Pluchea odorata* (L.) Cass.)
Family Asteraceae
Introduced 2 species, 2 established

*Dichomeris* (=*Trichotaphe*) *aenigmatica* (Clarke)
(Lepidoptera: Gelechiidae)
Mexico 1955 (est)

*Acinia picturata* (Snow)
(Diptera: Tephritidae)
Guatemala 1959 (est)

**Hamakua pamakani (spreading mist flower)**
*Ageratina riparia* (Regel) R. King & H. Robinson
(formerly *Eupatorium riparium* Regel)
Family Asteraceae
Introduced 4 species, 3 established

*Xanthaciura connexionis* Benjamin
(Diptera: Tephritidae)
Mexico 1955

*Leioptilus* (=*Oidematophorus*) *beneficus* (Yano & Heppner)
(Lepidoptera: Pterophoridae)
Mexico 1973 (est)
*Procecidochares alani* Steyskal
(Diptera: Tephritidae)
Mexico 1973 (est)

*Entyloma ageratinae* Baretto & Evans
(Moniliales: Moniliaceae)
Jamaica 1974 (est)

**Emex**
*Emex spinosa* (L.) Champd.
Family Polygonaceae
Introduced 3 species, 1 established

*Perapion* (=*Apion*) *antiquum* (Gyllenhal)
(Coleoptera: Apionidae)
South Africa 1957 (est)

*Perapion* (=*Apion*) *neofallax* (Warner)
(Coleoptera: Apionidae)
Morocco 1962

*Perapion* (=*Apion*) *violaceum harcyniae* (Herbst)
*Perapion* (=*Apion*) *violaceum violaceum* (Kirby)
(Coleoptera: Apionidae)
Portugal 1962

**Melastoma (Indian rhododendron)**
*Melastoma candidum* D. Don
(formerly *Melastoma malabathricum* L.)
Family Melastomataceae
Introduced 3 species, 3 established

*Ategumia* (=*Bocchoris*) *fatualis* (Lederer)
(Coleoptera: Chrysomelidae)
Philippines 1958 (est)

*Ategumia* (=*Bocchoris*) *adipalis* (Lederer)
(Coleoptera: Chrysomelidae)
Malaysia 1964 (est)

*Rhynchopalpus brunellus* Hampson
(=*Selca brunella* Hampson)
(Lepidoptera: Noctuidae)
Malaysia 1964 (est)

**Elephant's foot**
*Elephantopus mollis* Kunth
Family Asteraceae
Introduced 1 species, established

*Tertraeuaresta obscuriventris* Loew
(Diptera: Tephritidae)
Fiji 1961 (est)

**Nohu / puncture vine (goat head)**
*Tribulus cistoides* L. / *Tribulus terrestris* L.
Family Zygophyllaceae
Introduced 2 species, 2 established

*Microlarinus lareynii* (Jacquelin du Val)
(Coleoptera: Curculionidae)
California 1962 & Arizona 1963 (est)

*Microlarinus lypriformis* (Wollaston)
(Coleoptera: Curculionidae)
California 1963 (est)

**Blackberry (prickly Florida blackberry, 'ohelo'ele'ele)**
*Rubus argutus* Link (formerly *Rubus penetrans* L. H. Bailey)
(targeted as Rubus lucidus Rydb.)
Family Rosaceae
Introduced 2 species, 1 established

*Pennisetia* (=*Bembecia*) *marginata* (Harris)
(Lepidoptera: Sessiidae)
Oregon 1963

*Croesia zimmermani* Clarke
(Lepidoptera: Tortricidae)
Mexico 1963 (est)

**Blackberry**
*Rubus* spp.
Family Rosaceae
Introduced 3 species, 2 established

*Schreckensteinia festaliella* Hubner
(Lepidoptera: Heliodinidae)
California 1963 (est)

*Priophorus morio* (Le Peletier)

(Hymenoptera: Tenthredinidae)
Oregon 1966 (est)

*Neochlamisus gibbosus* (Fab.) (= *Chlamisus gibbosa* (Fab.))
(Coleoptera: Chrysomelidae)
Missouri 1967 & 1968

**Klamath weed (St. Johnswort)**
*Hypericum perforatum* L.
Family Clusiaceae (Guttiferae)
Introduced 3 species, 3 established

*Chrysolina hyperici* (Forster) and *Chrysolina quadrigemina* (Suffrian)
(Coleoptera: Chrysomelidae)
California 1965 (est)

*Zeuxidiplosis giardi* (Kieffer)
(Diptera: Cecidomyiidae)
New Zealand 1966 (est)

**Russian thistle (tumbleweed)**
*Salsola* (=*pestifer* A. Nels.) *kali* L.
Family Chenopodiaceae
Introduced 2 species, none established

*Coleophora klimeschiella* Toll.
(Lepidoptera: Coleophoridae)
California 1980

*Coleophora parthenica* Meyrick
(Lepidoptera: Coleophoridae)
California 1980

**Banana poka**
*Passiflora mollissima* (Kunth) L. H. Bailey
Family Passifloraceae
Introduced 3 species, 2 established

*Cyanotricha necyria* (Felder & Rogenhofer)
(Lepidoptera: Notodontidae)
Colombia 1988

*Pyrausta perelegans* Hampson
(Lepidoptera: Crambidae)
Venezuela 1991 (est)
*Septoria passiflorae* Syd
(Sphaeropsidales: Sphaeropsidaceae)
Colombia 1996 (est)

**Firetree (fayatree, firebush)**
*Myrica faya* Aiton
Family Myricaceae
Introduced 2 species, 1 established

*Caloptilia* sp. nr. *schinella*
(Lepidoptera: Gracillariidae)

Madeira & Azores 1991 (est)

*Septoria hodgesii* Gardner
(Sphaeropsidales: Sphaeropsidaceae)
Azores 1997

**Ivy gourd (scarlet-fruited gourd)**
*Coccinia grandis* (L.) Voigt
Family Cucurbitaceae
Introduced 3 species, 2 established

*Melittia oedipus* Oberthur
(Lepidoptera: Sessiidae)
Kenya 1996 (est)

*Acythopeus burkhartorum* O'Brien
(Coleoptera: Curculionidae)
Kenya 1998

*Acythopeus cocciniae* O'Brien
(Coleoptera: Curculionidae)
Kenya 1998 (est)

**Miconia (velvet tree)**
*Miconia calvescens* DC
Family Melastomataceae
Introduced 1 species, established

*Colletotrichum gloeosporioides* (Penz.) Penz. & Sacc.
f. sp. *miconiae* Killgore et al.
(Melanconiales: Melanconiaceae)
Brazil 1997 (est)

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A special mahalo (thank you) and aloha (love) is extended to Phil Motooka and all the members of the Western Society of Weed Science for the opportunity to attend your 56th Annual Meeting and to share this report with you. Thank you for blessing Hawaii with your visit. The dedicated work of all of the biocontrol practitioners throughout the history of the Hawaiian Islands made this report possible. Special thanks go to Po-yung Lai and George Funasaki for compiling and publishing the "List of Beneficial Organisms Purposely Introduced for Biological Control in Hawaii: 1890 to 1985, including the Addendum (to 1990)," which greatly facilitated compilation of this report. [Paper number 45]

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**INVASIVE SPECIES IN HAWAII.** Philip A. Thomas, Hawaiian Ecosystems at Risk Project, Makawau, HI.

The biota of Hawaiian Islands is unlike any other in the world. Hawaii has extremely high endemism (species uniqueness) rates in many groups of organisms, and is a showpiece of evolution. Because of the nature of its native (pre-human contact) species—and indirectly because of its geographic isolation—Hawaii's ecosystems are particularly vulnerable to invasion by alien (non-native) species. However, since the advent of human discovery and habitation of the islands, many of Hawaii's unique species have become extinct, and many of its native ecosystems have been irreparably damaged or completely eliminated. Many of the remaining species and ecosystems are in danger of being lost, not only from Hawaii, but also—since these species and ecosystems are unique to Hawaii--from the world. The main threat to Hawaii's extant native biota is displacement by invasive species. Alien species invasions have far-reaching effects, not only to native plants and animals, but also to Hawaii's economy and to the quality of life of its residents and visitors. Although some measures are being taken to reduce current problems and prevent new problems caused by alien species invasions, many other things need to be done in order to protect Hawaii from ongoing problems caused by invasive species. Invasive species are a human-caused problem, and it will take continuous, dedicated actions by humans to keep additional—and often irrevocable—harm from occurring to Hawaii's economy, ecology, and quality of life. Philip A. Thomas (pt@hear.org) Hawaiian Ecosystems at Risk project (HEAR): www.hear.org [Paper number 46]

*The full text of the paper written (by Philip Thomas and Lloyd Loope) to correspond with Philip's presentation at the 2003 WSWS meeting (Kauai) is available online via a link from: http://www.hear.org/wsws*

## WEEDS OF RANGE AND FOREST (PROJECT 1)

**DATA COLLECTION AND FIRE MODELING DETERMINE THE POTENTIAL FOR THE USE OF PLATEAU(R) HERBICIDE TO ESTABLISH FUEL BREAKS IN *BROMUS TECTORUM*-DOMINATED RANGELANDS.** Brenda K. Kury[1], Jack D. Alexander III[1] and Jennifer Vollmer[2]. Environmental Specialist, Senior Specialist and Public Land Technical Specialist. [1]Synergy Resource Solutions, Inc., Sparks, NV and [2]BASF Corporation, Laramie, WY.

*Abstract.* Plateau® herbicide was applied on recently-burned cheatgrass (*Bromus tectorum*)-dominated rangelands near Boise, Idaho, to determine if the application of up to 12 ounces/acre of Plateau was a viable method to create and maintain firebreaks. Plateau has been used extensively throughout the U.S. to enhance native plant seedings and control cheatgrass. Synergy Resource Solutions, Inc., gathered data to determine biomass production, litter accumulation, and plant height in the study area on June 15 and 16, 2002. Fire behavior at each site was modeled with collected data using BehavePlus fire-modeling program. Modeling predicted that application of Plateau at rates above 6 ounces/acre would effectively reduce Bromus tectorum in fuel break areas. Between Plateau treatments, flame height increased slightly at the 12 ounces/acre rate due to an increase in the number of forbs (broadleaf) species compared to a greater percentage of grass species encouraged at the lower rates of 6 ounces/acre and 8 ounces/acre. These data indicated that fuel breaks treated with Plateau for cheatgrass control would have lower flame lengths and rates of spread than untreated areas. [Paper Number 1]

**YEARLY CHANGE IN SPATIAL DISTRIBUTION OF DALMATION TOADFLAX AT ARCHER, WY.** Lisa L. Boggs, David A. Claypool and Stephen D. Miller. Graduate Assistant, Research Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Precision agriculture is beginning to emerge as a new management tool in farm production systems. Technology aids such as computers and global positioning satellite (GPS) systems can be used for site-specific weed management. Herbicide treatments, when using precision tools, can be done site-specific rather than whole field. Dalmation toadflax (*Linaria dalmatica*) is an herbaceous perennial that infests rangelands and other disturbed areas. It can quickly colonize disturbed soils and greatly reduces grass and forage crop production. A widely adaptable plant, toadflax is difficult to control once it is established. A study to locate and map established dalmation toadflax plants was initiated on the Archer Research and Extension Center (AREC) in June 2001. Toadflax plants were mapped, using a GPS, in July of 2001 and July of 2002. ARCviewä was used to analyze the GPS data. This analysis showed an increase in toadflax plants in the northeast part of the center and a decrease in plants in the southwest corner. Most toadflax plants were mapped in the same location in both 2001 and 2002. In July 2002, toadflax plants

were treated with recommended herbicides. Mapping will continue in 2003 to estimate percent control with herbicides. Plants that were sprayed will be located using information collected with the GPS in 2001 and 2001. [Paper Number 2]

**ESTABLISHMENT OF NATIVE WILDFLOWERS AND GRASSES FOR ROADSIDE RE-VEGETATION USING IMAZAPIC.** Lise Pittman Foy, Thomas D. Whitson and W. Bart Stevens. M.S. Graduate Student, Plant Sciences Department, Weed Specialist, Plant Sciences Department and Soils Specialist, Powell Research & Extension Center. University of Wyoming, Laramie, WY.

*Abstract.* Weeds interfere with re-seeding and establishment of native grass and wildflower populations. Three experiments were conducted at a site near Sheridan, WY to compare imazapic, with and without pendimethalin to oryzalin for their influence on weed control, establishment, germination, and injury of Lewis blue flax [*Linum lewisii* (Pursh.) *var lewisii*], Indian blanket flower (*Gaillardia aristata* (Pursh.)], Rocky Mountain penstemon [*Penstemon strictus* (Benth.)], purple prairieclover (*Dalea purpurea* (Vent.) *var purpurea*), purple prairie coneflower [*Echinacea angustifolia* (DC.) *var angustifolia*], white yarrow [*Achillea millefolium* (L.)],upright prairie coneflower [*Ratibida columnifera* (Nutt.) Woot. & Standl.], thickspike wheatgrass [*Elymus macrourus* (Turcz.) Tzvelev. *var* 'Critana'], western wheatgrass [*Pascopyrum smithii* (Rydb.) A. Love *var* 'Rosana'], and big bluegrass [*Poa secunda* (J. Presl.) *var* 'Sherman']. Herbicide mixtures applied before plant emergence included imazapic at 0.03 kg ai/ha, 0.07 kg ai/ha, and 0.1 kg ai/ha, imazapic at 0.07 kg ai/ha tankmixed with pendimethalin at 0.55 kg ai/ha, oryzalin at 0.55 kg ai/ha, and oryzalin at 0.82 kg ai/ha. Plant establishment, as indicated by plant count density one month and twelve months after planting, was imporved when treated with imazapic in weedy environments. Six of the seven tested wildflowers and the three grasses tested showed tolerance to imazapic applied pre-emergence. Based on the findings in this study, purple prairieclover, Indian blanketflower, and Lewis blue flax, when seeded with Rosana western wheatgrass, have the potential for road-side establishment in Wyoming when treated with imazapic at 0.07 kg ai/ha or 0.1 kg ai/ha. [Paper Number 3]

**PHYSIOLOGICAL RESPONSES OF AFRICAN RUE (*PEGANUM HARMALA* L.) TO PROGRESSIVE DROUGHT.** Laurie B. Abbott, Lena M. Hite and Tracy M. Sterling. Assistant Professor, Undergraduate Research Assistant and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* African rue (*Peganum harmala* L.) is a small, suffrutescent shrub originating from north Africa and currently expanding its range in southern New Mexico. Established plants possess an extensive, woody root system that aids in African Rue's ability to tolerate dry conditions. However, the tolerance of seedlings to drought could have important implications for African rue's ability to invade adjacent areas, yet seedling response to moisture stress is undocumented. We conducted a progressive drought experiment under greenhouse conditions in which gas exchange, water potential, and biomass of watered and non-watered seedlings were compared 3, 6, 9, 12, and 15 d after drought initiation. Water applications were resumed 12 d after drought was initiated to evaluate any potential for recovery from water stress. Photosynthesis was reduced from 17 to 2 mmol CO2 $m^{-2}$ $s^{-1}$ after 12 d without water. Conductance dropped from 0.9 to 0.1 mmol H2O $m^{-2}$ $s^{-1}$ within 6 d without water. After 15 d without water, leaf water potential was –1.5 MPa in control plants and –4.8 MPa in stressed plants. Within 12 d after watering was resumed, levels of photosynthesis and conductance in water-stressed plants reached levels similar to those of well-watered controls. Total biomass of recovered plants was approximately 70% of control plants at that time. Effect of drought length was examined in a separate study. In plants where water was withheld for 9 d, photosynthesis, conductance, and leaf water potential recovered within 4 d of re-watering. The ability of water-stressed seedlings to recover following water stress suggests that recruitment of new individuals may occur despite short-term drought conditions. [Paper Number 4]

**DETECTING LEAFY SPURGE WITH REMOTE SENSING TECHNIQUES IN BONNEVILLE COUNTY IDAHO.** Larry W. Lass[1], Timothy S. Prather[1], Nancy Glenn[2], Keith T. Weber[2], Jacob Mundt[2] and Jeff Pettingill[3]. Research Support Scientist III, Assistant Professor Weed Ecologist, Assistant Research Professor, GIS Director, Graduate Student and County Weed Supervisor. [1]University of Idaho, Moscow, ID, [2]Idaho State University, Pocatello, ID and [3]Bonneville County, Idaho Falls, ID.

*Abstract.* The purpose of this research is to develop and implement remote sensing techniques to monitor invasive plants species in the state of Idaho. Three areas have been selected within southern Idaho as a case study. This poster

reports our progress on using hyperspectral and multispectral sensors to detect leafy spurge (*Euphorbia esula* L.) along the upper Snake river near the Tetons. Sections of the Swan Valley northeast of Idaho Falls was imaged with three hyperspectral sensors mounted in an airplane and one multispectral sensor mounted in a satellite. Images were acquired between June 30 and July 31 when leafy spurge was flowering. Spacial resolution range from 1 to 4 meters depending on the platform used. Ground validation consisted of 219 GPS data points showing small weed infestation of less than 5 acres, and 32 GPS polygons showing larger infestations. Data taken on each infestation on the ground indicated if the area was treated or not treated, a cover category and distribution class. Hand-held reflectance data for leafy spurge, associated vegetation, and calibration tarps were collected during most of the hyperspectral acquisition times. Additional spectral reflectance data for other weeds of interest were obtained from USBR Denver. The images were georectified by the data providers or rectification data was provided. The images were atmospherically corrected using calibration tarp data. Multispectral data using Principle Component Analysis (PCA) with subsequent Spectral Angle Mapper (SAM) classification routines showed leafy spurge was detectable, but irrigated crop land was also included in the leafy spurge class. A simple filter of the known crop land reduced commissional error. Hyperspectral data using Spectral Angle Mapper also detected leafy spurge. Irrigated crop land was not included in the leafy spurge class went the classification angle was low but not all leafy spurge infestations were detected. Widening the classification angle showed all leafy spurge infestations but increased classification error in crop land and meadows near water. Results show leafy spurge is detectable with remote sensing imagery in the Swan valley study area. [Paper Number 5]

**LARGE-SCALE MANAGEMENT OF YELLOW STARTHISTLE USING AN INTEGRATED APPROACH.** Joseph M. DiTomaso, Jessica Torrence and Guy Kyser. Cooperative Extension Specialist, Graduate Student and Research Associate. University of California, Davis, CA.

*Abstract.* A long-term, large-scale management program was implemented to reduce yellow starthistle (*Centaurea solstitialis*) populations at Fort Hunter Liggett in Monterey County, California. Treatments integrated spring herbicide applications, early summer prescribed burns, and biocontrol agents. A series of 2- to 3-year initial intensive management plans were prescribed to four sites: 1) a highly-disturbed grassland (military-use grassland); 2) a 250-acre oak woodland (Training Area (TA) 27); 3) a grassland with rare plants; and 4) a smaller 30-acre oak woodland site (TA 16). The treatments, integrating prescribed fire, herbicide application, and biocontrol, were based upon resource management objectives at each site. Results varied depending upon treatments administered at each site. In particular, the military use grassland achieved the greatest success after three years (first year prescribed burn, second and third year aerial clopyralid treatments). After the first and second year of treatments, there was a 96.3% reduction in yellow starthistle cover. After the third year of treatment, yellow starthistle was reduced by 100%. During the fourth year, when there was no treatment administered, yellow starthistle populations began to rebound. As part of a follow-up maintenance program for this site, approximately 82 plants per acre were hand-pulled. Based on successful initial intensive treatment, follow-up costs were estimated at approximately $4.00/acre for hand pulling. However, in areas where initial treatments were ineffective, as seen in TA 27, follow-up costs were estimated to exceed initial treatment costs. A follow-up management program should be instigated once initial treatment has been completed for effective long-term, large-scale control of yellow starthistle. Although two to three years of intensive treatment can potentially reduce yellow starthistle cover by 100%, the persistent nature of the yellow starthistle seedbank allows for populations to rebound. Assuming the initial treatments were both properly timed and effective, the cost of a follow-up plan should decrease from year to year as populations dwindle. [Paper Number 6]

**AFRICAN RUE SEEDLING RESPONSE TO HERBICIDES APPLIED UNDER DROUGHT STRESS.** Amber D. Vallotton, Laurie B. Abbott, Lena M. Hite and Tracy M. Sterling. Research Asssitant, Assistant Professor, Undergraduate and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* African rue has become established in several western states, where it poses a threat of further spread because of its capability of reproduction by seed and vegetative lateral roots, as well as its apparent success under water-stressed conditions. In previous studies, applications of hexazinone, imazapyr, and metsulfuron have provided effective control of African rue. In this study, plant-herbicide-water stress interactions were investigated. Greenhouse-grown African rue seedlings, placed under watered (control) and non-watered conditions for 6 d, were screened for their sensitivity to these three herbicides, each applied at increasing rates (0, 0.5x, 1.0x, 2.0x recommended rates). Gas exchange and water potential of each seedling were compared prior to herbicide

application (6 d after water treatments were initiated). Photosynthesis was reduced from 18 to 10 umol $CO_2$ $m^{-2}$ $s^{-1}$ in well-watered seedlings versus non-watered seedlings (n=6). Conductance dropped from 0.8 to 0.1 mmol $H_2O$ $m^{-2}$ $s^{-1}$ in control versus non-watered treatments. Mean leaf water potential was -1.1 MPa for controls compared to -2.5 MPa in non-watered seedlings. After herbicide application, plants were visually rated up to 21 days. Although less active physiologically, plants under water-stressed conditions were more sensitive to herbicide application, with metsulfuron and imazapyr causing the most damage. One day after treatment (DAT), non-watered plants were the only treatments with visible injury as measured by wilting. By 21 DAT, herbicide activity continued to be greater in the non-watered compared to the watered treatments. This initial screening suggests that water status plays a role in altering African rue's sensitivity to herbicides. [Paper Number 7]

**LEAFY SPURGE CONTROL USING *APHTHONA* SPP. FLEA BEETLES.** John A. Kava[1], Don R. Kirby[1], Rodney G. Lym[1], Gerald L. Anderson[3], and Dean A. Cline[3]. Graduate Research Assistant, Professor, Professor, Research Ecologist, and Noxious Weed Specialist. [1]North Dakota State University, Fargo, ND and [2]USDA, ARS, Northern Great Plains Agricultural Research Laboratory, Sidney, MT, [3]Noxious Weed Specialist, North Dakota Department of Agriculture, Plant Industries, Bismarck, North Dakota 58505.

*Abstract.* Leafy spurge infests over 450,000 ha of North Dakota rangeland and causes large economic losses to ranchers due to its competitiveness and avoidance by grazing cattle. The search for biological control agents for leafy spurge began in the 1960s and to date 15 insects have been introduced. The most successful agents have been the *Aphthona* spp. flea beetles. The objective of this research was to evaluate the effectiveness of large scale releases of *Aphthona* spp. for reducing leafy spurge. A mixture of 3,000 *Aphthona lacertosa*/*A. czwalinae* and 3,000 *A. nigriscutis*/*A. cyparissiae* flea beetles were released at 100 locations in June or July 1998. Release sites were grouped according to their topographic location, upland, overflow and steep. Changes in foliar cover of leafy spurge were recorded using a digital imaging system and a 0.1 $m^2$ quadrat along each of four selected transects at each release site. Area of leafy spurge control was determined visually by estimating and recording the greatest distance of suppression as the major axis and the minor axis length perpendicular to the major axis. The first year after *Aphthona* spp. release leafy spurge decreased at upland and steep range sites ($P<0.05$), from 41% and 53% respectively, to 22% and 28% respectively. The second year after release, leafy spurge foliar cover decreased to 14% averaged across all range sites. By the third year leafy spurge foliar cover decreased rapidly to only 5%, from over 50% before release. One year after release 54% of the sites had an area of leafy spurge suppression between 100 to 399 $m^2$ or better. Two years after release, 84% had leafy spurge area of suppression between 400 to 999 $m^2$, while 3 years after release, 69% had leafy spurge area of suppression > 1,000 $m^2$. Leafy spurge area of suppression was > 1,000 $m^2$ at 98 of 100 sites four years after the release of the biological control agents. *Aphthona* spp. biological control agents reduced leafy spurge equally regardless of topography at release location. [Paper Number 8]

**ANTIOXIDANT LEVELS OF AFRICAN RUE UNDER WATER STRESS.** Greg T. Bettmann, Harish H. Ratnayaka, Laurie B. Abbott and Tracy M. Sterling. Student, Postdoctoral Fellow, Assistant Professor and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* Invasive and toxic weeds pose a great economic and environmental problem in rangeland management in the southern United States. Among such weeds, African rue (*Peganum harmala* L.) is an extremely drought-tolerant suffrutescent shrub with an extensive woody root system. The mechanisms of its drought tolerance are not well known. To determine whether antioxidant defenses play a role in drought tolerance in African rue, we monitored the levels of leaf antioxidants five times over a 15 day-period of progressive drought, and four times during recovery from drought in the greenhouse. Water potential dropped to –4.8 MPa in stressed plants compared to –1.5 MPa in well-watered controls at the end of the drought treatment. Stressed plants regained gas exchange levels comparable to well-watered plants in 12 days of recovery. A rapid HPLC method was optimized for simultaneous analysis of photosynthetic pigments and antioxidants chlorophyll a, chlorophyll b, alpha-carotene, beta-carotene, xanthophylls (violaxanthin, antheraxanthin, zeaxanthin and lutein) and alpha-tocopherol. We used an ODS-1 column and a gradient elution with solvent A: acetonitrile:methanol:Tris HCl 0.1M (72:8:3), and B: methanol:ethyl acetate (68:32) at a flow rate of 1 mL min-1. Chlorophylls and carotenoids were detected at 445 nm, and alpha-tocopherol was detected with excitation at 295 nm and emission at 340 nm using photodiode array and fluorescence detectors, respectively. The functional implications of variation of these constituents under progressive drought in African rue will be discussed. [Paper Number 9]

**DOWNY BROME CONTROL AND DESIRABLE SPECIES ESTABLISHMENT AS INFLUENCED BY BURNING AND IMAZAPIC APPLICATION RATE AND TIMING.** Charles A. Rice[1], Corey V. Ransom[1], Don W. Morishita[2] and Michael J. Wille[2]. Faculty Research Assistant, Assistant Professor, Professor and Support Scientist II. [1]Oregon State University, Malheur Experiment Station, Ontario, OR and [2]University of Idaho, Twin Falls R&E Center, Twin Falls, ID.

*Abstract.* The need for herbicides that effectively control downy brome *(Bromus tectorum)*, while allowing for the establishment of desirable species is of considerable importance in reclaiming downy brome infested pastures and rangelands. Field trials were conducted near Jerome, ID and Ontario, OR to evaluate fall applied imazapic at rates of 0.031, 0.063, 0.094, 0.125, 0.156, and 0.188 lb ai/acre applied prior to or following seeding of various desirable species. In addition, the herbicide treatments were applied to burned and unburned main plots to compare the effect of duff removal on downy brome control and desirable species establishment. Trials were initiated in Idaho on October 15, 2001 and in Oregon on October 11, 2001. Duff removal by burning significantly ($P < 0.05$) increased downy brome control compared to no duff removal at the Oregon location but not at the Idaho location on April 24, 2002 and May 17, 2002, respectively. However, downy brome control was significantly ($P < 0.05$) greater in burned versus unburned plots at both trial locations on July 1, 2002. Desirable species establishment varied by main effect and by main effect interactions. Downy brome competition in untreated plots prevented the establishment of all seeded species at the Oregon location. Imazapic rates between 0.031 and 0.094 lb ai/acre following duff removal by burning appear to balance downy brome control with desirable species establishment. [Paper Number 10]

**EFFECT OF MOWING PRIOR TO APPLICATION OF PICLORAM AND CLOPYRALID ON RUSSIAN KNAPWEED CONTROL.** Michael F. Carpinelli[1] and Corey V. Ransom[2]. Rangeland Scientist and Assistant Professor of Weed Science. [1]USDA-ARS, Burns, OR and [2]Oregon State University - Malheur Exp. Station, Ontario, OR.

*Abstract.* Russian knapweed is a perennial weed that forms dense colonies by adventitious shoots arising from an extensive root system. It infests some of the most productive pasture and hayland of the Great Basin. Fall application of a persistent, soil-active herbicide has been shown to effectively control Russian knapweed growth the following year. The Brown Brush Monitor™ mows and applies herbicide in a single pass, removing standing dead plants and allowing more herbicide to reach the soil surface. We tested the hypothesis that mowing immediately prior to applying a soil-active herbicide in the fall increases Russian knapweed control the following year. Using the Brown Brush Monitor™, we tested mowing alone and two persistent, soil-active herbicides with and without mowing at two sites in SE Oregon. Treatments (including an untreated control and a mow-only treatment) were applied in fall 2001, and measurements were made in summer 2002. At Site 1, Russian knapweed control using clopyralid (0.38 lb ae/A) decreased with mowing, while mowing had no effect on control using picloram (0.5 lb ae/A). At Site 2, Russian knapweed control using clopyralid (0.38 lb ae/A) increased with mowing, while mowing had no effect on control using picloram (0.5 lb ae/A). Herbicide effects on Russian knapweed density were not affected by mowing at either site. In the untreated plots, Russian knapweed density and height were greater at Site 1 than at Site 2. Overall, control using either herbicide, with or without mowing, was greater at Site 1 than at Site 2. [Paper Number 11]

**THE INTRODUCTION OF FORAGE KOCHIA TO MILITARY LANDS: CURE ALL OR FUTURE CATASTROPHE?** M.G. Hohmann. US Army Corps of Engineers, Champaign, IL

*Summary.* Poster will summarize current uses of forage kochia on western military installations and evaluate its invasiveness using a ranking system based on biological characteristics. [Paper Number 12]

**INTEGRATED MANAGEMENT OF SOME INVASIVE WEEDS OF FORESTRY IN BRITISH COLUMBIA.** Raj Prasad. Research Scientist. Pacific Forestry Centre, 506 West Burnside Road,, Victoria, BC.

*Abstract.* Many organisms such as crop plants, selected ornamentals, livestocks, game animals were introduced into North America for various beneficial purposes but some of these exotics have invaded and expanded their range into the new environments beyond usefuklness. Thus they have facilitated ecosystem changes and displaced native organisms through habitat alteration, predation or parasitism or simply by competion fot light, water, nutriens or

space. Alien pests that cause the greatest share of forest damage are insects and diseases. However, some introduced flora ( woody species, ornamentals and weeds) are also proving to be destructive and highly competitive with native forest vegetation for space, nutrients, water and light. Two such forest weeds are the Scotch broom (*Cytisus scoparius*) and gorse (*Ulex* europaeus). Recently some other exotics (*Daphne laureola* and *Hedera helix*) have also encroached the forest ecosystems in BC and are posing a threat to native species. Therefore, a field experiment was carried out with all these four species to investigate their colonisation, migration patterns, their impacts on native ecosystems and finally to study and devise some control options so that their further spread can be arrested.Four methods of control were studied by : cutting the woody stems only; by application of a plastic mulching; a bioherbicide(*Chondrostereum purpurem*) and a chemical herbicide(triclopyr) treatment. A randomised type of block layout design was laid out in the forests with 45 replications and the effects were monitored on the sprouting behavior after , one, two and three years of treatment. Data are presented for gorse only and show that an integrated approach using mulching, herbicide and possibly the mycoherbicide may hold some promise. [Paper Number 13]

**POPULATION DYNAMICS OF GARLIC MUSTARD ( *ALLARIA PETIOLATA* ).** Kevin D. Gibson. Dr.. Purdue University, West Lafayette, IN.

*Abstract.* Garlic mustard, (*Alliaria petiolata*), a non-native biennial herb that displaces native species, particularly spring ephemerals, has become widespread in eastern deciduous forests of the United States. Efforts to limit the spread of this invasive weed through conventional weed management practices have been largely unsuccessful. The development of alternative practices is clearly needed but will require a greater understanding of the processes and factors facilitating or limiting garlic mustard survival and dispersal. We assessed the relationship between abiotic factors and the survival of A. petiolata cohorts in pine and oak forests in Purdue University's Martel Forest in 2002. Garlic mustard survival was generally lower for late emerging cohorts than for early emerging cohorts and survival was lower on warm dry soils than on cool wet soils. There was a significant negative relationship between average soil temperature and percent survival at the end of the season. Our results suggest that garlic mustard survival may be closely linked to its ability to emerge early in the season and initiate growth during more favorable environmental conditions. Our results also suggest that xeric sites may be less susceptible to garlic mustard invasion than mesic sites. [Paper Number 14]

***BROMUS TECTORUM* CONTROL AND REVEGETATION USING IMAZAPIC HERBICIDE.** Joseph G. Vollmer and Jennifer L. Vollmer. Market Development Specialist, II and Senior Vegetation Management Scientist. BASF, Laramie, WY.

*Abstract.* Downy brome (*Bromus tectorum*) is an invasive weed which increases fire regimes and robs desirable native range species of early moisture. Revegetation of downy brome infested sites is difficult due to prolific germination and aggressive nature of downy brome to out compete new seedlings of desirable species. Field trials were conducted near Boisie, ID, on rangeland infested with downy brome, to determine efficacy of PLATEAU for downy brome control and seedling survival of "Bozoyski" Russian wildrye (*Psathyrostachys juncea*) and "Vavilov" Siberian wheatgrass (*Agropyron fragila ssp. sibiricum*). Two trials were established in winter of 1999. The first was sprayed two weeks prior to planting and the second, two weeks after planting. Data was collected in 2000, 2001 & 2002. Bur buttercup (*Ranunculus testiculatus*), clasping pepperweed (*Lepidium perfoliatum*) and downy brome control was excellent (93 – 100%) at 0.032 to 0.188 lbs ai imazapic/A rates. Seedling grass establishment was increased 3.6 to 6.7 times greater than the non-treated check as a result of actual plant counts per foot of row. [Paper Number 71]

**OPTIMAL FREQUENCY OF CONTROL AND ECONOMIC THRESHOLD LEVELS FOR BIG SAGEBRUSH (*ARTEMISIA TRIDENTATA*).** L. Allen Torell and Kirk C. McDaniel. Professor and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* Big sagebrush recovery rates following tebuthiuron control were defined for eight study locations on the Colorado Plateau of northwest New Mexico. Tebuthiuron was applied in the early 1980s at rates between 0.33 and 1.1 kg ai/ha. Over the 20-year study period, big sagebrush canopy cover increased from <1% 12 months after tebuthiuron was applied to between 5% and 10% at the studies end. Big sagebrush canopy cover on adjacent untreated areas ranged from 14% to 20%. It was projected that big sagebrush canopy cover will not return to untreated levels for more than 40 years at most study locations. Based on plant production and big sagebrush canopy

cover data collected periodically during the study, a non-linear S-shaped regression curve best described the overstory-understory relationship. Annual average forage production remained about 3 times higher on areas with < 6% big sagebrush canopy cover as compared to untreated areas. As big sagebrush exceeded about 6% canopy cover, a threshold was reached and understory production decreased rapidly. As big sagebrush canopy cover approached 12 to 14%, there was little additional suppression of understory production. Big sagebrush control with tebuthiuron was found to be an economical treatment (i.e. have a positive net present value from the investment) provided cost share programs were available to producers. Site productivity and the assumed value of forage greatly influenced economic benefits. Reapplying tebuthiuron to eliminate reinvading big sagebrush and to extend treatment life should optimally be implemented before herbage production is fully depleted. [Paper Number 72]

**THE EFFECTS OF IMAZAPIC ON DOWNY BROME, DALMATIAN TOADFLAX, RUSSIAN KNAPWEED, AND PERENNIAL PEPPERWEED.** Tom D. Whitson. Weed Specialist. University of Wyoming, Laramie, WY.

*Abstract.* THE EFFECTS OF IMAZAPIC ON DOWNY BROME, DALMATIAN TOADFLAX, RUSSIAN KNAPWEED AND PERENNIAL PEPPERWEED. Tom D. Whitson, Plant Sciences Department, University of Wyoming, Laramie, WY 82071-3354. Invasive weed species on rangeland communities are causing perennial, desirable forbs and grasses to decline up to 90% of normal production. These reductions can be reversed with control of the invaders followed by proper management. The objectives of these studies were to determine if control of these invasive weeds could be attained with imazapic by changing herbicide application rates or applying them at various growth stages. Downy brome trials were conducted near Cheyenne and Sheridan, Wyoming on dense stands at various growth stages, dalmatian toadflax trials were conducted near Cheyenne, Wyoming in mid-June, Russian knapweed trials were conducted near Shoshoni, Wyoming from early senescence to dormancy, and perennial pepperweed trials were conducted near Farson, Wyoming at the weed vegetative and bloom stages. Results: Applications of imazapic at 4 and 6 oz/acre made to downy brome at early germination on April 4, 2002, controlled 97% of the cheatgrass. A one month delay resulted in significantly lower control. Imazapic applied at 10 oz/acre to Dalmatian toadflax in mid-June controlled 90% of the toadflax, and 99% of the downy brome. Western wheatgrass yields increased from 135 in the check to 1,235 lbs/acre, three years after treatment. Russian knapweed control was 100% at the three mature growth stages when imazapic was applied at 12 oz/acre. Control of perennial pepperweed was 98% at the vegetative and bloom stages with applications of 10 oz/acre. Imazapic herbicide causes cool-season grasses to delay maturity 2 to 3 weeks with considerable seed head suppression occurring the first growing season following application. Grazing should be delayed until grasses mature the first year. Control of downy brome has been done selectively with paraquat and glyphosate in past years. Imazapic has soil activity at higher rates but can be applied as a post-emergence herbicide in early spring at low rates to provide excellent downy brome control. Picloram provides excellent control of dalmatian toadflax, but does not control downy brome in the understory; while imazapic provides control of both species. Picloram and clopyralid provide excellent control of Russian knapweed after the weed matures. Imazapic applied after the killing frost also provides excellent control of Russian knapweed. Metsulfuron provides excellent control of perennial pepperweed. This weed can now be controlled successfully with imazapic. [Paper Number 73]

**LOW RATES OF IMAZAPIC CONTROL DOWNY BROME IN ARID RANGELANDS.** Alex Ogg, Jr.[1], Steve Christy[2], Ken Stinson[2] and Gary Blincow[2]. Research Scientist, Natural resources Specialist, Rangeland Specialist and Natural Resources Specialist. [1]University of Wyoming, Ten Sleep, WY and [2]Bureau of land management, US Department of Interior, Worland, WY.

*Abstract.* Field plots were established on downy brome-infested rangelands 19 miles SE of Worland, WY in October 2001. This area had burned in a wildfire in 1996. The fire killed most of the sagebrush and because of the presence of downy brome before the fire, the area developed a moderate to dense downy brome infestation after the fire. There was a light to moderate residual population of western wheatgrass and thin populations of blue grama and needle and thread. The site was located at 4660 feet above sea level and had an average annual rainfall of about 10 inches, although annual rainfall was about 6 inches in 2001 and about 8 inches in 2002. Surface soil was classified as a very fine sandy loam. There had been very little rainfall from August 1, 2001 through October 2001, and the soil was very dry. The downy brome and other winter annuals had not emerged as of October 29, 2001. Imazapic was applied at using a hand-held, 10-foot boom sprayer equipped with Tee Jet 8002 nozzle tips and calibrated to apply 13 gallons per acre at 3 mph and 25 psi. Plots were 10 feet wide and 560 feet long. A nontreated control was

included and all treatments were replicated four times. Fall pre-emergence treatments were applied at 0.031, 0.047 and 0.067 lb ai/acre on October 29, 2001 and spring post-emergence treatments were applied at 0.016 and 0.031 lb ai/acre on April 5, 2002. A silicone surfactant was added to the post-emergence sprays at 1.5 pints per acre. A nontreated control was included and all treatments were replicated four times. The plot area was fenced to prevent livestock from grazing in the plots. Imazapic applied pre-emergence at 0.047 or 0.063 lb ai/acre gave excellent control of downy brome in this test. Early season tolerance of the native grasses was reduced noticeably when imazapic was applied pre-emergence at 0.063 lb ai/acre or post-emergence at 0.031 lb ai/acre. By May 24, 2002, most the downy brome seedlings in the treated plots had died or were extremely stunted and had few, if any, seed heads. From the standpoint of both downy brome control and tolerance of native grasses, the best treatment in this test was imazapic applied pre-emergence at 0.047 lb ai/acre. For post-emergence control of cheatgrass in the spring, 0.031 lb ai/acre of imazapic was necessary for good control. The order of tolerance of the three native grasses to imazapic appeared to be blue grama >> needle and thread > western wheatgrass. Under the severe drought conditions of this test, the downy brome out-competed the native grasses and by early May the native grasses in the nontreated controls were severely stunted, brown and dried-up. In all the imazapic treatments, the native grasses continued to grow into July and many plants produced seed heads. The extended growth of the native grasses under the severe drought conditions was probably the result of two major factors. First, imazapic controlled the downy brome early and prevented the weed from using the soil water. Secondly, the population of native grasses was thin and competition for water among individual plants was low. On November 4, 2002, the number of new downy brome seedlings was counted in each plot. The number of downy brome seedlings in the imazapic plots was reduced 94 to 99% compared to the number in the nontreated control plots. These percentages are somewhat misleading because there were many seeds produced in the nontreated controls in the spring of 2002 compared to very few seeds produced in the imazapic treated plots. Most of the downy brome seedlings in the imazapic plots in November 2002 were stunted and more purplish compared to the plants in the nontreated controls. These results suggested that the imazapic was still persisting in the soil and was suppressing the growth of the fall-germinating downy brome. [Paper Number 74]

**RUSSIAN KNAPWEED CONTROL ON SOUTHERN COLORADO RANGELAND.** Kenny W. Smith[1], Richard N. Arnold[2] and Dan Smeal[2]. Agricultural Agent, College Assistant Professor and College Assistant Professor. [1]Colorado State University, Cortez, CO and [2]New Mexico State University, Farmington, NM.

*Abstract.* Russian knapweed is one of southern Colorado's and northern New Mexico's notorious noxious weeds. This plant is a herbaceous perennial that reproduces by seeds and rhizomes. It grows on clay, sandy or gravelly soils alone ditch banks, rivers, lakes, slopes of hills, pastures, grain fields, and waste lands. Russian knapweed grows in most western states, is toxic to horses, and may survive over 75 years. Research plots were established on September 19, 2001 in Montezuma County Colorado to evaluate the response of Russian knapweed to postemergence herbicides. Treatments were applied with crop oil concentrate at 0.5 percent v/v. Treatments were evaluated approximately one year after treatment on October 1, 2002. Clopyralid plus 2,4-D applied at 2.4 lb ai/A acre gave the best weed control rating of 65 percent. Due to low winter moisture received after application and during the summer of 2002, Russian knapweed control ratings were approximately 55 percent less in 2002 than in 2001. (Published with the approval of the New Mexico State University Agricultural Experiment Station.) [Paper Number 75]

**ESTIMATING THE ECONOMIC IMPACT OF LEAFY SPURGE INFESTATIONS IN IDAHO.** Neil R. Rimbey[1], Tim D. Darden[2] and Ken Crane[3]. Professor, Research Analyst and Range Specialist. [1]University of Idaho, Caldwell, ID, [2]University of Nevada-Reno, Reno, NV and [3]Idaho State Dept. of Agriculture, Boise, ID.

*Abstract.* Infestations and the spread of leafy spurge (Euphorbia esula L.) can dramatically impact forage production, recreational amenities and other activities on rangelands. The objectives of this study were to quantify the amount of leafy spurge affecting Idaho rangelands; to develop a model of the state's economy; and to use that model to estimate the economic impact of forage losses resulting from leafy spurge infestations. Estimates of leafy spurge acreage and rates of spread were provided by county or multi-county weed management areas to Idaho State Department of Agriculture. Estimates of losses in grazing carrying capacity were undertaken based upon the amount of acreage currently infested and carrying capacity estimates provided by rangeland experts. The value of lost forage was estimated using private grazing lease rates over time and livestock budgets. An IMPLAN Input-Output model was developed for Idaho and used in conjunction with the forage loss estimates to determine the economic impact of

the infestations. Results show a loss of 11,429 animal unit months of forage per year, resulting in direct economic impacts of $588,000 per year. Indirect and induced impacts contribute to the total economic impact of $978,000 and the loss of 11 jobs. Impacts will increase if leafy spurge continues to expand in the state. [Paper Number 76]

**WEED CONTROL EFFICACY FROM IMAZAPIC AND BERMUDAGRASS (CYNODON DACTYLON) TOLERANCE.** Paul A. Baumann, Luke M. Etheredge, Fred T. Moore, Twain J. Butler and Matt E. Matocha. Professor and Extension Weed Specialist, Extension Graduate Assistant, Extension Associate, Assistant Professor and Extension Agronomist and Extension Assistant. Texas Cooperative Extension, College Station, TX.

*Abstract.* There are approximately 15 million acres of improved pastureland in Texas where broad-spectrum weed control is an important component of bermudagrass (Cynodon dactylon) hay production. Although many broadleaf herbicides are available, grass control has been a recurring problem. Several herbicides have been evaluated in an effort to achieve broad-spectrum weed control of both broadleaves and annual grasses, but significant crop injury has occurred. Recently, BASF Corp. has developed Oasis herbicide which contains the active ingredients imazapic and 2,4-D. It provides broadleaf weed and annual grass control in pasturelands, however, bermudagrass injury from Oasis has been a problem that requires remediation. Research was conducted during 2001 and 2002 to evaluate the effects of Oasis on two popular Texas bermudagrass varieties at two locations. These included Coastal and Tifton 85 bermudagrasses. Plot size was 8 ft. x 20 ft. and treatments were replicated four times and arranged in a RCB design. Treatments were applied with a CO2 backpack sprayer calibrated to deliver 20 GPA. Two herbicide application timings were evaluated at crop heights of 2-3 in. (stubble) and 6-8 in. (regrowth) within both varieties. Water or urea ammonium nitrate (UAN 32-0-0) were evaluated as herbicide carriers, and Oasis was applied at 2, 4, 6, and 8 oz./A. Dry Nitrogen fertilizer (70 lbs./A) was applied in the water carrier treatments to compensate for the 32% UAN applications in the other treatments. Three harvests were collected after initiating the studies. All rates of Oasis significantly decreased crop yields in the first harvest, regardless of application timing, carrier or variety. No yield reduction was observed in the sequential harvests. In fact, there were significant yield increases in the second harvest from all Oasis treatments in the Tifton 85 bermudagrass study, and from the 8 oz./A treatment in the Coastal bermudagrass study. All other treatments in the Coastal bermudagrass study were equal in yield to the untreated areas. All yields collected in the third harvest were equal. Seasonal yield totals for Coastal bermudagrass over both years showed that all rates of Oasis caused significant yield reductions when compared to untreated plots. Similar results were shown in the Tifton 85 bermudagrass, where rates above 4 oz./A significantly reduced seasonal yields. However, the initial injury in the first harvest was substantial and resulted in significant seasonal yield reductions. Neither application timing or herbicide carrier influenced seasonal yields. [Paper Number 77]

**CONTROLLING RIDDELL GROUNDSEL AND DOWNY BROME ON WYOMING RANGE AND GRASSLANDS.** Tamra R. Jensen[1], Wayne R. Tatman[2] and Tom D. Whitson[3]. University of Wyoming, Cooperative Extension Educator, University of Wyoming, Cooperative Extension Educator and University of Wyoming, Extension Weed Specialist, Emeritus. [1]University of Wyoming Cooperative Extension Service, Niobrara County, Lusk, WY, [2]University of Wyoming Cooperative Extension Servie, Goshen County, Torrington, WY and [3]University of Wyoming Cooperative Extension Service, Weed Extension Specialist, Emeritus, Powell, WY.

*Abstract.* In 1998, Riddell groundsel (Senecio riddellii), a poisonous plant was identified on rangeland in Niobrara County, Wyoming. Three years later, in 2001, this plant had invaded approximately 85 percent of two pastures and was noticed in several locations throughout southern Niobrara County and northern Goshen County. In September 2001, a field study was designed to evaluate various control methods of this plant. The pasture land was also heavily infested with downy brome (Bromus tectorum L). Thus, imazapic was used on twelve acres at a rate of 0.125 lb ai/A and another twelve acres at 0.19 lb ai/A in order to control downy brome in addition to the Riddell groundsel. Twenty-five acres were treated with 0.25 lb ai/A picloram plus 1 lb ai/A 2, 4-D, plus two additional sixty-five acre plots were treated with 0.25 lb ai/A and 0.5 lb ai/A of picloram, respectively. Aerial applications were made when Riddell groundsel was in full bloom and downy brome was matured. Visual evaluations were taken during the spring and early summer, 10 months later. Control of Riddell groundsel was 90 to 95 percent with picloram. Imazapic at both rates controlled Riddell groundsel at 90 percent and downy brome at 100 percent. However, needle and thread grass was reduced by 50%. By September 2002, Riddell groundsel seedlings were found in the imazapic plots, but not in any other treatments. In July 2002, sixteen acres were treated with 0.25 lb ai/a of imazapic, four acres with 0.56 lb ai/A triclopyr plus 0.18 lb ai/A cloypralid and twenty acres with 0.25 picloram in the vegetative stage (July 2002). Visual evaluations in late summer and fall indicated picloram treatments had slightly reduced

Riddell groundsel. However, no control was noted with imazapic and triclopyr and cloypralid aerial applications when applied during this stage of growth, noting that the summer of 2002 was extremely dry. [Paper Number 78]

**BROADLEAF WEED CONTROL WITH BAS 662H AND TANK MIXTURES WITH BAS 662H.** Dan D. Beran, C. T. Horton, Joe G. Vollmer and Leo D. Charvat. Market Development Specialist, Market Development Specialist, Market Development Specialist and Area Biology Manager. BASF Corporation, Research Triangle Park, NC.

*Abstract.* BAS 662H is a postemergence broadleaf herbicide being evaluated by BASF Corporation for use in range and pasture. BAS 662H currently has an EPA registration for use in non-crop areas for the control of annual and perennial broadleaf species. BAS 662H is formulated as a 70% WG, containing 55% sodium salt of dicamba (50% ae) and 21.4% sodium salt of diflufenzopyr (20% ae). Several studies were initiated in 2001 and 2002 to further evaluate the weed control spectrum and potential tank mixtures with BAS 662H. In two experiments conducted in South Dakota, BAS 662H applied at 295 and 392 g ae/ha averaged greater than 90% top growth control of Canada thistle one year after application at the spring rosette stage. Similarly, BAS 662H applied alone at 392 g ae/ha or in combination with clopyralid at 210 g/ha provided greater than 90% control of Canada thistle one year after treatment in Nebraska. BAS 662H also provided 100% control of musk thistle when applied at either 98 or 196 g ae/ha in two separate experiments conducted in Nebraska. In a noncropland site in North Carolina, BAS 662H was applied alone at 98, 196, and 295 g ae/ha and in combination with triclopyr amine at 105, 210, and 420 g/ha. Combinations of BAS 662H with triclopyr provided improved control of wild blackberry, buckhorn plantain, wild carrot, and sericea lespedeza when compared to similar or greater rates of triclopyr alone. In studies conducted in Nebraska, North Dakota and Utah, BAS 662H applied in the spring at 196 g ae/ha in combination with picloram at 140 and 280 g/ha provided improved control of leafy spurge when compared to similar rates of picloram alone. [Paper Number 79]

**RESTORATION AS A MANAGEMENT TOOL TO COMBAT INVASION.** Monica L. Pokorny. Wildfire and Restoration Program Coordinator. Center for Invasive Plant Management, Bozeman, MT.

*Abstract.* The Restoration Program at the Center for Invasive Plant Management (CIPM) was created in 2002 to promote the use of restoration as an invasive plant management tool. We promote revegetation as a means to restore and maintain plant communities that function at a sustainable level, resist invasion, and meet land use objectives. Specifically, we strive to further the scientific knowledge of ecologically based restoration of invasive plant dominated lands; promote and establish the use of revegetation as a weed management tool; and provide leadership and educational materials on restoration / revegetation. The Restoration Program is designed to promote and coordinate participation among diverse interest groups on regional, multidisciplinary restoration projects. We are establishing restoration case studies with public and private land managers to restore invasive plants infested lands, research restoration / revegetation techniques, and disseminate research findings. Research results will be included in educational literature distributed by the CIPM and field days held at the study sites. The Restoration Program is also in the process of developing a handbook and a 'train the trainers' workshop on western restoration / revegetation techniques. As a regionally based organization, the Restoration Program plans to coordinate with restoration experts on the production and participation of workshops to provide the most recent information to land managers. Restoration of invasive plant dominated lands is an important weed management tool that can meet objectives of weed control while developing a desired, weed-resistant plant community. [Paper Number 80]

**"ERADICATION" OF ALHAGI PSEUDALHAGI (CAMELTHORN) IN NORTHCENTRAL ARIZONA.** John H. Brock. Professor. Arizona State University East, Mesa, AZ.

*Abstract.* Alhagi pseudalhagi (camelthorn) established residential subdivision roads about 15 years ago in a pine-oak forest in northcentral Arizona. The working hypothesis is that a seed source for invasion of this habitat was in the road bed material. Since 2000 herbicides have been applied in the summer to "eradicate" this problem species. While many people, especially the general public, believe eradication is a simple process, this project demonstrates that it is not. This paper describes the treatments and current results. Each year, the number of live crowns in the stands has been reduced and 3 years after the initiation of treatments, 7% of the original population is still present. Vegetation managers need to be reminded that "eradication" is often a long term process requiring timely treatments, planning and effective monitoring. [Paper Number 82]

**KNAPWEED: AN ALTERNATIVE TO HERBICIDES ON PUBLIC LAND - A MANAGER'S PERSPECTIVE**. Chance Gowan. US Forest Service, Fort Jones, CA.

*Summary*. Treatment of noxious weeds is problematic on public lands. I'll explore a case study that evaluates the effectiveness of large scale manual treatments.. [Paper Number 83]

**CIMARRON MAX, A NEW PRODUCT PROVIDES RESIDUAL AND POSTEMERGNECE WEED CONTROL IN PASTURE AND R RANGELAND.** Chris M. Mayo, Eric P. Castner, Robert N. Rupp, Gil E. Cook and Bill C. Kral. R&D Rep, R&D Rep, R&D Rep, R&D Rep and R&D Rep. DuPont, Grand Island, NE.

*Abstract.* Metsulfuron methyl, 2,4-D amine and dicamba (Cimarron Max), a new product offering from DuPont Crop Protection that provides residual and postemergence weed control in pasture and rangeland. Replicated field trials measured grass response and weed control following applications of metsulfuron methyl, 2,4-D amine and dicamba in improved pastures and rangeland. Research showed excellent results on broadleaf weeds including western ragweed, musk thistle, Scotch thistle, and broom snakeweed. Clipping studies were conducted to evaluate differences in forage production of native and introduced grasses in pasture and rangeland. The clipping studies showed near 100% biomass reduction of horsenettle, silverleaf nightshade, horseweed, and bitter sneezeweed with a 1 to 3-fold forage increase when metsulfuron methyl, 2,4-D amine and dicamba was used. [Paper Number 84]

**EFFECTS OF HERBICIDES, BURNING, AND RESEEDING OF DESIRABLE FORAGES FOR MEDUSAHEAD CONTROL.** Travis M. Osmond and Steven A. Dewey. Research Assistant and Professor. Utah State University, Logan, Ut.

*Abstract.* Medusahead is an aggressive, non-native, winter annual grass that infests millions of acres of rangeland in the western United States. Its aggressive and invasive nature has caused much concern among landowners. Two study sites were selected in northern Utah to evaluate the potential of combinations of herbicides (timing and rate), and seeding of desirable perennial forages (timing and species) that provide the most effective medusahead control. Both sites were burned to remove thatch during the summer of 2000. Herbicide treatments consisted of a fall and spring application of sulfometuron at 39 and 79 g ai/ha, a fall and spring application of imazapic at 70 and 140 g ai/ha, and a spring application of glyphosate + metsulfuron at 55 + 11 g ai/ha. Three seedings of 'Hycrest' crested wheatgrass (Agropyron cristatum (L.) Gaertn and A. desertorum (Fischer ex Link) Schultes), 'Luna' pubescent wheatgrass (Thinopyrum intermedium (Host) Barkworth et D.R. Dewey), forage Kochia (Kochia prostrata (L.) Schrader), a native grass mix, and a grass/forb mix were seeded in the fall of 2000, the spring of 2001, and again in the fall of 2001. Visual evaluations showed the high rate of fall-applied sulfometuron provided almost 100 % control of medusahead. The low rate of fall-applied sulfometuron and the spring-applied imazapic also provided adequate control. In the second YAT, the high rate of spring-applied imazapic and the high rate of fall applied sulfometuron still showed significant control. Because of severe drought conditions experienced during this experiment, no germination of the seeded species was observed. [Paper Number 62]

**TOWARDS DEFINING THE COMPETITIVE LIMITS TO YELLOW STARTHISTLE DISTRIBUTION.** Brett S. Bingham and Tim S. Prather. Graduate Research Assistant and Assistant Professor. University of Idaho, Dept. PSES, Moscow, ID.

*Abstract.* Yellow starthistle, originally from the Mediterranean region, was found in the United States in the mid 1800's and has spread throughout western North America. Defining the competitive limits of yellow starthistle would aid identification of plant communities susceptible to infestation. A previous yellow starthistle occurrence model was built for the canyon grasslands of Northern Idaho. The occurrence model defines environmental gradients useful for construction of experiments that characterize competitive and physiological limits to a species distribution. Initial biomass, final biomass, and biomass accumulation rate along the plant occurrence gradient were collected in the field for the 2002 growing season. An indicator of plant biomass, the Normalized Difference Vegetation Index (NDVI), was calculated through the growing season. In the field the southerly aspect where yellow starthistle occurred frequently was used to study competition along a slope gradient. NDVI showed an increase earlier in biomass accumulation on the south slopes and a later increase of biomass on north slopes. NDVI showed earlier senescence on the south slopes compared to the north slopes. A series of plant exclusion distances from a

yellow starthistle plant was laid out at 0.2, 0.4, 0.6, 0.8, and 1.0 meter. Individual exclusion biomass was taken at the end of the growing season. Each of the exclusion trials was on a south slope at differing gradients. Initial results of the competitive exclusion experiment showed competition intensity in the grasslands was higher at gentle versus steep slopes. [Paper Number 169]

**MODELING YELLOW TOADFLAX (*LINARIA VULGARIS* MILL.) OCCURRENCE IN THE FLAT TOPS WILDERNESS OF COLORADO.** Jason R. Sutton and K. G. Beck. Graduate Student and advisor. Colorado State University, Fort Collins, CO.

*Abstract.* Yellow toadflax (*Linaria vulgaris* Mill.) is an invasive perennial found in the Flat Tops Wilderness of the White River National Forest on the western slope of Colorado. Logistic regression was used to generate a model to predict the occurrence of yellow toadflax based on measurable site characteristics of a plot. A case paired study in two locations was conducted at the Ripple Creek and Marvine Creek sites in 1999 and 2000, respectively. The final model included two vegetation levels, the presence of trails, and plant species richness per plot. The model correctly classified 90% of the 242 plots sampled. The model indicated yellow toadflax was most often found in open areas along trails with higher plant diversity. Ninety-seven percent of yellow toadflax plots were in meadows or along a margin, while 37 percent of non-toadflax plots were found in these same vegetation types. Yellow toadflax infestations had a higher association with trails at Ripple Creek than Marvine Creek, the latter likely an older infestation. Ripple Creek toadflax plots averaged 28 plant species per plot while non-toadflax plots averaged 17 species. Species richness in Marvine Creek was slightly higher with toadflax and non-toadflax plots containing 30 and 20 species per plot, respectively. The results give land managers in the Flat Tops a tool to identify areas most likely to contain yellow toadflax infestations, as well as, demonstrate that yellow toadflax occurs in areas of higher species richness. [Paper Number 174]

## WEEDS OF HORTICULTURAL CROPS (PROJECT 2)

**USE OF SUBIRRIGATION FOR WEED MANAGEMENT IN ORNAMENTAL PLANT PRODUCTION SYSTEMS.** Cheryl A. Wilen. Area Integrated Pest Management Advisor. University of California Statewide IPM Program and UC Cooperative Extension, San Diego, CA.

*Abstract.* Weed and crop growth in nursery containers with wells for subirrigation were compared to conventional pots irrigated by overhead sprinklers or by spot spitters. The use of automatic sensors for managing irrigation timing was also investigated. In general, subirrigated woody plants had significantly greater growth as indicated by plant height and by root and shoot dry weights. Weed dry weight and percent cover were also significantly reduced in the subirrigated treatments. The use of a sensor to initiate irrigation reduced percentage weed cover and dry weight in one study. [Paper Number 15]

**BLUEBERRY PREEMERGENCE WEED CONTROL.** Bob Mullen. Farm Advisor. University of California, Davis, CA.

*Abstract.* Blueberries are a relatively new crop for the San Joaquin Valley of California with most of the plantings utilizing overhead irrigation systems operating several times a week in the summer months. This frequent irrigation encourages rapid weed growth and leads to expensive and time consuming hand weeding operations under the bushes. Napropamide at 4lb/A, simazine at 3.96lb/A, and a tank mix of a half rate of both materials, napropamide at 2lb/A and simazine at 1.98lb/A was evaluated. All treatments were applied in 30 gallons of water with a directed spray to the soil surface. There were no indications of crop injury. The best control of weeds present, yellow nutsedge and common purslane, was provided by the combination treatment of the one half label rates of napropamide and simazine. [Paper Number 16]

**PURPLE NUTSEDGE GROWTH AND BIOMASS PARTITIONING IN RESPONSE TO ROOT-KNOT NEMATODES.** Ericka L. Luna, Jill Schroeder, Stephen Thomas and Leigh Murray. Student, Professor, Professor and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* Two key agricultural pests of southern sandy soils are purple nutsedge (*Cyperus rotundus*), and root-knot nematodes (*Meloidogyne incognita* (RKN)). Greenhouse studies were conducted to examine water use and the above- and below-ground biomass partitioning of purple nutsedge in the presence and absence of root-knot nematodes. Tubers (0.5 – 0.7 g) were collected, germinated, planted 2.5 cm deep in twice-pasteurized soil (85% sand, 10% silt, 5% clay, 0.4 % organic matter, pH 7.4), and inoculated with RKN eggs on July 26 and August 19, 2002. The design was a randomized complete block with four replications. The amount of water added to each pot daily was recorded. Two pots (one infected and one non-infected) were harvested per replication each week for six weeks after emergence. Data included leaf area, root length, tuber counts and shoot, subterranean shoot, root, rhizome, tuber, total, and total subterranean dry weights. In study one significant RKN by harvest interactions were observed for tuber, subterranean shoot, root, rhizome, total, and total subterranean weight. For these variables, the presence of RKN generally had no effect until harvest six, where RKN reduced dry weights and counts. In study two the presence of RKN increased root length, tuber count, subterranean shoot count, and subterranean shoot, root, total subterranean, and total weight. No significant RKN by harvest interactions were found in study two. In both studies, the presence of RKN had no effect on leaf area or shoot dry weight. [Paper Number 17]

**INFLUENCE OF DIMETHENAMID APPLICATION TIMING ON ONION RESPONSE AND WEED CONTROL.** W. Mack Thompson[1] and Scott J. Nissen[2]. Assistant Professor and Associate Professor. [1]University of Idaho, Parma, ID and [2]Colorado State University, Fort Collins, CO.

*Abstract.* Weed control options for onion production in the Western U.S. is limited to a handful of herbicides or expensive hand labor and because onions never form a canopy, season-long weed control is required. Many of the currently available herbicides either don't provide consistent broad spectrum weed control, lack residual soil activity, or can only be used mid-season when the onion crop is more tolerant to herbicide application. Dimethenamid is a potential new herbicide for use in onions that can provide broad spectrum weed control of emerging weeds including pigweeds, nightshades, several grasses, and yellow nutsedge. It is anticipated to be registered for application to 2-3 leaf onions for residual weed control. Research conducted in Colorado and Idaho in 2000 and 2002 indicates that earlier dimethenamid applications may be safe to the crop. In Idaho, dimethenamid at 0.73 (1x) or 1.47 (2x) kg ai/Ha did not reduce onion stand or yield when applied to early preplant, loop, 1-leaf, or 2-leaf onions. The highest yielding treatments included early preplant applications of dimethenamid, whereas early preplant applications of pendimethalin reduced onion stand by 25%. Dimethenamid caused 38% injury and reduced onion yield when applied premergence in Colorado, but all other application timings (loop, flag, 1-leaf and 2-leaf) appeared to be safe. If dimethenamid is safe for applications before the 2-leaf stage, this might provide early yellow nutsedge control. [Paper Number 18]

**EFFECTS OF HERBICIDES ON PRODUCTION OF RED BEET SEED AND RESULTANT SEED GERMINATION.** Timothy W. Miller, Robert K. Peterson and Brian G. Maupin. Extension Weed Scientist, Agricultural Research Technologist and Agricultural Research Technologist. Washington State University Mount Vernon Research and Extension Unit, Mount Vernon, WA.

*Abstract.* Weed control and crop injury were evaluated in red beet grown for seed after treatment with several herbicides alone and in combination. Eleven different products were applied PPI, PRE, or POST in overwintered, transplanted beet roots. No treatments significantly injured beet foliage or reduced stand counts. Treatments in the herbicide trial providing > 85% weed control by mid-June included cycloate (PPI) followed by dimethenamid-p or s-metolachlor (PRE), cycloate (PPI) followed by dimethenamid-p or phenmedipham + desmedipham (POST), ethofumesate or pyrazon + dimethenamid-p (PRE), and dimethenamid-p (PRE) followed by pyrazon (POST). Treatments in a second trial providing > 85% weed control by mid-June included sulfentrazone (PRE) followed by phenmedipham + desmedipham or triflusulfuron (POST), azafenidin (PRE) followed by phenmedipham + desmedipham, triflusulfuron, or thiazopyr (POST), and thiazopyr (PRE) followed by phenmedipham + desmedipham, triflusulfuron, clopyralid, or thiazopyr (POST). There were no significant differences in seed yield due to treatments in the first trial, although yield increased with improved weed control in the second trial. Germination percentage of cleaned and screened seed, production of abnormal seedlings, rotted seed, or non-

germinated seed did not differ by herbicide treatment. Overall seed germination was poor, however, ranging from 53 to 65%. Poor male plant establishment and resultant poor pollination of female plants in the field likely accounted for the low germination percentage in harvested seed. [Paper Number 19]

**PRODUCTIVITY AND WEED CONTROL IN PUMPKIN, SQUASH, AND CUCUMBER AFTER TREATMENT WITH VARIOUS HERBICIDE COMBINATIONS.** Timothy W. Miller, Brian G. Maupin and Robert K. Peterson. Extension Weed Scientist, Agricultural Research Technologist and Agricultural Research Technologist. Washington State University Mount Vernon Research and Extension Unit, Mount Vernon, WA.

*Abstract.* Nine varieties of three cucurbit types (cucumber, winter squash, and pumpkin) were tested for sensitivity to several herbicide combinations. Crop injury was < 10% for all treatments. Using clomazone (PRE) in sequence with other herbicides improved weed control by some 7% by August. Maximal weed control (> 85%) was achieved under five conditions: 1. clomazone + ethalfluralin (PRE) with or without sequential clomazone; 2. halosulfuron + s-metolachlor or dimethenamid-p (PRE) with or without sequential clomazone; 3. halosulfuron or bentazon (POST) with or without sequential clomazone; 4. S-metolachlor or halosulfuron (PRE) with sequential clomazone; or 5. halosulfuron (PRE) followed by halosulfuron, bentazon, dimethenamid-p, or s-metolachlor (POST) with or without sequential clomazone. Stand counts did not vary by treatment but did by the variety by clomazone interaction, ranging from 3.7 plants/plot for Table Ace squash with clomazone to 14.7 for Calypso pickling cucumber with clomazone. Fruit weight differed primarily by variety, while fruit number was slightly reduced by seven treatments: ethalfluralin (PRE), dimethenamid-p or s-metolachlor (PRE or POST), and halosulfuron (PRE) followed by dimethenamid-p or s-metolachlor (POST). These reductions in fruit number were partially due to weed competition, as weed control from most of these treatments was less than 85% in August. Although sequential clomazone affected the number of fruit produced by variety, fruit numbers were not consistent with clomazone affects on stand counts, indicating that clomazone may not have been the primary factor involved. [Paper Number 20]

**EVALUATION OF POTENTIAL POST EMERGENCE HERBICIDES FOR BROCCOLI.** Richard F. Smith[1], Steven A. Fennimore[2] and Warren E. Bendixen[3]. Farm Advisor, Extension Specialist and Farm Advisor. [1]University of California Cooperative Extension, Salinas, CA, [2]University of California, Davis, Salinas, CA and [3]University of California Cooperative Extension, Santa Maria, CA.

*Abstract.* Weed control can be a significant cost in fresh market broccoli production. There is currently no registered post emergence herbicide for use on broccoli for control of broadleaf weeds; however a fair amount of weed control can be achieved with topical applications of liquid fertilizers such as 20% ammonium nitrate (AN 20). Field studies were conducted in the Salinas and Santa Maria Valley, California to evaluate the crop safety and weed control provided by several post emergence herbicides. Post emergence applications of the micro encapsulated 4F formulation of oxyfluorfen at 0.063 and 0.125 lb ai/A, and the 2XL formulation of oxyfluorfen at 0.031, 0.63, 0.125 and 0.250 were made at the 3 to 4 leaf stage of broccoli 35 days after direct seeding. These treatments were compared with a topical application of AN 20 at 70 gallons/A. All rates of oxyfluorfen provided improved weed control of common purslane and burning nettle over AN 20. The 4F formulation of oxyfluorfen at 0.125 had improved safety and yield over the 2XL formulation at 0.031 and 0.063 lb ai/A. The 4F formulation of oxyfluorfen has greater safety than the 2XL formulation for over-the-top post emergence applications of direct seeded broccoli and it provides superior weed control than topical applications of AN 20. [Paper Number 21]

**PRE-IRRIGATION FOLLOWED BY CULTIVATION OR FLAMING TO DEPLETE THE WEED SEED BANK PRIOR TO CROP PLANTING.** Wayne T. Lanini and Tomas R. Stevenson. Extension Weed Ecologist and Graduate Student Weed Science. University of California at Davis, Davis, CA.

*Abstract.* Pre-irrigation followed by weed removal has been utilized in weed management strategies for reducing weed seed banks prior to crop planting. Benefits have included reduced herbicide inputs or tillage operations necessary for subsequent weed control. However, a better understanding of this technique is needed for wider acceptance among growers. Two field trials (tomato and lettuce) were conducted at Davis, California, in order to determine the most effective pre-irrigation strategy followed by either cultivation or flaming for weed seed bank depletion prior to crop planting. Pre-irrigation was carried out by either sprinkler or furrow and weed removal was performed at either 10 or 17 days after pre-irrigation using either flaming (propane) or shallow cultivation. Three herbicide programs were evaluated; full label rate (tomato: rimsulfuron post-emergence and trifluralin layby; lettuce:

pronamide pre-emergence), the same treatment for both crops at half label rate and a third treatment without herbicide. Weed density, weeding time and yield were measured. In lettuce, weed density, weeding time, and yield were all influenced by herbicide rate, but not by pre-irrigation method or weed removal prior to planting. Weeding time in lettuce was affected by the interaction between pre-irrigation method and herbicide rate, with less time required for full-rate treatments, or half-rate in the furrow irrigated system. Weed density in tomatoes did not differ among treatments, but weeding time and yield were both affected by herbicide rate. The no herbicide plots required more weeding time and yields were lower, but full-rate and half-rate treatments did not differ. [Paper Number 22]

**WEED CONTROL AND CURCURBIT TOLERANCE TO ETHALFLURALIN, CLOMAZONE OR A COMBINATION.** W. T. Lanini[1] and Ernest A. Roncoroni[2]. Extension Weed Ecologist and Product Development Manager. [1]University of California, Davis, CA and [2]United Agri Products, Woodland, CA.

*Abstract.* A weed control/cucurbit tolerance field study was conducted at Davis, California, in 2001 and 2002. Watermelon, summer squash, pumpkin, cantaloupe, honeydew melon, cucumber, were direct seeded in both years. Treatments in 2001 included ethalfluralin at three rates and PCC-0170 (a mixture of ethalfluralin and clomazone) at five rates, plus a weed free and weedy control. In 2002, clomazone at five rates was also included. Visual evaluations of weed control were made by species at 14, 21, and 35 days after treatment (DAT). Weed species present included purslane (*Portulaca oleracea*), lambsquarters (*Chenopodium album*), nightshades (*Solanum* and *Physalis* spp.) and barnyardgrass (*Echinochloa crus-galli*). Cucurbit injury (growth reduction and leaf bleaching) was visually rated at emergence, 21, and 35 DAT. Cucurbit stand counts were made at 21 DAT. Purslane control was initially 75% or better with the high rate of ethalfluralin, clomazone, and all rates of PCC-0170, but declined 20 to 25% by 21 and 35 DAT. Lambsquaters and nightshade control also declined about 20% between the 14-day and the 35-day evaluation and was about 15% better with PCC-0170 compared to ethalfluralin, and 40% better than clomazone. Barnyardgrass control was 70% or better with the high rate of ethalfluralin and all rates of PCC-0170. Overall weed control improved with higher application rates and PCC-0170 generally provided 5 to 15% better overall weed control than did ethalfluralin or clomazone. Cucurbit crop phytotoxicity did not differ among the herbicide treated plots at any evaluation. Stand counts further confirmed that herbicide treatments did not affect cucurbits. [Paper Number 23]

**WEED CONTROL USING A ROBOTIC SPRAYER EQUIPPED WITH AN IMAGE-VISION SYSTEM.** Juan C. Brevis[1], Thomas Lanini[1], Daniel Downey[2], Ken Giles[2] and David C. Slaughter[2]. M.Sc. Student, Ph.D. Extension Weed Ecologist, Assoc. Dev. Engineer, Ph.D. Professor and Ph.D. Professor. [1]Dept. of Vegetable Crops, University of California, Davis, CA and [2]Dept. of Biological and Agricultural Engineering, Univesity of California, Davis, CA.

*Abstract.* Development of GPS technology, real time sensors and sprayer controllers make possible the application of non-selective herbicides on specific targets providing spatial selectivity for weed control. Two experiments were conducted in 2002 at Davis, California, to examine the use of a pulsed jet micro-sprayer with a vision system. The first compared three rates of glyphosate (0.25, 0.375 and 0.5% v/v a.i. with and without an anti-splash adjuvant) applied manually with a pulsed jet nozzle, rimsulfuron (35 g/ha) conventionally-applied and a control in processing tomato at three application dates. Glyphosate applications were made directly to individual weeds located within a 10-cm band centered on the crop row. Black nightshade and spotted spurge control with glyphosate (96% and 80, respectively) was significantly higher than that with rimsulfuron at the three dates. The polymer increased selectivity at the highest glyphosate rates, reducing the mortality of the tomato plants, although tomato biomass was significantly higher in the glyphosate treatments than in the control for the first two application dates. In the second experiment, the control of *Eragrostis sp.* in cotton was assessed using conventionally applied sethoxydim (315 g/ha), and glyphosate (0.125, 0.25, and 0.5% v/v a.i.) and an 8% acetic acid solution applied with pulsed jet micro-sprayer controlled by a computer. Weed control with glyphosate treatments was erratic and lower than the sethoxydim treatment. The injury on the cotton plants indicates that the vision system did not properly recognize the crop and the precision application was not effective in this preliminary experiment. [Paper Number 24]

**DODDER CONTROL IN PROCESSING TOMATOES.** Thomas W. Lanini and Mario R. Miranda Sazo. Dodder control in processing tomatoes and Dodder control in processing tomatoes. UCDavis, Davis, CA.

*Abstract.* Dodder is a stem parasite which attacks a wide variety of crops. Dodder has been reported to reduce tomato yield by as much as 75%. Dodder infestations in tomatoes are often managed by late-season planting, hand removal of infested tomato plants, or the use of tolerant varieties. However, these methods are not always practical, and thus, the objective of this research is to evaluate several herbicides for the selective control of dodder in processing tomato. A field study was conducted in 2002, to assess post-attachment dodder control with rimsulfuron (150 g ai/ha), halosulfuron (70 g ai/ha), or sulfosulfuron (25, 50, and 100 g ai/ha) in a tomato field at Three Rocks, California. Treatments were applied to seedling tomatoes which were parasitized by young twining dodder seedlings. Dodder growth was visually evaluated on a scale of 0 (no dodder present) to 100 (dodder completely covering tomato plants) 50 days after treatments. Dodder growth was lowest (3%) when treated with sulfosulfuron at 100 g/ha. Sulfosulfuron at 25 and 50 g/ha had 17 and 10% dodder cover, respectively. Rimsulfuron at 150 g/ha was the least effective treatment with 62% dodder cover. Halosulfuron at 70 g/ha had intermediate dodder cover (40%) and was also observed to provide less black nightshade control. Treatments did not affect tomato yield. [Paper Number 25]

**ANNUAL WEED CONTROL USING THE ATARUS RANGER PROPANE FLAMER IN A NON-CROPLAND ENVIRONMENT.** Thaddeus R. Gourd[1] and Tim Ferrell[2]. Agriculture Extension Agent and Farmer. [1]Colorado State University Cooperative Extension, Brighton, CO and [2]Berry Patch Farms, Brighton, CO.

*Abstract.* Dr. Thaddeus Gourd, Extension Agent (Agriculture), Colorado State University Cooperative Extension in Adams County. 9755 Henderson Road, Brighton, CO 80601. Phone: 303-637-8117 FAX: 303-637-8125 E-mail: tgourd@co.adams.co.us Web Site:www.adamscountyextension.org Tim Ferrell, Producer, Berry Patch Farms Certified Organic Pick Your Own Farm Market, 13785 Potomac Street, Brighton, CO 80601 Phone: 303-659-5050. E-mail: berrypatchfarms@qwest.net Annual weeds commonly infest non-cropland areas such as ditch banks and fencerows along the Front Range of Colorado. The annual weed examined in this study was kochia(Kochia scoparia). A trend towards sustainable agriculture and organic products has encouraged efforts towards identifying effective, economical alternatives to herbicides. The purpose of this study was to examine whether propane flaming treatments of non-cropland (ditch banks) in the early spring could effectively reduce kochia populations. Weeds were flamed using the handheld Atarus Ranger Thermal Weed Control Device. This device uses propane as the fuel source and provides about 45 minutes of flaming per 6.6 lb tank of propane when used at high flame setting. Two flame applications were used during this experiment, with the first applied on April 8 and the second on April 17, 2002. Flaming occurred when kochia was ¼ to ¾ inch tall or about the size of a penny in diameter. Kochia populations averaged about one plant per square inch. Each plot was 4 by 4 feet and required 30 seconds of flaming to treat all weeds. Successful flaming requires only a blanching of weed tissue without allowing the fire point to be reached (The fire point is the temperature at which the flame becomes self-sustained so as to continue burning). Eight days after the first flame application, 93.5% kochia control was achieved. A 93% level of kochia control was achieved 68 days following the 2nd application. The lack of rainfall during this test helped prevent new seedlings from emerging and helps to explain the long period of weed control achieved with the flame. Flaming weeds using the Atarus Ranger effectively controlled the annual weed kochia after just two applications. [Paper Number 26]

**THE EFFECT OF DIURON ON TIFWAY BERMUDAGRASS.** Joh W. Boyd. Weed Scientist. University of Arkansass, Fayetteville, AR.

*Abstract.* Effect of Diuron on Tifway Bermudagrass. John W. Boyd, University of Arkansas Cooperative Extension, Fayetteville, AR 72704. We conducted three field trials from 2001-2002 to determine the tolerance of Tifway bermudagrass to diuron. The 2001 trial was located in central Arkansas on a commercial sod farm. The soil was a sandy loam (48% sand, 45% silt and 7% clay). The fertility regime for all trials was 1 lb N/1,000 sq ft every 3 weeks during the growing season. The sprigging rate for all trials was 400 bu/a. Diuron was applied to the 2001 study on July 10, 2001 at 1.5 and 3.0 lb ai/A, 7 days after planting. Oxadiazon at 3.0 lb ai/A was included as a standard treatment. Percent bermudagrass cover in all trials was determined by taking digital photographs from directly over the center of each plot and analyzing them using SigmaScanÒ software. SigmaScanÒ counts the number of green pixels (bermudagrass) in the digital photo and divides it by the number of total pixels to calculate a percent bermudagrass cover in the plot. In the 2001 study, diuron caused severe damage to Tifway sprigs. At 45 DAT (days

after treatment) percent cover was 54% for the low rate of diuron and 13% for the high rate compared to 95% cover in the oxadiazon standard. The oxadiazon plots were at 100% cover by 86 DAT. The 1.5 lb ai/A diuron treatment required 122 DAT (November 9, 2001) to achieve complete cover. The 3.0 lb ai/A treatment had 65% cover by 122 DAT when a cold front ended the bermudagrass growing season. One complicating factor in 2001 was common bermudagrass contamination. Common bermudagrass has greater tolerance for diuron than Tifway and thus gains a competitive advantage following an application of diuron. The 2002 trials were located in northwest Arkansas on the University of Arkansas Research Farm. The soil was a loam (37% sand, 43% silt and 20% clay) that had been fumigated the previous year and was free of common bermudagrass as were the sprigs used for planting. In study I, an area was sprigged with Tifway bermudagrass on May 31, 2002 and then sprayed with diuron at 1.5 lb ai/a at 0, 10, 30 and 60 DAP (days after planting). The objective of this trial to determine how long Tifway sprigs require to become sufficiently established to tolerate diuron. In study II, the trial was established on bare ground and sprayed with diuron at 1.5 lb/ai/a on May 31, 2002. Treatments in study II consisted of planting previously sprayed plots at 30, 45 and 60 days after application. Control plots were included for each planting date. The objective was to determine how soon it would be feasible to plant Tifway sprigs after diuron had been applied. In study I at 118 DAT, percent bermudagrass cover in the 0, 10, 30 and 60 DAP treatments was 100, 68, 50, 39%, respectively. However, the 0 DAP treatment plots were replanted on July 30, 2002 because all sprigs were killed by the diuron applied immediately after planting. At the time that they were sprayed, the 60 DAP plots had achieved 100% cover. However, diuron injury was such that only 39% cover remained in these plots by the end of the growing season. In study II at 118 days after spraying, percent bermudagrass cover in the 30, 45 and 60 DAP treatments was 78, 76, and 91%, respectively. The growth of Tifway sprigs planted at 30 and 45 days after spraying was slowed by diuron residues. However, growth of sprigs planted at 60 DAT was comparable to that of the untreated. At 118 DAT, percent cover in the 30, 45 and 60 DAT treatments was 77, 78 and 91 %, respectively. Percent cover in the control plots was 100, 97 and 96%, respectively. [Paper Number 86]

**EFFICACY OF FOMESAFEN AND FOMESAFEN TANK MIXES FOR POSTEMERGENCE WEED CONTROL IN DRY BEANS.** Robert G. Wilson. Professor. Department of Agronomy and Horticulture, University of Nebraska, Scottsbluff, NE.

*Abstract.* Field studies were initiated near Scottsbluff, NE to compare the efficacy of fomesafen and fomesafen tank mixes applied postemergence for selective weed control in six different market classes of dry bean. Dry bean market classes examined were great northern, pinto, pink, black, navy, and light red kidney. Fomesafen was applied at four rates: 0.21, 0.28, 0.56, and 0.84 kg $ha^{-1}$ when dry beans were either in the unifoliate, first trifoliate, or third trifoliate growth stage. Fomesafen was also applied in combination with imazamox at 0.04 kg $ha^{-1}$, bentazon at 0.56 kg $ha^{-1}$, and clethodim at 0.14 kg $ha^{-1}$. All six market classes of dry bean showed excellent tolerance to fomesafen. Fomesafen was effective in controlling common purslane, redroot pigweed, and hairy nightshade but did not control narrowleaf lambsquarters. Fomesafen could be combined with bentazon and clethodim but combinations with imazamox caused unacceptable crop injury. [Paper Number 87]

**SUMMARY OF HERBICIDE PERFORMANCE FOR DESERT MELON PRODUCTION.** Kai Umeda. Area Extension Agent. University of Arizona Cooperative Extension-, Phoenix, AZ.

*Abstract.* Very few herbicides are available for commercial melon production. Major manufacturers rarely conduct research and development to market herbicides for minor crops such as melons. Screening tests were initiated and few products were identified that appeared promising for providing effective and safe weed control. Halosulfuron at 36 to 112 g/ha applied postemergence (POST) gave very good control of *Cyperus rotundus*. At 56 g/ha or less, *Amaranthus* spp. were not adequately controlled. Halosulfuron applied POST was safer than soil applications. Rimsulfuron at 22 g/ha consistently controlled *Amaranthus* spp. and *Portulaca oleracea* but was marginal against *Chenopodium album* and *C. rotundus*. Halosulfuron and rimsulfuron applied alone did not control *Physalis wrightii*, a difficult to control weed in the desert. Combining halosulfuron and rimsulfuron may broaden the spectrum of weeds to be controlled in melons. Clomazone at 560 g/ha was effective against weeds and safe on melons when applied to the soil and mechanically preplant incorporated (PPI) compared to preemergence surface applications (PREE). Dimethenamid, s-metolachlor, and flumioxazin appear to be promising PREE applied herbicides in initial field experiments by controlling *Amaranthus* spp. and C. album. Halosulfuron, s-metolachlor, dimethenamid, and flumioxazin applied PREE caused brief plant stunting with no observable foliar chlorosis. [Paper Number 88]

**EFFECTS OF VOLUNTEER POTATO DENSITY AND REMOVAL TIME ON ONION YIELD.** Martin M. Williams II[1], Corey V. Ransom[2] and W. M. Thompson[3]. Assistant Professor, Assistant Professor and Assistant Professor. [1]Washington State University, Prosser, WA, [2]Oregon State University, Ontario, OR and [3]University of Idaho, Parma, ID.

*Abstract.* Previous research indicates critical period for weed control begins 2- to 8-weeks after onion emergence, however, these studies have been conducted using small-seeded annual weeds that ranged from 50 to 850 weeds/$m^2$. Volunteer potato is a perennial weed of potato rotation crops and occurs in densities less than 10 weeds/$m^2$. Two separate studies were conducted at Parma, ID, Ontario, OR, and Prosser, WA in 2002 to quantify the impact of volunteer potato density and removal time on onion yield and quality. Weed density studies consisted of six weed density treatments, including 0, 0.5, 1, 2, 4, and 8 tubers/$m^2$. Onion yield was regressed against weed density using a hyperbolic model. Weed densities as low as 0.5 tubers/$m^2$ reduced onion yield some 40% and no onions were recovered in treatments with 4 and 8 tubers/$m^2$. At a single density of 2 tubers/$m^2$, eight weed removal treatments were tested, including weed removal at onion emergence, 1-lf, 2-lf, 3-lf, 4-lf, 6-lf, 8-lf, and season-long weedy. Onion yield was regressed against weed removal treatments, as growing degree days, using a logistic equation. Yield loss began between 2- and 6-lf treatments, and varied by location according to relative time of crop and weed emergence. As length of competition increased beyond 3-lf stage of onion, a greater proportion of bulbs were in the small and medium market class. Volunteer potato tuber production occurred by the 2-lf stage of onion and exceeded 15 tubers/$m^2$ by the 6-lf stage. Onion yield losses due to volunteer potato competition occur earlier and at lower weed densities than previous reports on competition from small-seeded annual weeds. [Paper Number 89]

**FALL ALFALFA TERMINATION USING HERBICIDES AND TILLAGE IN ARIZONA.** Kwame O. Adu-Tutu and William B. McCloskey. Research Specialist and Associate Specialist. University of Arizona, Tucson, AZ.

*Abstract.* Experiments were conducted at the University of Arizona Maricopa Agricultural Center in the fall of 2002 to assess the efficacy of postemergence herbicides in terminating non-dormant alfalfa. Mecca II alfalfa was sprayed with glyphosate at various rates and times before being green-chopped in two randomized complete block experiments. Glyphosate at 0.75, 1.25 or 1.5 lb ae/A did not reduce alfalfa shoot fresh weights after 39, 48, 72 or 90 h of exposure. Alfalfa shoot regrowth was reduced at least 78% by all glyphosate rates and exposure times when visually assessed 11, 20, 35, 42 or 60 days after cutting. Alfalfa shoot fresh weights 74 days after the initial cutting were reduced 68% and 79% by glyphosate at 0.75 and 1.5 lb ae/A, respectively, and were reduced 80, 75, 68 and 65% by exposure to glyphosate for 90, 72, 48, and 39 h, respectively, compared to the unsprayed control fresh weight of 8,798 lb/A. The field was disked and barley was planted 80 days after the last glyphosate treatment. The number of crowns emerging in the barley crop 135 days after the initial cutting was statistically similar for the untreated plots and the plots treated with glyphosate at 0.75 and 1.25 lb ae/A; however, the number of crowns was substantially reduced by glyphosate at 1.5 lb ae/A. In a second experiment where the alfalfa was disked 16 days after the last glyphosate treatment, alfalfa regrowth was reduced by 39, 48 or 62 h of glyphosate exposure before green-chopping. Disking reduced the number of emergent alfalfa crowns by at least 70% one month after disking (45 days after cutting) compared to the unsprayed control. The percent groundcover due to alfalfa regrowth was reduced at least 50% by spraying glyphosate relative to the unsprayed control plots 75 days after disking. In both experiments, neither glyphosate application rate nor exposure time substantially affected hay quality. In two additional herbicide-alfalfa termination experiments, various combinations of 2,4-D and dicamba were applied to Mecca II or glyphosate-tolerant alfalfa varieties. The first 2,4-D-dicamba experiment was arranged in a split-plot design, with disking as the main plot factor and herbicide treatment as the subplot factor. Mecca II alfalfa regrowth was significantly less in unsprayed disked plots compared to unsprayed no-till plots but no-till plots sprayed with 2,4-D + dicamba combinations had less regrowth than unsprayed disked plots. Averaged across all herbicide treatments, disking reduced alfalfa regrowth 74%, 52%, 43% and 27% when visually assessed 15, 22, 29 and 62 days after herbicide application, respectively. The spray treatments of 2,4-D + dicamba at a combined rate of 1 or 1.5 lb ae/A (0.75+0.75, 0.5+1, 1+0.5, 0.665+0.335 or 0.335+0.665 lb ae/A) and 2,4-D alone at 1, 1.25 or 1.5 lb ae/A resulted in at least 90% phytotoxicity relative to the unsprayed control 22 to 62 days after application, and were superior to dicamba alone, glyphosate or paraquat. There were 83% fewer alfalfa crowns in the disked plots than in the no-till plots 102 days after application (38 days after disking and planting of barley). All herbicide treatments except paraquat at 1 lb ai/A reduced the number of emergent alfalfa crowns 90% (2,4-D at 1.25 lb ae/A) to 97% (2,4-D + dicamba at 0.75 + 0.75 lb ae/A) relative to the unsprayed control. In the second 2,4-D-dicamba alfalfa termination experiment, all plots were disked 16 days after herbicide application because of the excellent tillage effect

demonstrated in the first experiment. Dicamba or 2,4-D individually at 1, 1.25 or 1.5 lb ae/A, and various ratios of 2,4-D and dicamba at combined rates of 1 and 1.5 lb ae/A were applied to glyphosate-tolerant alfalfa. All herbicide treatments resulted in 61% to 70% alfalfa phytotoxicity 15 days after spraying. Forty-three, 53, 81 and 88 days after herbicide treatment (27, 37, 65 and 72 days after disking), there were 47, 80, 119 and 138 emergent alfalfa crowns, respectively, in the unsprayed treatment. In comparison, plots sprayed with herbicides had less than 2, 4, 4 and 10 emergent crowns on the same assessment days. Thus, all the herbicide treatments were effective in terminating glyphosate-tolerant alfalfa when combined with disking. [Paper Number 90]

**WEED CONTROL DURING ESTABLISHMENT IN FALL-PLANTED ALFALFA IN ARIZONA.** William B. McCloskey and Kwame O. Adu-Tutu. Associate Specialist and Research Specialist. University of Arizona, Tucson, AZ.

*Abstract.* Experiments were conducted to evaluate herbicides for weed control in conventional and glyphosate-tolerant alfalfa at the University of Arizona Maricopa Agricultural Center (MAC) and on a commercial farm. In Glendale, Arizona, an experiment was conducted to compare imazamox with the commercial standards bromoxynil, 2,4-DB and imazethapyr. Initial control of broadleaves at 12 DAT was fair to poor for most treatments. For example, the initial control of shepardspurse 12 DAT by bromoxynil at 0.375 lb ai/A, 2,4-DB at 1.5 lb ae/A, and imazethapyr at 0.063 lb ai/A was 90, 28 and 57%, respectively, compared to 50, 48, 58, 60, and 58% control by imazamox at 0.024, 0.032, 0.047, 0.063 and 0.094 lb ai/A, respectively. Similarly, the initial control of silversheath knotweed 12 DAT by bromoxynil, 2,4-DB and imazethapyr at the rates above was 60, 23 and 47%, respectively, compared to 48, 45, 57, 53, and 57% control by imazamox at the rates listed above, respectively. Significant stunting of alfalfa occurred 12 DAT with bromoxynil, 2,4-DB and imazethapyr causing 41, 1 and 43% stunting compared to 41,45, 51, 58, and 68% stunting, respectively, caused by the imazamox rates listed above. Broadleaf weed control improved significantly by 40 DAT and stunting of the alfalfa was still evident. For example, the control of shepardspurse 40 DAT by bromoxynil at 0.375 lb ai/A, 2,4-DB at 1.5 lb ae/A, and imazethapyr at 0.063 lb ai/A was 7, 72 and 97%, respectively, compared to 98, 98, 99, 98, and 99% control by imazamox at 0.024, 0.032, 0.047, 0.063 and 0.094 lb ai/A, respectively. Similarly, the control of silversheath knotweed 40 DAT by bromoxynil, 2,4-DB and imazethapyr at the rates above was 32, 72 and 98%, respectively, compared to 96, 98, 97, 98, and 98% control by imazamox at the rates above, respectively. The alfalfa was still stunted 40 DAT with bromoxynil, 2,4-DB and imazethapyr causing 41, 24 and 39% stunting compared to 20, 29, 44, 49, and 69% stunting, respectively, caused by the imazamox rates listed above. Stunting of the alfalfa was not evident at harvest 88 DAT and yields were similar in most herbicide treatments but the yield of the untreated control was reduced 22% by weeds and the yield of the imazamox at 0.094 lb ai/A treatment was reduced 21% compared to the imazethapyr treatment. An experiment conducted at MAC compared imazamox alone at 0.039 and 0.047 lb ai/A and imazethapyr at 0.094 lb ai/A with various mixtures of 2,4-DB at 0.5 lb ae/A with imazamox (0.234, 0.312, 0.039, and 0.047 lb ai/A) or imazethapyr (0.094 lb ai/A). The weeds evaluated in the experiment were prostrate knotweed, Sahara mustard (*Brassica tournefortii*), shepardspurse, annual bluegrass, annual sowthistle and littleseed canarygrass. In general, weed control obtained with either imazamox or imazethapyr was improved by mixing with 2,4-DB at 0.5 lb ae/A but crop injury (i.e., stunting early and yield at harvest) was increased. None of the treatments adequately controlled annual bluegrass. A second experiment was conducted at MAC in glyphosate-tolerant alfalfa. Glyphosate at two rates, 0.75 and 1.5 lb ae/A, and at two application timings, 3.5 and 9 trifoliate leaves, was compared with imazethapyr (0.094 lb ai/A) or with imazamox (0.047 lb ai/A) alone or mixed with 2,4-DB (0.5 lb ae/A). Weeds evaluated were the same as those listed in the previous experiment. In general, glyphosate applied at either 0.75 or 1.5 lb ae/A at the third trifoliate leaf stage provided better weed control than the imazamox or imazethapyr treatments at either application time. Similar to the previous experiment, tank-mixing 2,4-DB with imazamox or imazethapyr improved weed control slightly but increased alfalfa injury substantially. Herbicide treatments applied at the 9 trifoliate leaf-stage were much less effective than herbicide treatments applied at the 3.5 trifloliate leaf-stage. [Paper Number 91]

**DETECTION OF TRIAZINE-RESISTANT ANNUAL BLUEGRASS IN TURFGRASS.** Jeffrey F. Derr. Professor. Virginia Tech, Virginia Beach, VA.

*Abstract.* Several southeastern Virginia golf courses had reported difficulty in controlling annual bluegrass (*Poa annua* L.) in their bermudagrass fairways. The standard control program for annual bluegrass at these courses had been a fall application of simazine. Plants were collected from a total of six fairways at three golf courses and

maintained in a greenhouse. Seed was also collected at the research station in Virginia Beach from annual bluegrass plants growing in areas that had not been treated with simazine. Seed from these plants were used in trials to determine if resistance to simazine had occurred. Simazine applied preemergence at 1.12 and 2.24 kg ai/ha did not control annual bluegrass from two of the three golf courses. In a second trial to verify the level of resistance, these biotypes were not controlled by simazine applied at rates up to 9 kg ai/ha. Prodiamine at 0.84 kg ai/ha and ethofumesate at 1.1 kg ai/ha applied preemergence controlled annual bluegrass from all three golf courses. Triazine-resistant annual bluegrass had developed at two golf courses in southeastern Virginia, but these biotypes can be controlled using alternative preemergence herbicides. [Paper Number 92]

**EFFICACY AND ECONOMICS OF TWO- AND THREE-WAY TANK MIXTURES FOR PREEMERGENCE WEED CONTROL IN POTATOES.** Brent R. Beutler, Pamela J.S. Hutchinson and Felix E. Fletcher. Support Scientist, Assistant Professor and Research Technician. Aberdeen Research and Extension Center, University of Idaho, Aberdeen, ID.

*Abstract.* Throughout the Pacific Northwest, potato growers rely on herbicide tank mixtures for weed control. The majority of potato herbicides are applied in at least two-way tank mixtures with a third herbicide often added to the mixture. Replicated field trials were conducted over a three-year period to determine the efficacy and economic benefits of two-way versus three-way preemergence herbicide combinations, in Aberdeen, ID. Treatments included metribuzin, rimsulfuron, pendimethalin, EPTC, ethalfluralin, and s-metolachlor in two- and three-way combinations. All treatments were applied preemergence to an area with moderate to heavy broadleaf weed infestations, and light to moderate grass infestations in 2000. In 2001 and 2002, broadleaf weed infestations were again moderate to heavy with light grass infestations. In 2000, all of the three-way tank mixtures and a majority of the two-way tank mixtures provided greater than 90% control of all weed species present. In 2001, all treatments provided at least 88% control of all weeds present, except hairy nightshade. All three-way and a majority of two-way tank mixtures provided greater than 80% control of hairy nightshade. However, the pendimethalin + metribuzin and ethalfluralin + metribuzin treatments resulted in less than 70% control of hairy nightshade. In 2002, only rimsulfuron + metribuzin and rimsulfuron + s-metolachlor provided greater than 90% control of hairy nightshade with the remainder of the treatments providing less than 88% control. However, all three-way tank mixtures, except EPTC + pendimethalin + s-metolachlor, resulted in at least 88% hairy nightshade control. Also in 2002, all three-way and a majority of the two-way tank mixtures resulted in at least 90% control of kochia and common lambsquarters. All herbicide treatments also provided at least 90% control of volunteer oat. Gross return and net return were calculated, on a per acre basis, using eastern Idaho economic figures. Gross return was calculated by multiplying the sum weight of U.S. No. 1 and U.S. No. 2 tubers by $4.50 per hundredweight. Incentives are also paid for a high percentage of U.S. No. 1 tubers and tubers weighing six ounces or more. Incentives are also received for tubers with high specific gravity, and a flat rate is paid for process grade culls (tubers of good quality less than 4 ounces). Net return was based on the gross return minus the treatment cost, hauling costs, and operating costs. Herbicide costs for two-way combinations ranged from $27.00 to 51.66/A, while three-way tank mixture costs ranged from $40.26 to 60.34/A. In all three years of the study, three-way tank mixtures generally provided more consistent weed control than two-way tank mixtures, although the improved control did not always result in significant increases in tuber yield or quality. However, the net return of the majority of three-way herbicide combinations was equal to or greater than that of the two-way tank mixtures. [Paper Number 93]

**EFFECTS OF HERBICIDES USED FOR PRIMOCANE SUPPRESSION IN RED RASPBERRY.** Timothy W. Miller[1], Stephen F. Klauer[2] and Martin Nicholson[2]. Extension Weed Scientist, Former Research Associate and Agricultural and Research Operations Manager. [1]Washington State University Mount Vernon Research and Extension Unit, Mount Vernon, WA and [2]Washington State University Vancouver Research and Extension Unit, Vancouver, WA.

*Abstract.* Several herbicides were evaluated from 2000 through 2002 for primocane management in Meeker red raspberry production. While the herbicide programs did not modify floricane height or lateral production, there was a trend toward more fruiting sites on treated raspberries compared to untreated checks. This trend did not result in greatly improved yield compared to untreated raspberries. The poorest yielding treatments were dichlobenil + oxyfluorfen, carfentrazone, and two untreated checks, while dichlobenil + carfentrazone was numerically the highest yielder. Berry size was not affected by herbicide treatment, but did vary by year. Primocane suppression ranged from 90 to 98% using oxyfluorfen, carfentrazone, or glufosinate. Primocane regrowth was slowest when oxyfluorfen

was used either with or without dichlobenil, followed by carfentrazone and glufosinate. Dichlobenil alone or in combination gave excellent weed control (97 to 99%) after three years of applications at 4 lb ai/a. Cane burning products used alone resulted in lower weed control than when used sequentially with dichlobenil, and carfentrazone alone performed statistically poorer (58% control) than either oxyfluorfen or glufosinate used alone (79 and 75%, respectively). All tested herbicides tended to reduce the number of primocanes produced, but primocane suppression did not as a rule reduce those numbers more than from dichlobenil treatment alone. It appears from these data that a cane burning program does not drastically alter Meeker productivity. [Paper Number 94]

**FACTORS INFLUENCING EMERGENCE OF POWELL AMARANATH AND HAIRY NIGHTSHADE IN IRRIGATED ROW CROPS.** Ronald E. Peachey, Ray D. William and Carol Mallory Smith. Senior Research Assistant, Professor and Associate Professor. Oregon State University, Corvallis, OR.

*Abstract.* Several mechanisms have been postulated on the cause of the reduced emergence for many summer annuals when tillage is reduced or eliminated in the spring. These mechanisms include but are not limited to stimulation of germination by light during tillage, changes in soil moisture retention, nitrate fluxes in the soil, or less mechanical resistance from the soil crust that is removed during tillage. Another possibility is that seed burial depth during fallow months influences seed survival or the dormancy structure of the seedbank. The goal of this project was to determine whether seed burial depth influences weed emergence in direct-seed tillage systems. A system was developed to bury seeds of Powell amaranth and hairy nightshade at 1 and 25 cm and evaluate emergence potential in the spring without introducing germination promoters such as light during the evaluation process. Seeds were buried in the fall in 1.3 cm dia by 15 cm plastic tubes that were filled with 6 cm of soil. The tubes were then buried in the soil so that seeds were located at 1 and 25 cm below the soil surface. The soil tubes (with seeds and soil undisturbed) were extracted at monthly intervals from April through June, and placed in a temperature gradient table to determine the effect of burial depth on emergence potential. Seeds buried at the soil surface emerged slower than seeds that were buried at 25 cm for Powell amaranth and hairy nightshade. Powell amaranth emergence in the germination table was consistent from March through May; emergence of hairy nightshade increased over the three months. Moving the seeds from 25 cm to the soil surface to simulate vertical seed movement during tillage reduced the emergence potential of these summer annuals. Covering the soil tubes at the soil surface during the winter increased Powell amaranth emergence in the temperature gradient table compared to seeds that were buried near the soil surface. Powell amaranth seed survival was less when seeds were buried near the surface. Hairy nightshade seed survival was unaffected by burial depth. Simulation of seed movement within the soil during tillage with miniaturized electronic transponders found that as much as 10 % of seeds buried at 15 cm in the soil move to within 4 cm of the soil surface during tillage. [Paper Number 95]

**EVALUATION OF SEVERAL POTENTIAL HERBICIDES TO MANAGE YELLOW NUTSEDGE IN CELERY.** Steven A. Fennimore[1], Richard F. Smith[2] and Oleg Daugovish[3]. Extension Specialist, Farm Advisor and Farm Advisor. [1]University of California-Davis, Salinas, CA, [2]University of California-Monterey County, Salinas, CA and [3]University of California-Ventura County, Ventura, CA.

*Abstract.* Yellow nutsedge is becoming more common in California celery fields. Standard celery herbicides such as linuron or prometryn do not provide effective control of yellow nutsedge. Field studies were conducted near Salinas and Oxnard, CA to evaluate the crop tolerance and yellow nutsedge control provided by several herbicides. Applications of S-metolachlor at 0.5, 0.63 and 0.95 lb ai/A, flufenacet at 0.4, 0.5 and 0.6 lb ai/A, flumioxazin at 0.094 and 0.188 lb ai/A and oxyflourfen at 0.125 lb ai/A were made prior to transplanting. Post emergence applications of linuron at 1.0 lb ai/A and prometryn at 1.5 lb ai/A were made 2 to 4 weeks after transplanting. Flufenacet at 0.4 lb ai/A and S-metolachlor at 0.63 lb ai/A provided effective control of yellow nutsedge. None of the flumioxazin, oxyflourfen, linuron or prometryn treatments controlled yellow nutsedge, however these herbicides all provided effective control of little mallow. All of the herbicides tested were found to be safe on transplanted celery. [Paper Number 96]

**COMPARATIVE EFFICACY AND PHYTOTOXICITY OF TWO GOAL™ FORMULATIONS ON TRANSPLANTED BROCCOLI.** Barry R. Tickes[1], Jesse M. Richardson[2] and Jack Schlesselman[3]. Extension Agent, Field Scientist and Customer Agronomist. [1]Yuma County Cooperative Extension, Yuma, AZ, [2]Dow AgroSciences, Hesperia, CA and [3]Dow AgroSciences, Reedley, CA.

*Abstract.* Vegetable production in the desert southwest often involves substantial reliance on hand hoeing. Few herbicides are presently available for effective weed control in vegetables, particularly post-emergence products. A new oxyfluorfen formulation was evaluated in a field study at the Yuma Valley Agricultural Center in Yuma, AZ in 2002. Goal 4E was compared to Goal 2XL for efficacy and crop safety as pre-emergence and postemergence treatments in fall-planted broccoli. Both formulations of Goal, DCPA (Dacthal™) and bensulide (Prefar™) were applied prior to transplanting. Trifluralin (Treflan™) was also applied PPI. Broccoli transplants were planted on the same day as the PRE and PPI treatments. Approximately one month later, both Goal formulations were applied postemergence. Comparing all herbicide treatments in November, highest efficacy on Wright groundcherry (*Physalis wrightii*) was achieved with Goal 2XL POST. Goal 4E POST was slightly less effective. Of the PRE treatments, Goal 2XL provided the best control, with Goal 4E again somewhat less effective. For nettleleaf goosefoot (*Chenopodium murale*), the best treatments were Treflan PPI and Goal 2XL Post. Goal 4E POST and PRE, Goal 2XL PRE and bensulide PRE provided some goosefoot control, but not at the same level as the former two treatments. DCPA PRE was the least effective treatment on this weed species. None of the PRE and PPI treatments resulted in any detectable broccoli injury. Both Goal formulations induced some crop phytoxicity, with the 2XL formulation being more injurious. In a late-season evaluation, the Treflan treatment provided the highest level of goosefoot control. Goal 2XL POST provided intermediate control, with Goal 4E POST and both Goal formulations PRE demonstrating little residual activity. DCPA and bensulide provided no measurable goosefoot control at the late season evaluation. [Paper Number 98]

**WEED CONTROL USING THE SIOUX WEED BLASTER STEAMER, ATARUS RANGER PROPANE FLAMER AND MECHANICAL CULTIVATION IN A PEACH ORCHARD.** Thaddeus R. Gourd[1] and Tim Ferrell[2]. Agriculture Extension Agent and Producer. [1]Colorado State University Cooperative Extension of Adams County, Brighton, CO and [2]Berry Patch Farms, Brighton, C.

*Abstract.* Dr. Thaddeus Gourd, Extension Agent (Agriculture), Colorado State University Cooperative Extension in Adams County. 9755 Henderson Road, Brighton, CO 80601. Phone: 303-637-8117 FAX: 303-637-8125 E-mail: tgourd@co.adams.co.us Web site:www.adamscountyextension.org Tim Ferrell, Producer, Berry Patch Farms Certified Organic Pick Your Own Farm Market, 13785 Potomac Street, Brighton, CO 80601. Phone 303-659-5050 E-mail: berrypatchfarms@qwest.net Weeds are a chronic problem in organic peach production along the Colorado Front Range. The purpose of this study was to examine whether steam or flame treatments in the late spring could reduce weed populations in an organic peach orchard. The weeds encountered in this study were kochia (Kochia scoparia), netseed lambsquarter (Chenopodium berlandieri), common rye (Secale cereale) and volunteer alfalfa (Medicago sativa). Weeds were steamed using the trailer mounted Sioux Weed Blaster Steamer weed control device. The Sioux Weed Blaster Steamer uses diesel as a fuel source and applies 2 gallons of water per minute, which produces 350 degree F saturated steam at 250 psi. The flamed treatment involved using the handheld Atarus Ranger Thermal weed control device. The Atarus Ranger uses propane as the fuel source and provides about 45 minutes of flaming per 6.6 lb tank of propane when used at the high flame setting. Mechanical cultivation control consisted of using a gas powered Stihl trimmer. The steam, flame and mechanical cultivation treatments were each applied on April 30, May 4 and May 20, 2002. Each weed control treatment was replicated 3 times. Each plot was 60 square feet and required from 60 to 120 seconds of steaming, flaming or mechanical cultivation to treat all weeds during the three application timings. Treatment time durations were increased to compensate for the increase in plant biomass encountered through the growing season. Twelve days after the first treatment of steam, no detrimental effect was seen on any weed species. The flame treatment showed 82% and 85% control of kochia and netseed lambsquarter, respectively. Common rye and volunteer alfalfa showed only 30% and 40% control, respectively, following the first flame application. Mechanical cultivation had the greatest effect on kochia, netseed lambsquarter, common rye and volunteer alfalfa, with at least 81% control of each weed species. Twenty-five days after the third and final treatment applications, the mechanical cultivation treatment gave 92% and 93% control of common rye and volunteer alfalfa, respectively. Both kochia and netseed lambsquarter control dropped to 50% for the mechanical cultivation treatment. Flaming gave 72% and 80% control of common rye and volunteer alfalfa, respectively. Both kochia and netseed lambsquarter were controlled at 65%. Steaming weeds using the Sioux Weed Blaster Steamer weed control

device gave 6% control of common rye, 8% control of volunteer alfalfa, 13% control of kochia, and 2% control of netseed lambsquarter. Drought conditions could have played a major role in thermal weed control efficacy and possibly reduced the benefit of steam applications. [Paper Number 99]

**A COMPARISON OF COLORED POLYETHYLENE FILM MULCHES FOR WEED CONTROL IN STRAWBERRY PRODUCTION.** Mark S. Johnson and Steven A. Fennimore. Graduate Student and Extension Weed Specialist. University of California, Davis, CA.

*Abstract.* Polyethylene film is commonly used as mulch in strawberry production to protect the fruit from rotting, conserve soil moisture and increase soil warming. Colored polyethylene mulch may contribute to an integrated weed management system. The effects of light filtration by a clear and seven colored mulches on weed germination and growth were studied in conventional and organic strawberry production systems as well as in greenhouse and growth chamber experiments. Photosynthetically active radiation (400 – 700 nm) transmitted through the mulch is primarily responsible for the growth of weeds under the mulch. Weed growth was significantly reduced under green, brown, black, yellow (on brown, laminated) and white (on black, laminated) mulches. Soil warming effects were quantified through plant growth and yield analysis. In the conventional system, clear mulch increased early season plant growth and yield. However, if increased weed pressure exists, as in the organic system, green, brown and red mulches offered comparable yields. [Paper Number 181]

## WEEDS OF AGRONOMIC CROPS (PROJECT 3)

**NITROGEN FERTILIZER APPLICATION METHOD AFFECTS WHEAT COMPETITIVENESS WITH WEEDS.** Robert E. Blackshaw. Weed Scientist. Agriculture and Agri-Food Canada, Lethbridge, AB.

*Abstract.* Crop fertilization can markedly affect crop-weed interactions. A field study was conducted to determine the effects of various nitrogen fertilizer timings and application methods on weed emergence, weed biomass, and spring wheat yield and quality. Fertilizer was applied in either fall or spring and application methods were surface broadcast, mid-row banded 10 cm deep every crop row, mid-row banded every second crop row, or point-injected 10 cm deep at 20 cm intervals every second crop row. Treatments were applied in four consecutive years to determine annual and cumulative effects over time. Weed density was rarely affected by nitrogen timing or placement method. However, weed biomass always increased with added nitrogen compared with the unfertilized control and was often greater with surface broadcast than either point-injected or banded every second crop row applications. When there was a significant effect of fertilizer timing, fall- compared with spring-applied nitrogen resulted in greater weed biomass. In the presence of weeds, nitrogen application method affected wheat yield in all four years with surface broadcast nitrogen being the least favorable method. Growers should consider weeds, as well as crops, when planning their fertilizer programs. [Paper Number 47]

**METHODOLOGIES FOR LONG-TERM WEED CONTROL STUDIES WITH GEOGRAPHIC INFORMATION SYSTEMS.** Douglas J. Munier[1] and Thomas W. Lanini[2]. Farm Advisor and Specialist. [1]University of California Cooperative Extension, Orland, CA and [2]University of California, Davis, Davis, CA.

*Abstract.* Some weeds are very difficult to control and are very persistent once they are established in a field. This type of weed may be better controlled by individually mapping the location of each weed in a field if the weed is present at a low population and it is a weed which spreads relatively slowly. This trial tested methodologies for mapping weeds which were present at low densities and difficult to control, and then evaluated small area herbicide treatments focused on these weeds. A Trimble AgGPS 132 real-time differential correcting receiver with a Compaq IPAQ handheld PC as a data logger was used to collect all data and guide all treatments. This equipment allowed returning to the same spot in a field within a 2.5-foot radius of accuracy. In the fall of 2001, 116 rhizome johnsongrass clumps were mapped and sprayed with glyphosate (2% solution) in a 12-acre field at the CSU Chico School Farm. During 2002, both pre-emergence and post-emergence treatments were applied to corn (4 acres) and safflower (8 acres). Fall 2001 johnsongrass densities ranged from 250 to 350 plants per acre in 30 by 50 foot blocks. A single spring 2002 2X metolachlor (1.90 lb ai/A) treatment reduced johnsongrass by 100% at an April and two May evaluations, compared to the 1X metolachlor (0.95 lb ai/A) rate which was less effective. There was an 87% reduction in johnsongrass density in early June, before a late June glyphosate (2% solution) application. Twenty-

eight of the 116 rhizome johnsongrass root systems were dug up 7 to 10 days after the fall 2001 glyphosate (2% solution) application. By early June 2002, 18% of the locations where johnsongrass had been treated with glyphosate and dug up had been reoccupied by johnsongrass, growing from seeds and rhizomes. However, 30% of the fall 2001 glyphosate (2% solution) only treatment had johnsongrass plants which survived the treatment. Of the 116 treated johnsongrass rhizome clumps in the fall of 2001, only two locations had large vigorous rhizome johnsongrass clumps in 2002. In the fall of 2001, the eight acres planted to safflower had a much lower johnsongrass population. There were four clumps per acre compared to the corn at 21 clumps per acre. The safflower only had 0.5 johnsongrass plants per acre during several monitorings in the 2002 season, which was too few to evaluate the site-specific trifluralin treatments. GIS tools and software allowed weed control to be successfully focused on small parts of the field where difficult to control weeds were present during the previous cropping season. [Paper Number 48]

**BROADLEAF WEED CONTROL IN FIELD CORN WITH POSTEMERGENCE HERBICIDES.** Dan Smeal, Richard N. Arnold and Michael K. O'Neill. College Assistant Professor, College Assistant Professor and Assistant Professor. New Mexico State University, Farmington, NM.

*Abstract.* Research plots were established on May 13, 2002 at the Agricultural Science Center, Farmington, New Mexico to evaluate the response of field corn (var. Pioneer 34M95) and annual broadleaf weeds to postemergence herbicides. Treatments were applied on June 4, when corn was in the 4th leaf state and weeds were small. All treatments had methylated seed oil and 32-0-0 added at 0.5 and 1.0 percent v/v to the spray mixture. Black nightshade, prostrate and redroot pigweed, and common lambsquarters infestations were heavy and Russian thistle infestations were moderate throughout the experimental area. Treatments were evaluated on July 8. None of the treatments caused any noticeable crop injury. All treatments except the check gave good to excellent control of redroot and prostrate pigweed, and common lambsquarters. Russian thistle control was poor with nicosulfuron plus rimsulfuron, DPX 79406, and foramsulfuron applied alone at 0.035, 0.023, and 0.033 lb ai/A or in combination with mesotrione applied at 0.06 lb ai/A and the check. All treatments gave good to excellent control of black nightshade except nicosulfuron plus rimsulfuron applied alone at 0.035 lb ai/A or in combination with diflufenzopyr plus dicamba applied at 0.09 lb ai/A, and DPX 79406 applied at 0.023 lb ai/A and the check. (Published with the approval of the New Mexico State University Agricultural Experiment Station.) [Paper Number 49]

**RUSSIAN KNAPWEED CONTROL ON SOUTHERN COLORADO RANGELAND.** Kenny W. Smith[1], Richard N. Arnold[2] and Dan Smeal[2]. Agricultural Agent, College Assistant Professor and College Assistant Professor. [1]Colorado State University, Cortez, CO and [2]New Mexico State University, Farmington, NM.

*Abstract.* Russian knapweed is one of southern Colorado's and northern New Mexico's notorious noxious weeds. This plant is a herbaceous perennial that reproduces by seeds and rhizomes. It grows on clay, sandy or gravelly soils alone ditch banks, rivers, lakes, slopes of hills, pastures, grain fields, and waste lands. Russian knapweed grows in most western states, is toxic to horses, and may survive over 75 years. Research plots were established on September 19, 2001 in Montezuma County Colorado to evaluate the response of Russian knapweed to postemergence herbicides. Treatments were applied with crop oil concentrate at 0.5 percent v/v. Treatments were evaluated approximately one year after treatment on October 1, 2002. Clopyralid plus 2,4-D applied at 2.4 lb ai/A acre gave the best weed control rating of 65 percent. Due to low winter moisture received after application and during the summer of 2002, Russian knapweed control ratings were approximately 55 percent less in 2002 than in 2001. (Published with the approval of the New Mexico State University Agricultural Experiment Station.) [Paper Number 50]

**AN OVERVIEW OF ROUNDUP READY ALFALFA FOR STAND ESTABLISHMENT IN CALIFORNIA.** Mick Canevari[1], Kurt Hembre[2], Barbara Kutzner[3], Steve Orloff[4] and Ron Vargas[5]. UCCE Advisor, UCCE Advisor, Field Development, UCCE Advisor and UCCE Advisor. [1]University of California Cooperative Extension, Stockton, Ca, [2]University of California Cooperative Extension, Fresno, Ca, [3]Monsanto Corporation, Reedly, Ca, [4]University of California Cooperative Extension, Yreka, Ca and [5]University of California Cooperative Extension, Madera, Ca.

*Abstract.* An Overview of Roundup Ready Alfalfa for Stand Establishment in California W. Mick Canevari, Kurt J. Hembree, Steve B. Orloff, Ronald N. Vargas, Farm Advisors, University of California Cooperative Extension, San Joaquin, Fresno, Siskiyou, Madera Counties, and Barbara Kutzner, Monsanto Field Development, Reedley Ca, 93654 Uniform weed control trials were conducted in the intermountain area, Sacramento Valley, and San Joaquin

Valley of California. Testing the Roundup Ready concept over varied environments allows for a better comparison of the benefits and shortcomings of the system. Roundup Ready alfalfa (fall dormancy appropriate to the production area) was seeded in the fall at each site. An additional spring-seeded trial was conducted at the intermountain site. Different glyphosate rates and application timings were evaluated. The glyphosate rates tested were one and two pounds active ingredient per acre (0.75 and 1.5 lbs. ae/A). There were three different herbicide application timings based on the alfalfa growth stage: A) unifoliate to first trifoliate, B) 3–4 trifoliate leaves, C) 6–9 trifoliate and timing D is the second treatment for a sequential application. The conventional standards tested were imazamox and a tank mix of imazethapyr and bromoxynil or clethodim. A tank mix of glyphosate and imazethapyr was also evaluated. Sequential treatments, when deemed necessary, were evaluated to ascertain the need for multiple treatments to control weeds that emerged after the initial application Treatments were applied with a CO2 pressurized backpack sprayer, except at the Kearney Agricultural Center, where a tractor-pulled plot sprayer was used. There was very little to no injury to the alfalfa with the Glyphosate treatments. At some sites there were very slight injury symptoms but they were insignificant and short-lived. Alfalfa at the Kearney Agricultural Center site showed an initial reduction in plant height when treated with glyphosate at the 6-9 trifoliate stage compared with other timings, but the injury was no longer evident by the time of first cutting. The imazamox and the bromoxynil tank mix treatments resulted in more injury. However, the injury was generally less than 20 percent at most locations. Alfalfa crop mortality occurred in all glyphosate treatments. The Roundup Ready alfalfa planted for the trials was a blend of experimental varieties and contained a small percentage of plants without glyphosate resistance. Better than 95 percent control of nearly all weeds was achieved with glyphosate at all sites. These weeds included prickly lettuce, wild radish, shepherd's purse, volunteer wheat, volunteer oats, common groundsel, annual bluegrass, swinecress, chickweed, common purslane, black nightshade, and kochia. Glyphosate was less effective on henbit. While the 2.0 pounds active ingredient per acre rate (1.5 lbs. ae/A) of glyphosate resulted in more rapid weed kill, it was generally not needed. A 0.5 pound active ingredient per acre rate was sufficient to control the summer annual weeds in the spring-seeded trial in the intermountain area.The importance of the timing of glyphosate application varied depending on weed species, location, and time of the year. At the intermountain site an application made at the unifoliate to first trifoliate timing resulted in subsequent invasion of some weeds. A second application was needed to control all the weeds that could infest first cutting. Similarly, a second application of glyphosate was needed at one of the San Joaquin Valley sites. All of the glyphosate timings resulted in excellent weed control in other trials. The situation was similar in the San Joaquin County trial, where all glyphosate timings performed well. However, a second flush of annual bluegrass and hood canarygrass germinated in all treatments at this location in early December. Imazamox and the imazethapyr combinations controlled most weeds, but not as complete control as with glyphosate. Weeds not adequately controlled with imazethapyr alone were purslane, prickly lettuce, henbit, kochia and the grasses. Imazamox was more effective than imazethapyr for the control of the grasses and was generally slightly more effective on some of the broadleaf weeds. The Roundup Ready system of weed management shows significant promise for use in stand establishment of alfalfa. It resulted in the best overall weed control of the treatments evaluated and there was considerable flexibility in treatment timing. Crop injury from glyphosate appears to be less than with most conventional herbicides. [Paper Number 51]

**PERENNIAL AND WINTER ANNUAL WEED CONTROL IN ESTABLISHED ALFALFA.** Rob G. Wilson. Farm Advisor. University of California Cooperative Extension, Susanville, CA.

*Abstract.* Perennial and winter annual weeds can become significant weed problems in alfalfa. Once established, weeds reduce alfalfa yield and quality and can shorten stand life. Field experiments in Northeastern California examined the usefulness of imazamox, imazethapyr, 2,4-DB amine, imazapic, paraquat, and clethodim for post-emergent weed control in established alfalfa. Herbicides were applied in late March when alfalfa had 1 to 2 inch re-growth. Experiments were arranged in a randomized complete block design with four replications. Plot size was 10 by 30 ft. Imazamox at 0.047 lb ai/A plus methylated seed oil (MSO)(1 % v/v), imazethapyr at 0.095 lb ai/A plus MSO, and imazapic at 0.187 lb ai/A plus MSO provided over 80 % control of perennial pepperweed 2 and 4 months after treatment (MAT). Imazamox at 0.047 lb ai/A plus MSO plus ammonium sulfate and clethodim at 0.125 lb ai/A plus MSO provided similar control of foxtail barley 2 MAT with control ranging from 74 to 80%. Clethodim at rates above 0.125 lb ai/A provided good control of hare barley. None of the herbicides effectively controlled curly dock or dandelion, although imazamox rates above 0.039 lb ai/A plus MSO and imazethapyr at 0.063 lb ai/A plus 2,4-DB amine at 0.5 lb ai/A provided good dandelion suppression 1 MAT minimizing crop contamination. Imazapic or imazethapyr plus 2,4-DB provided suppression of curly dock. Imazamox rates above 0.039 lb ai/A caused 4 to 6 %

alfalfa injury 2 weeks after treatment (WAT), although yields were not different from the control. Imazapic and paraquat treatments caused over 19 % alfalfa injury 2 WAT. [Paper Number 52]

**WEED PRESSURE IN TOMATO AND COTTON ROTATIONS TRANSITIONING TO CONSERVATION TILLAGE IN CALIFORNIA'S SAN JOAQUIN VALLEY.** Jeffrey P. Mitchell[1], Kurt J. Hembree[2] and Neil Va[2]. Cooperative Extension Specialist, Cooperative Extension Farm Advisor and Cooperative Extension Field Technician. [1]University of California, Davis, Davis, CA and [2]Cooperative Extension, Fresno, CA.

*Abstract.* Weed species biomass was quantified during the third year of a field study in Five Points, CA comparing standard tillage with and without winter cover crops and conservation tillage with and without cover crops in a rotation of processing tomato and cotton. Weed management operations in the standard tillage system without cover crop consisted of an over-the-top application of Shadeout at transplanting (without cover crop treatment only), Treflan incorporated at sidedress, two mechanical cultivations and one hand weeding. Weed management in the conservation tillage systems relied on an application of Shadeout (without cover crop treatment only), two mechanical cultivations using a modified Buffalo High Residue Cultivator, and hand weeding. In year two of the transition to conservation tillage, total weed dry weights along 150 ft of the center 6 inches of tomato beds were significantly higher in the conservation tillage with cover crop systems relative to the other systems, with black nightshade and lambsquarters making up the bulk of th eweed biomass. In the third year of the study, total weed dry weights for black nightshade, tumble pigweed, lambsquarter, purslane, annual sowthistle and barnyardgrass/junglerice were significantly higher in the conservation tillage with cover crop system relative to the standard tillage system without cover crop before the 2002 tomato crop was harvested. These data clearly indicate the need for refined and improved weed management in conservation tillage tomato production systems. [Paper Number 53]

**RECENT PREEMERGENCE AND POSTEMERGENCE WEED MANAGMENT RESEARCH IN CALIFORNIA ASPARAGUS.** Robert J. Mullen and Scott W. Whiteley, University of California Cooperative Extension Farm Advisor and Field Technician, University of California Cooperative Extension, 420 South Wilson Way, Stockton, CA 95205.

*Abstract.* Seven studies from 2000 to 2002 evaluated weed control efficacy and crop response for 10 preemergence and 4 postemergence herbicides in newly planted and established asparagus in the northern San Joaquin Valley. In a 2000 preemergence trial on newly planted one-year-old asparagus crowns, excellent control (88 to 100%) of annual sowthistle, burning nettle, shepherd's-purse, annual bluegrass and common chickweed occurred with flumioxazin, halosulfuron, azafenidin, sulfentrazone, thiazopyr, oxyfluorfen, pendimethalin and combination treatments of diuron plus pendimethalin, diuron plus napropamide and oxyfluorfen plus thiazopyr. All treatments were safe to the crop except for a temporary vigor reduction from oxyfluorfen, flumioxazin and the oxyfluorfen plus thiazopyr combination. A 2000 postemergence trial, with treatments applied over emerged weeds and 12 to 30 inch tall crop fern, provided excellent control (>80%) of burning nettle, shepherd's-purse and annual sowthistle using metribuzin or linuron plus COC. All treatments were weak on annual bluegrass but crop safety was excellent. Another postemergence study, on established fern stage asparagus, evaluated halosulfuron plus X-77 at three rates and compared single versus double applications for yellow nutsedge control. Best suppression (>80%) occurred with two applications of 0.047 lb ai/A plus ½% X-77, followed by one application of 0.064 lb ai/A plus ½% X-77 and two applications of 0.032 lb ai/A plus ½% X-77. Sprays were directed to the base of the crop fern but over the three to seven true leaf yellow nutsedge; crop safety was excellent. In 2001 this same trial was harvested all season and all treatments outyielded the untreated control by 560 to 753 lbs/A. In the 2001 preemergence trial, on newly planted asparagus, 90 to 100% control of burning nettle, common groundsel and shepherd's-purse was achieved by flumioxazin, azafenidin, thiazopyr, halosulfuron, pendimethalin and the combinations of diuron plus napropamide, thiazopyr plus oxyfluorfen and diuron plus pendimethalin. Temporary crop suppression occurred with thiazopyr plus oxyfluorfen and flumioxazin alone. A 2001 postemergence study on newly planted asparagus, with herbicides applied over emerged weeds and 12 to 14 inch tall crop fern, gave nearly 100% control of shepherd's-purse, burning nettle and common groundsel with metribuzin; linuron plus COC was nearly as effective. Crop safety was excellent for all treatments. In a 2002 preemergence plot in newly planted asparagus, very good control (>80%) of common lambsquarters, annual bluegrass, swamp smartweed and barnyardgrass was obtained by both rates (0.125 and 0.250 lb ai/A) of flumioxazin, azafenidin, sulfentrazone, pendimethalin and the combination of pendimethalin plus diuron. Crop safety was excellent with all treatments. The 2002 postemergence trial on newly planted asparagus, with

treatments applied over emerged weeds and 12 to 14 inch tall crop fern, showed the best control (78 to 98%) of common lambsquarters, common knotweed and annual bluegrass was given by the combination of linuron plus clethodim plus COC; halosulfuron plus COC gave the best control (80%) of swamp smartweed. Linuron plus clethodim plus COC gave temporary crop fern chlorosis, as did metribuzin alone. [Paper Number 54]

**SPRING WHEAT SEED SIZE AND SEEDING RATE EFFECTS ON WILD OAT DEMOGRAPHICS AND SPRING WHEAT YIELD.** Robert N. Stougaard and Qingwu Xue. Associate Professor and Research Associate. Northwestern Agricultural Research Center, Montana State University, Kalispell, MT.

*Abstract.* Wild oat continues to reduce spring wheat yields despite the wide spread use of herbicides. Further reductions in the occurrence of wild oat could be achieved with the development of competitive cropping systems. Experiments were conducted in 1999, 2000 and 2001 at the Northwestern Agricultural Research Center located near Kalispell, MT to evaluate the effects of wheat seed size and seeding rates on wild oat and spring wheat yield components. Treatments consisted of four wild oat densities (0, 85, 170, and 340 plants m-2), two spring wheat seeding rates (175 and 280 plants m-2), and three spring wheat seed size classes (large, small, and bulk). The effect of increased seed size on crop competitiveness was substantial. Wild oat panicle number, biomass, and seed production consistently decreased with increased spring wheat seed size. Averaged across all other factors, spring wheat plants derived from large seed reduced wild oat panicle numbers by 15%, and reduced wild oat biomass and seed production by 25% compared to small seed. Correspondingly, the effects of seed size on spring wheat yield components were also dramatic. As seed size increased, wheat spike number, biomass and grain yield increased. Relative to the small seeded treatments, large seed reduced yield loss due to wild oat competition by 18% when averaged over all other main effects. [Paper Number 55]

**EFFECTS OF SPRING WHEAT SEED SIZE AND TRALKOXYDIM RATE ON WILD OAT INTERFERENCE.** Qingwu Xue and Robert N. Stougaard. Research Associate and Associate Professor. Montana State University, Kalispell, MT.

*Abstract.* The development of competitive cropping systems has become increasingly important as a means to augment herbicide use and improve weed control. The objective of this study was to investigate the potential interaction between spring wheat seed size and tralkoxydim rate on wild oat interference, wheat yield and economic return. Field experiments were conducted in 2000 and 2002 in Kalispell, MT. Treatments consisted of three spring wheat seed size classes (large, medium and small) and five tralkoxydim rates (0, 25, 50, 100 and 200 g ai ha-1). The experimental design was a split-plot with seed size as main plot and herbicide rate as sub-plot. The three seed size classes were obtained by passing common McNeal spring wheat seed over 2.7, 2.3 and 1.9 mm sieves. Herbicide treatments were applied using a CO2 backpack sprayer in 187 L ha-1 of water with Teejet XR11002 nozzle spaced 51 cm apart. The herbicides were sprayed on May 18, 2000 (3-4 main stem leaves with 1 tiller) and May 27, 2002 (4-5 main stem leaves with 1-2 tillers). Prior to spring wheat maturity and wild oat seed shatter, spring wheat and wild oat plants were harvested from two 0.14 m2 quadrats. Spring wheat and wild oat population densities and spike/panicle numbers were counted, and total biomass was determined after oven drying. Wild oat seeds were estimated by total biomass using a linear equation in 2000. In 2002, wild oat seeds were threshed from harvested panicles, weighed, and counted. Spring wheat yield was determined after combine-harvest in each year. The economic return was determined by yield, mean grain price of the two years, dockage and test weight discounts, and herbicide and application costs. Tralkoxydim was very effective in controlling wild oat. Wild oat plants, panicles, biomass and seed production decreased as tralkoxydim rate increased. Wild oat response to tralkoxydim rate was a typical log-logistic function in each year. When comparing both years, tralkoxydim was more effective in 2002 than 2000, as indicated by a lower LD50 response in 2002. For both years, spring wheat spikes per square meter, biomass, yield and economic return increased as tralkoxydim rate increased initially, then reached to near maximum as tralkoxydim increased further. Spring wheat seed size also had a significant effect on wild oat interference. Increasing seed size reduced wild oat plants, panicles, biomass and seed production. At the same time, increasing seed size increased the number of spikes, biomass, yield and economic return in spring wheat. The results of this study demonstrated that the use of larger seeded wheat can significantly increase crop competitiveness. The combined use of large seeded wheat plus tralkoxydim applications provided greater wild oat control than either single tactic. [Paper Number 56]

**FENOXAPROP AND TRALKOXYDIM REDUCED SPLIT RATES FOR WILD OAT CONTROL IN BARLEY.** Joan M. Campbell and Donn C. Thill. Research/Instructional Associate and Professor. University of Idaho, Moscow, ID.

*Abstract.* Two studies were established to evaluate wild oat and barley effects from split rate applications of fenoxaprop and tralkoxydim. The experimental design was a randomized complete block split plot with three wild oat densities and seven herbicide treatments plus an untreated control replicated four times. Wild oat main plots were 20 by 64 ft and herbicide subplots were 8 by 20 ft. Wild oat was planted to establish plant densities of 0, 20, and 40 plants/ft$^2$. 'Baroness' spring barley was planted at 90 lb/a in 7-inch rows perpendicular to wild oat rows. Wild oat and barley populations were determined immediately before applying herbicide treatments by counting the number of plants in 3-ft of row in each plot. Herbicides were applied at 1X (fenoxaprop = 0.083 lb ai/a and tralkoxydim = 0.18 lb ai/a), 0.75X, 0.5X, and 0.25X rates as single applications when most wild oat plants were in the 1 to 3 leaf stage. Low-rate split-applied treatments were 0.5X + 0.5X, 0.5X + 0.25X, and 0.25X + 0.25X. The first split treatment was at the same time as the single treatments. The second split treatment was applied 2 weeks later when wild oat was in the 1 to 4 leaf stage. Supercharge surfactant was added to all tralkoxydim treatments at 0.5% v/v. Wild oat control and barley injury were evaluated visually. Wild oat tillers were counted and biomass and wild oat seed were collected from a 0.25 yd$^2$ area in each plot before seed was shattered. Samples were cleaned and the number of wild oat seeds were counted. Barley grain was harvested at maturity, cleaned, and weighed to determine yield. Test weight and the percentage of plump and thin kernels were determined after all wild oat seeds were removed by hand sorting. Wild oat seed removed from the sample was counted to determine dockage. Net return of herbicide treatments was calculated using the following equation: Net return = (barley yield X market price) - herbicide program cost. The barley market price used was $4.00/cwt. fenoxaprop cost $15.23 for 0.083 lb ai/a, tralkoxydim cost $18.63 for 0.18 lb ai/a, and application cost was $4.00. Minimum air temperature ranged from 27 to 31 F May 7 through 11 and on June 12 which injured barley and resulted in a poorly tillered, noncompetitive crop. Barley was also injured by fenoxaprop with up to 30% visible vigor reduction at the high rates and decreasing to no injury at the lowest rate compared to the untreated check. Wild oat tillers, biomass, and seed were not statistically different between the 20 and 40 wild oat plants/ft$^2$ when averaged over fenoxaprop and tralkoxydim rates. Barley grain yield, test weight, plump kernels, and net return decreased as the wild oat density increased and thin kernels increased in both the tralkoxydim and fenoxaprop experiment, but not all means were statistically different due to variability in the field. Wild oat seed dockage was similar between the two wild oat densities. Wild oat tillers, biomass, and seed number were highest with fenoxaprop at 0.021 lb ai/a, the split rate of 0.041 lb ai/a, and the untreated check when averaged over wild oat density. Wild oat components were lowest with the single application of fenoxaprop at 0.083 lb ai/a. The fenoxaprop single application controlled wild oat better than the split application at similar rates. Percentage of plump and thin barley and net return were not statistically different among fenoxaprop rates. Wild oat control with tralkoxydim at 0.045 lb ai/a was better than the untreated check, but control was not as good as the higher tralkoxydim rates. Wild oat biomass and seed production did not vary among tralkoxydim rates of 0.18, 0.135 or 0.09 lb ai/a applied as single or split treatments. Barley grain yield and test weight did not vary among treatments with fenoxaprop or tralkoxydim. Percentages of plump barley was lower and thin barley was higher with tralkoxydim at 0.045 lb ai/a and the untreated check compared to higher rates. Net return was not affected by tralkoxydim treatments. A more competitive barley stand may enhance differences among the treatments. This study will be repeated in 2003. [Paper Number 100]

**CONTROL OF PROTOX-RESISTANT COMMON WATERHEMP IN CORN AND SOYBEAN.** Douglas E. Shoup, Kassim Al-Khatib and Dallas E. Peterson. Graduate Research Assistant, Associate Professor and Professor. Kansas State University, Manhattan, KS.

*Abstract.* Common waterhemp (*Amaranthus rudis*) is a major problem in corn and soybean production. Resistance to protoporphyrinogen oxidase (protox)-inhibiting herbicides was confirmed in 2001 in a population of common waterhemp that had been treated with acifluorfen for several years. The objectives of this research were to evaluate herbicide efficacy on protox-resistant common waterhemp in corn and soybean. In 2001 and 2002, experiments were conducted in the field where the protox-resistant common waterhemp biotype was found. Corn and soybean were planted according to Kansas State University Research and Extension recommendations. In soybean, postemergence application of protox-inhibiting herbicides acifluorfen and lactofen gave 14 and 24% common waterhemp control, respectively. However, application of preemergence protox-inhibiting herbicides flumioxazin and sulfentrazone gave 95 and 92% common waterhemp control, respectively. Alachlor, metolachlor + metribuzin, and glyphosate

provided 100% common waterhemp control. In corn, flufenacet + atrazine, isoxaflutole followed by bromoxynil + atrazine, and mesotrione + metolachlor gave greater than 98% control of common waterhemp. The lowest common waterhemp control was with imazethapyr + imazapyr + diflufenzopyr + dicamba, which gave 65% control of common waterhemp. [Paper Number 101]

**MAPPING WEED POPULATIONS WITH VIDEO FOR SITE-SPECIFIC WEED MANAGEMENT.** Lori Wiles[1], David Wright[2], and Kenan Diker[2]. [1]USDA-ARS. Fort Collins, CO and [2]Red Hen Sstems, Fort Collins, CO.

*Summary*. We designed a system for making geo-referenced weed maps that involves image analysis of video and uses only readily available technology. [Paper Number 102]

**CONTROL OF VOLUNTEER CANOLA (*BRASSICA NAPUS*) WITH SINGLE AND MULTIPLE HERBICIDE RESISTANCE TRAITS.** Eric N. Johnson[1], Hugh J. Beckie[2] and Ginette Sequin-Swartz[2]. Weed Biologist, Research Scientist and Research Scientist. [1]Agriculture and Agri-Food Canada, Scott, Sk and [2]Agriculture and Agri-Food Canada, Saskatoon, Sk.

*Abstract.* Greenhouse studies were conducted at Saskatoon and Scott, SK, Canada to investigate the possibility of altered herbicide sensitivity of canola (*Brassica napus* )plants due to genetic transformation. The first study investigated the dose response of three single herbicide resistant (HR)canola cultivars (glyphosate, glufosinate, imidazolinone), one non-HR cultivar, and seven (double or triple) HR experimental lines treated at the two- to three-leaf stage with 2,4-D (amine and ester) and metribuzin. The second study investigated the dose response of one non-HR and four HR cultivars (glyphosate, glufosinate, imidazolinone, bromoxynil) to 2,4-D amine applied at two growth stages (two- to three- and five- to six-leaves). In the first study, all canola lines responded similarly to increasing doses of the three herbicides. In the second study, all five cultivars responded similarly to rates of 2,4-D amine when applied at the two- to three-leaf stage. All canola lines were much more tolerant to 2,4-D when applied at the five to six leaf stage. The bromoxynil resistant cultivar exhibited reduced sensitivity to 2,4-D at the later growth stage. However, this reduced sensitivity was not evident in a follow-up field trial. The results of the study suggest that non-HR canola and canola with single or multiple herbicide resistant traits are equal in sensitivity to herbicides that are commonly used to control volunteers. All volunteer canola plants should be treated early when the plants are most sensitive to herbicides to reduce crop interference and perpetuation of gene flow. [Paper Number 103]

**TEMPERATURE AND MOISTURE EFFECTS ON THE GERMINATION OF PRICKLY LETTUCE.** Laylah S. Scarnecchia, Joseph P. Yenish and Patrick E. Fuerst. Student, Assoc Prof and Asst Sci. Washington State University, Pullman, WA.

*Abstract.* Prickly lettuce is prevalent in the Pacific Northwest in winter and spring crops. A study was conducted to determine the germination of two prickly lettuce biotypes across five temperatures: 5, 10, 15, 20 and 25 C and four water potentials: -0.00, -0.375, -0.75, and -1.50 MPa. Germination was measured daily over 31d. Germination did not occurred at –1.5 MPa. Greatest germination occurred at 0 MPa within each temperature. Germination was greatest at 10 C and 15 C averaged across water potentials. At –0.75 MPa, the Pullman biotype had 0% germination at all temperatures, and for the Lind biotype, ranged from 0 to 59%. Lowest germination within each water potential treatment occurred at 25 C. At 0 MPa, germination was significantly less for the Lind biotype at 25 C, 86.3% and 59.1% for runs 1 and 2, respectively, than all other temperatures. There were with no differences in germination at 5, 10, 15, and 20 C for the Lind biotype at 0 MPa. Differences occurred at 0 MPa for the Pullman biotype: 67, 99, 89, 74, and 45% germination at 5, 10, 15, 20, and 25 C, respectively. No differences in germination were found within temperature treatments for the Pullman biotype at –0.375 MPa, when compared to the same temperature for the Lind biotype at 0 MPa. [Paper Number 104]

**ASSESSING CANOLA VARIETY COMPETITIVENESS WITH WEEDS VIA DIGITAL CANOPY ANALYSIS.** Kenneth N. Harker[1], George W. Clayton[1], John T. O'Donovan[2], Robert E. Blackshaw[3], Al Tong[1] and Lui Tong[1]. Research Scientist, Research Scientist, Research Scientist, Research Scientist, Research Scientist and Computer Programmer. [1]AAFC, Lacombe Res. Centre, Lacombe, AB, [2]AAFC, Beaverlodge Exp. Farm, Beaverlodge, AB and [3]AAFC, Lethbridge Res. Centre, Lethbridge, AB.

*Abstract.* Experiments were conducted at Lacombe and Beaverlodge, Alberta, Canada to determine canopy development in three canola cultivars seeded at three seeding dates. Canola cultivars were InVigor 2663 (glufosinate-tolerant hybrid *Brassica napus*), Q2 (conventional open pollinated *B. napus*), and Hysyn 110 (conventional open pollinated *B. rapa*). Seeding date targets were late fall (dormant-seeded), late April (early spring), and mid May (normal). Canola canopy was determined by destructive biomass samples every 2 weeks and by digital photos of a selected area in each plot every week. A C++ program for Windows was written to determine percent green in the digital photos. At both locations canopy development was more rapid for InVigor 2663 than the other cultivars. At Beaverlodge, fall-seeded canola covered the ground most quickly early in the growing season but fell behind the spring seeded canola later in the season. At Lacombe, spring frosts damaged the fall-seeded canola more than the canola seeded in the spring and the early spring seeded canola canopy developed most quickly. Canopy development ranking among cultivars remained constant across the three seeding dates (the variety x seeding date interaction was not significant at any evaluation date). Digital canopy analysis can be utilized to quickly determine the influence of agronomic and environmental factors on the growth and vigour of canola genotypes. [Paper Number 105]

**PERSISTENCE OF FLUCARBAZONE-SODIUM IN SOIL.** Rachael C. Eliason, Jeff J. Schoenau and Anna M. Szmigielski. Graduate Student, Research Scientist and Post-Doctoral Fellow. Department of Soil Science, University of Saskatchewan, Saskatoon, SK.

*Abstract.* Laboratory studies using a developed bioassay were conducted to examine the persistence of flucarbazone in soils incubated at 25C and 85% field capacity. The persistence varied among the soils and was related primarily to soil organic matter, and also to soil pH and clay content. Faster flucarbazone degradation occurred in soils of lower organic matter. Flucarbazone degradation in soils of comparable organic matter was faster in soils having lower pH. Also, the rate of flucarbazone dissipation in soils of lower clay content was faster than in soils of similar organic matter but having higher clay content. The decay model was fitted to the relationship of flucarbazone concentration remaining in soil vs time of incubation. The half-lives, calculated from the regression lines fitted to the log of concentration vs. time and ranged from 6 to 116 days. [Paper Number 106]

**ROUNDUP READY ALFALFA IN THE CENTRAL SAN JOAQUIN VALLEY OF CALIFORNIA.** Ron Vargas[1], Kurt Hembree[2], Tome Martin-Duvall[1], Eric Hoffman[1] and Neil Va[2]. Farm Advisor, Farm Advisor, Staff Research Associate, Staff Research Associate and Staff Research Associate. [1]UC Cooperative Extension, Madera, CA and [2]UC Cooperative Extension, Fresno, CA.

*Abstract.* INTRODUCTION A number of different annual, perennial and poisonous weeds infest alfalfa hay grown in the San Joaquin Valley of California. The type of weed infestations in any given area is usually associated with planting time (fall, winter or spring), previous cropping history and environmental characteristics of the production area. Any of these weeds left uncontrolled can seriously reduce yields or cause a complete loss of the stand, especially in the establishment year. If a loss of stand does not occur, infestations can weaken young alfalfa seedlings, retard growth and delay the first cutting. Weeds also reduce the quality and value of alfalfa hay as many are less palatable and less nutritious than alfalfa, Properly establishing and managing an alfalfa stand are the first steps to effectively controlling weeds. But, most often weeds still become problems and growers are required to use herbicides. Currently available herbicides can provide adequate control, but additional weed control options, including Roundup Ready alfalfa will provide additional options for effective weed control. As the Roundup Ready system is integrated into the California production system, additional concerns will need to be directed toward weed species shift and resistance management. PROCEDURES A Roundup Ready alfalfa line, fall dormancy group 7, was seeded during the month of September. Once germination and emergence occurred, the seedling alfalfa was divided into plots and replicated four times in a randomized complete block design. Herbicide treatments were applied at three different timings: when alfalfa was in the unifoliate to one trifoliate leaf stage, 3 to 4 trifoliate leaf stage and 6 to 10 trifoliate leaf stage. All treatments were applied with a CO2 sprayer with 8002 flat fan nozzles,

delivering 20 gallons of spray solution per acre at 40 psi. Treatments included: Roundup Ultra Max at 1 and 2 lbs ai/A, Raptor at 0.036 ai/A, Pursuit plus Prism at 0.063 lb ai/A plus 0.088 lb ai/A, Pursuit plus Buctril at 0.063 lb ai/A plus 0.375 lb ai/A and sequential applications of Roundup Ultra Max either following a Roundup Ultra Max treatment or a Pursuit plus Prism or Buctril treatment. Pursuit plus Prism was followed by itself and Buctril followed Pursuit alone. RESULTS Volunteer oats, common groundsel, annual bluegrass, swinecress and chickweed were all controlled between 95 and 100 percent with the Roundup treatments at all rates alone and when followed by either Pursuit, or Pursuit plus Prism when applied at both the 3 to 4 and 6 to 9 trifoliate leaf stage. When applied at the unifoliate to one trifoliate leaf stage, a followup treatment of Roundup was needed to provide 100 percent control. Pursuit plus Prism, either applied once at the 3 to 4 leaf stage or a second application at the 6 to 9 leaf stage provided excellent control, but somewhat less than the Roundup treatments. Pursuit when followed by Buctril or applied tank mix did not control either annual bluegrass or volunteer oats, but provided 99 to 100 percent control of swinecress and chickweed. Raptor applied at the 3 to 4 leaf stage provided the least control of all weed species in the tests. Evaluations of alfalfa phytotoxicity for all rates and timings of Roundup Ultra Max, Pursuit plus Prism, and Raptor exhibited minimal to no injury at all dates of evaluation. Pursuit in combination with Buctril applied at the 7 to 9 trifoliate leaf stage did exhibit slight reduction of growth 21 days after treatment. Harvest data for percent composition showed 95 to 100 percent alfalfa for all Roundup and Roundup combinations. The Pursuit, Buctril treatments were 70 to 85 percent alfalfa and 15 to 30 percent weeds. The Raptor treatment in one trial was 25 percent alfalfa, and 75 percent weeds (volunteer oats), but in another 95 percent alfalfa and 5 percent weeds. The control plots in one study was 50 percent alfalfa and 50 percent weeds while the other was 5 percent alfalfa and 95 percent weeds or volunteer oats. [Paper Number 107]

**SMALL BROOMRAPE MANAGEMENT IN RED CLOVER SEED PRODUCTION.** Jed B. Colquhoun, Carol A. Mallory-Smith and Charles M. Cole. Assistant Professor, Associate Professor and Research Assistant. Oregon State University, Corvallis, OR.

*Abstract.* Small broomrape is a holoparasitic weed that was observed in a single red clover seed production field in Oregon in 1998, and has since been reported in 15 and 22 red clover fields in 2000 and 2001, respectively. The parasite reduces crop yield, or in severe cases, kills the host plant, and produces up to one million seeds per plant. In response, a study was conducted in 2002 to evaluate several herbicides for management of small broomrape. Herbicides were applied on June 20, 2002 to a second-year red clover seed production field. Small broomrape shoots were quantified prior to treatment and 10 and 20 days after treatment. Small broomrape seed was collected from each treatment at clover seed harvest and viability was assessed in a greenhouse study. Red clover tolerance to herbicides was visually estimated 10 and 20 days after treatment, and crop yield was quantified at physiological maturity. Control of emerged small broomrape was greatest and new emergence was prevented where imazethapyr, imazamox, or glyphosate were applied. Viable small broomrape seed was produced after all herbicide treatments, with the exception of the highest rate of glyphosate. Crop injury was similar to the untreated check except where imazethapyr, MCPA, or glyphosate were applied. Glyphosate reduced red clover seed yield when compared to the untreated check. [Paper Number 108]

**DEVELOPMENT OF WEED RESISTANCE AS AFFECTED BY FREQUENCY OF HERBICIDE APPLICATION.** Dan A. Ball, Donn C. Thill, Mike Ensminger, Kirk Howatt, Steve Seefledt, Phil A. Banks and Randy L. Anderson. Weed Scientist, Weed Scientist, Weed Scientist, Weed Scientist, Weed Scientist, Consultant and Agronomist. WSWS Herbicide Resistance Committee, Newark, CA.

*Abstract.* A key strategy for managing weed resistance is to reduce frequency of herbicide use, thus minimizing the herbicide's selection pressure on the weed community. Simulation models based on population dynamics of wild oats (Avena fatua L.) and jointed goatgrass (Aegilops cylindrica Host.) are available to predict rate of resistance development. Our objective was to quantify the impact of reducing use frequency in managing herbicide resistance. Our first case examines wild oats and its resistance to ACCase inhibiting herbicides. Cavan et al., (Weed Sci. 49:236; 2001) estimated rate of resistance development based on the frequency of ACC-inhibiting herbicides use across years. In a no-till system, resistant wild oats appeared within 13 years if ACCase-inhibiting herbicides were applied every year. If applied once every two years, resistance biotypes appeared after 30 years. A surprising trend, however, occurred when the herbicide was applied only once every three years; resistant plants did not appear until after 126 years. Applying an ACCase-inhibiting herbicide every year imposed 10-fold more selection pressure on wild oats than applying the herbicide once every three years. The contrast between applying the herbicide every two

years versus every three years was more than four-fold. A second simulation model evaluated the relationship between frequency of use and ALS-inhibiting herbicide resistance development in the jointed goatgrass seedbank. In this model developed by Hanson et al., (Weed Technol. 16:156-163) seedbank abundance of imazamox-resistant jointed goatgrass increased and surpassed the abundance of susceptible jointed goatgrass in the seedbank after 4 years when imazamox was used each year in continuous, imazamox-resistant winter wheat. In a winter wheat – fallow crop rotation, resistant jointed goatgrass seedbank abundance surpassed susceptible numbers after 9 years if imazamox-resistant wheat and imazamox were used every crop year. In a simulation of a winter wheat – fallow crop rotation with imazamox-resistant wheat grown every other crop (once in four years), an imazamox-resistant jointed goatgrass population did not surpass the susceptible population during the 10 year simulation. These simulation models demonstrate the impact of herbicide use frequency on rate of resistance development. Selection pressure on the weed community can differ 10-fold between yearly applications and less frequent use, such as one application every three years. In some regions of the Western U.S., producers are diversifying their rotations because of no-till systems; it will help resistance management if crop sequences could be developed that reduce frequency of herbicide use within a mode of action to once every three years. [Paper Number 109]

**RISKS OF WEED SPECTRUM SHIFTS AND HERBICIDE RESISTANCE IN GLYPHOSATE TOLERANT CROPPING SYSTEMS.** Robert G. Wilson. Professor. University of Nebraska, Scottsbluff, NE.

*Abstract.* Experiments were conducted in the field from 1998 through 2002 to determine if glyphosate use patterns in glyphosate tolerant cropping systems influenced weed control by placing selection pressure on weed species, altered weed population dynamics, or lead to the development of glyphosate-resistant weeds. Experiments were designed as a two factorial split plot set in a randomized complete block design with four replications. Main plots were either continuous glyphosate tolerant corn or a rotation of glyphosate tolerant corn, sugarbeet, corn, sugarbeet, and wheat. Sub-plots were glyphosate at 0.4 kg $ha^{-1}$ applied twice, glyphosate at 0.8 kg $ha^{-1}$ applied twice, a rotation of glyphosate at 0.8 kg $ha^{-1}$ applied twice followed the next year by a non-glyphosate treatment, or a non-glyphosate treatment each year. The seed bank was examined each year before crop planting. Weed density was measured before herbicide treatment, 2 wk after the last herbicide treatment, and at crop harvest. During the course of the experiment no weeds were observed to develop resistance to glyphosate. Over the five year period the weed population shifted from a kochia and wild proso millet dominated population to a predominately narrowleaf lambsquarters population. Narrowleaf lambsquarters seed and plant populations increased in areas treated with the low rate of glyphosate but decreased in areas treated with the high rate of glyphosate. Green foxtail and longspine sandbur increased in non-glyphosate treated areas. Narrowleaf lambsquarters increased to a greater extent in the corn-sugarbeet rotation compared to continuous corn. Kochia and hairy nightshade were more prevalent in continuous corn than in the corn-sugarbeet rotation. [Paper Number 110]

**VOLUNTEER POTATO CONTROL IN FIELD CORN WITH CARFENTRAZONE AND MESOTRIONE.** Rick A. Boydston[1] and Martin M. Williams II[2]. Plant Physiologist and Assistant Professor. [1]USDA-ARS, Prosser, WA and [2]Washington State University, Prosser, WA.

*Abstract.* Volunteer potato is a perennial weed that is difficult to control in regions with mild winter temperatures. Studies were conducted near Paterson, WA in 2001 and 2002 to evaluate the control of volunteer potato with carfentrazone-ethyl and mesotrione in field corn. When potatoes were not controlled corn yield was reduced 23 and 62 % in 2001 and 2002, respectively. Single postemergence (POST) applications of carfentrazone-ethyl at 9 g/ha killed exposed foliage of potato, but new shoots continued to emerge and reduced corn yield in one of two years. Carfentrazone-ethyl controlled potatoes best when applied as a single mid POST application with dicamba (9 + 280 g/ha), two applications of carfentrazone-ethyl alone at early POST and late POST, and three POST applications of carfentrazone-ethyl, which controlled volunteer potato 77 to 87 % in early June, reduced weight of tubers produced by 76 to 96 % compared to nontreated checks, and prevented corn yield loss compared to hand-weeded checks. Carfentrazone treatments reduced potato tuber weight more than tuber number. Mesotrione applied preemergence (PRE) at 0.21 kg/ha or mid POST at potato tuber initiation at 0.07 or 0.1 kg/ha controlled potatoes greater than 95 % by early July, reduced tuber number and tuber weight by 95 % and 99 %, respectively, compared to nontreated checks. Corn yield of all mesotrione treated plots was equal to hand weeded checks. The large reduction in potato tuber number with mesotrione is unique compared to other POST herbicide treatments tested. [Paper Number 111]

**ROTATIONAL CROP RESPONSE TO IMAZAMOX, FLUCARBAZONE, PROPROPCARBAZONE AND SULFOSULFURON.** Traci A. Rauch and Donn C. Thill. Research Support Scientist and Professor. University of Idaho, Moscow, ID.

*Abstract.* Flucarbazone was registered in 2001 to control wild oat in winter and spring wheat. In 2003, imazamox will be applied to a limited release of imidazolinone-resistant winter wheat in the Pacific Northwest. Propropcarbazone will be registered for downy brome control. All of these herbicides can persist in the soil and have or will have rotational crops restrictions. Currently, there is no regional information on rotational crop response to these herbicides. Studies were established at Moscow, Bonners Ferry, and Lewiston, Idaho to evaluate spring barley and yellow mustard response to imazamox, flucarbazone, propropcarbazone and sulfosulfuron persistence. The experimental design at all locations was a randomized split-block with four replications. Main plots were rotational crops ('Camas' spring barley and 'Idagold' yellow mustard) and subplots were eight herbicide treatments and an untreated check. Each herbicide was applied at a labeled rate (1X) and twice that labeled rate (2X). All herbicide treatments were applied to imidazolinone-resistant winter wheat in the spring 2001. At Moscow, the experiment was moldboard plowed in the fall 2001 and cultivated in the spring 2002, and at Bonners Ferry, the experiment was cultivated in the spring 2002 prior to seeding rotational crops. At Tammany, all rotational crops were direct-seeded into standing wheat stubble. At Moscow, no treatment visually injured or reduced seed yield of spring barley or yellow mustard. At Bonners Ferry, sulfosulfuron at 0.031 and 0.062 lb ai/A injured spring barley 16 to 26% and was not different from propropcarbazone at 0.04 and 0.08 lb ai/A (8 and 10%). Spring barley yield was higher in plots treated with imazamox at 0.04 and 0.08 lb ai/A and flucarbazone at 0.054 lb ai/A than the untreated check. Imazamox at 0.08 lb ai/A, sulfosulfuron at 0.062 lb ai/A, and propropcarbazone at 0.08 lb ai/A injured yellow mustard 18, 24, and 28%, respectively. At Tammany, flucarbazone at 0.027 lb ai/A, propropcarbazone at 0.04 and 0.08 lb ai/A, and sulfosulfuron at 0.031 and 0.062 lb ai/A injured spring barley 26 to 39%. Spring barley yield was higher in plots treated with imazamox at 0.04 and 0.08 lb ai/A and flucarbazone at 0.054 lb ai/A than the untreated check. Sulfosulfuron at 0.062 lb ai/A and propropcarbazone at 0.08 lb ai/A injured yellow mustard 30 and 36%, respectively, and imazamox at 0.08 lb ai/A injured yellow mustard 15%. Propropcarbazone at 0.04 and 0.08 lb ai/A reduced yellow mustard seed yield 24 and 49%, respectively, compared to the untreated check. [Paper Number 112]

**WEED POPULATION DYNAMICS IN AN INTENSIVE DRYLAND CROP ROTATION STUDY.** Dennis J. Tonks and Darla J. Rugel. Extension Dryland Cropping Systems Specialist and Research Technician. Washington State University, Davenport, WA.

*Abstract.* The traditional winter wheat-summer fallow cropping system commonly practiced in eastern Washington has led to many production and environmental problems. In other parts of the country, direct seeding or no-till practices have been widely adopted. These intensive systems take a holistic approach to production including crop rotation, soil biological systems, weed/pest management, and intense cultural management. Two crop rotations (3- and 4-year rotations) were established in 1998 at the WSU Wilke Research Farm near Davenport, WA and on five grower farms in Lincoln and Spokane counties using a systems approach to investigate the adaptation of intensive crop rotations in the intermediate rainfall area of eastern Washington. Weed management is a major concern in transition to direct seeding and one of the most costly operations to consider. One of the theories behind intensive cropping is that with a mixture of winter and spring crops certain weed species are selected against and should be less of a problem. In this project, a portion of this theory was observed with some weed species decreasing in number while certain management practices favored other species. On the Wilke farm, when comparing the 3- and 4-year rotations, wild oats were the only weed species that showed a difference between the two rotations. Averaged over years, wild oat populations were on average 10.6 and 0.29 plants/$m^2$ in the 3- and 4-year rotations, respectively. Averaged over rotations, prickly lettuce, knotweed, and wild oat populations decreased over time, while cone catchfly and downy brome populations increased. Weeds, in particular wild oats, contributed to lower than expected yields for many crops and was one of the most expensive crop inputs. Cooperator fields have also had changes in weed populations. Downy brome populations generally decreased but populations of kochia, prickly lettuce, and Russian thistle increased in some cases. Other shifts in weed populations based on observation are a reduction in field bindweed, but other perennial weeds such as Canada thistle, dalmatian toadflax, and mullein have increased. In this project, weed management was one of highest cost inputs, particularly for controlling wild oat populations in cereal crops. [Paper Number 113]

**CROP RESPONSE AND WEED CONTROL IN BROCCOLI WITH TWO FORMULATIONS OF OXYFLUORFEN.** Warren E. Bendixen[1] and Jack Schlesselman[2]. Farm Advisor and Customer Agronomist. [1]UC Cooperative Extension, Santa Maria, CA and [2]Dow AgroSciences LLC, Reedley, CA.

*Abstract.* Three field trials were conducted in 2002 comparing two oxyfluorfen formulations; the standard 2.0 lb ai/gallon emulsifiable concentrate (2XL), and a 4.0 lb ai/gallon flowable (4F). Experiments were randomized block design with 3 or 4 replications applied with a $CO_2$ pressurized backpack sprayer at 40 gallons/acre. In two trials, oxyfluorfen (0.25 and 0.5 lb ai/acre), DCPA (7.5 lb ai/acre), and bensulide (1.5 lb ai/acre) were applied to bare ground prior to transplanting broccoli. There was no adverse crop response by the broccoli to any treatment in either trial. All treatments in one trial gave excellent control of burning nettle *(Urtica urens)*. In the other pretransplant trial, both oxyfluorfen formulations provided the best overall preemergence control (86 to 100%) of lambsquarters *(Chenopodium album)* and little mallow *(Malva parviflora)* compared to DCPA (77%) and bensulide (68%). There were no differences in preemergence weed control activity between either formulation of oxyfluorfen. The third experiment consisted of oxyfluorfen being applied over-the-top of 3 to 4-leaf direct-seeded broccoli. Initial crop response ratings taken after nine days resulted in the 4F formulation being four times safer on the broccoli than was the 2XL formulation of oxyfluorfen; the broccoli injury being equal with the 4F formulation at 0.5 lb ai/acre compared to the 0.125 lb ai/acre rate of the 2XL formulation. The broccoli quickly recovered from the initial adverse response and there were no differences compared to the untreated broccoli after 37 days, as well as no yield reduction at harvest. Although there were numerical differences in postemergence weed control between the two formulations of oxyfluorfen (the 2XL formulation was slightly more effective than the 4F), those differences were not significant. [Paper Number 114]

**INTERACTION OF SEEDING RATE AND HERBICIDE RATE ON WEED CONTROL IN SPRING WHEAT.** Michael P. Quinn[1], Don W. Morishita[2] and Michael J. Willie[2]. Graduate Student, Professor of Weed Science and Support Scientist. [1]University of Idaho, PSES Department, Moscow, ID and [2]University of Idaho, Twin Falls R&E Center, Twin Falls, ID.

*Abstract.* A study was conducted in 2001 and 2002 to determine the effect of irrigated spring wheat plant population and herbicide rate on the control of broadleaf weeds. Spring wheat was seeded at 34, 67, 101, and 135 kg/ha. The experiment was a four-by-four factorial design arranged as a split plot randomized complete block with four replications. Wheat seeding rate was the main plot and herbicide rate was the sub-plot. Herbicide treatments were fluroxypyr + tribenuron applied at 0x, 0.25x, 0.50x, 0.75x, and 1x (1x = fluroxypyr + tribenuron at 140 + 9 g ai/ha). Kochia and common lambsquarters were the major weed species present. None of the herbicide treatments injured the crop. Kochia control was not affected by seeding rate in either year. Common lambsquarters control was better at the highest seeding rate, averaging 75% control at 135 kg/ha versus 63% control at 34 kg/ha in 2001, but was not affected by seeding rate in 2002. All herbicide rates of 0.5x or greater were equally effective at controlling both kochia and common lambsquarters, and all were better than the 0.25x rate for both years. Grain yield from all herbicide-treated plots was greater than from the untreated checks and differed only in 2002 between the 0.25x rate (3972 kg/ha) and the higher rates (4645 to 4914 kg/ha). Seeding rate and herbicide rate did not interact with respect to crop injury, kochia or common lambsquarters control, and grain yield. [Paper Number 115]

**WEED CONTROL AND NURSE CROP REMOVAL IN SEEDLING ALFALFA WITH POST HERBICIDES.** Gustavo M. Sbatella and Stephen Miller. Graduate Research Assistant and Professor. University of Wyoming, Laramie, Wy.

*Abstract.* Weeds affect alfalfa (Medicago sativa L.) yields and hay quality. Weeds effects are not limited to competition, higher incidence of diseases and insects can also be expected. Potential long-term yield is determined in the first growing season of perennial broadleaf crops. In areas where establishment is compromised by adverse conditions, nurse crops (generally small grains) are sown with alfalfa for protection. Nevertheless there is a competitive effect from the nurse crop. Nurse crop removal with postemergence herbicides is an important management tool. A field study was conducted at Morril, Nebraska in 2001, to evaluate weed control and nurse crop removal with different post herbicide and surfactant combinations in seedling alfalfa. Crop injury was determined by visual observation on a percentage basis. The highest alfalfa yields were obtained with imazamox and imazethapyr treatments, with no significant yield difference between surfactants except for X-77, which reduced yields. Nurse crop removal was more effective with the addition of clethodim to imazethapyr or higher rates of imazamox. Weed

biomass was significantly reduced with increased imazamox rates or with the surfactants Quad 7 and Newtone. [Paper Number 116]

**MANAGEMENT OF ALS RESISTANT KOCHIA IN BARLEY-SUGAR BEET ROTATIONS.** Nicole D. Flowers and James A. Mickelson. Research Associate and Assistant Professor. Montana State University, Huntley, MT.

*Abstract.* Kochia is a very competitive and troublesome weed that infests most sugar beet fields in Montana and the intermountain West. Triflusulfuron is an ALS inhibitor herbicide that has been relied upon almost exclusively in recent years to control kochia in sugar beet. Repeated use of ALS herbicides in these cropping systems and along the railroad has selected for kochia populations that are resistant to ALS herbicides. Therefore, triflusulfuron is no longer effective at controlling kochia in many sugar beet fields. Kochia seeds have relatively short longevity in the soil. Thus, effective kochia control in the crop year prior to sugar beet is likely to improve kochia control in sugar beet. The objective of this study was to evaluate the effectiveness of managing ALS-resistant kochia in sugar beet by using non-ALS inhibiting herbicides in barley the year prior to sugar beet. The experiment was a randomized complete block with a split plot restriction on randomization and 4 replicates. Main plots were 4 barley treatments in the first year. Subplots were 10 sugar beet treatments in the second year. The experiment was repeated. Main plot treatments in barley were treated with fluoroxypyr + MCPA and bromoxynil + MCPA, weed free, and an untreated check. The barley was harvested in July. Tillage was not conducted until after a killing frost in September to represent the worst-case scenario in which any uncontrolled kochia in barley would produce viable seed in the fall. Sugar beet was planted to the site in the second year and each of the main plot treatments from the previous year were subdivided into 10 sub plots, that each received a herbicide treatment. The herbicide treatments applied to sugar beet included conventional and micorate treatments containing desmedipham + phenmedipham+ clopyralid, or desmedipham + phenmedipham + clopyralid + triflusulfuron, and micro-rate treatments containing additional ethofumesate. Minimizing kochia seed production in barley greatly improved kochia control in sugar beet and resulted in higher sugar beet yields in fields containing either low or high initial densities of kochia. The lack of kochia control in the untreated barley plots resulted in poor kochia control in sugar beet and reduced sugar beet yields compared to the weed-free barley plots. The addition of ethofumesate to microrate treatments in sugar beet improved kochia control and sugar beet yields. The best control and yields in this experiment were achieved with conventional rates of triflusulfuron + desmedipham + phenmedipham + clopyralid or microrates of triflusulfuron + desmedipham + phenmedipham+ clopyralid + ethofumesate. From a kochia management standpoint, barley is a good rotational crop to grow the year prior to sugar beet. [Paper Number 117]

**FLUROXYPYR EFFICACY AS AFFECTED BY RELATIVE HUMIDITY AND SOIL MOISTURE.** Mark D. Lubbers[1], Phillip W. Stahlman[2] and Kassim Al-Khatib[3]. Graduate Research Assistant, Professor and Associate Professor. [1]Department of Agronomy, Kansas State University, Manhattan, KS and [2]Agricultural Research Center-Hays, Kansas State University, Hays, KS.

*Abstract.* Two separate studies were conducted to determine the effect of relative humidity and soil moisture and temperature and soil moisture on fluroxypyr efficacy. Kochia and Palmer amaranth were planted in pots and placed in growth chambers with a constant relative humidity of 35 or 90% or day/night temperatures of 32/28 or 22/18 C. Within each growth chamber, plants were grown in soil moisture regimes of either -20 or -40 kPa. Soil moisture was maintained throughout the study by weighing and watering pots daily. When plants were 10 cm tall, fluroxypyr was applied at 0, 26, 53, 79, or 105 g ae $ha^{-1}$. At 21 DAT, both species were controlled more at 90% RH compared to 35% RH, regardless of soil moisture. Kochia control differed between -20 and -40 kPa only at 35% RH, with higher control at -20 kPa. However, Palmer amaranth control differed between -20 and -40 kPa only at 90% RH, with higher control at -20 kPa. In general, kochia control was not affected by temperature whereas Palmer amaranth control was higher at 22/18 C, regardless of soil moisture. Control of both species did not differ between -20 and -40 kPa at 22/18 C. Differences in kochia and Palmer amaranth control were observed at 32/28 C with more control at -20 kPa. These studies show that relative humidity has a greater influence on fluroxypyr efficacy of kochia and Palmer amaranth than temperature or soil moisture. [Paper Number 118]

**HERBICIDE EFFECT ON WILD BUCKWHEAT CONTROL AND RESULTING DURUM WHEAT QUALITY.** Kirk A. Howatt, Frank A. Manthey and Ron F. Roach. Assistant Professor, Assistant Professor and Research Specialist. North Dakota State University, Fargo, ND.

*Abstract.* Broadleaf herbicides generally do not cause visible injury to durum wheat, but herbicide action may result in short-term physiologic effects. Field experiments were established at Cando, ND in 2001 and at Fargo, ND in 2002 to determine wild buckwheat control with herbicides and evaluate broadleaf herbicide effect on durum grain and semolina quality for milling and processing. At Cando, treatments that included thifensulfuron, thifensulfuron and tribenuron, or bromoxynil and MCPA provided greater than 90% wild buckwheat control 14 days after application. Addition of fluroxypyr or 2,4-D did not improve wild buckwheat control. Treatment with clopyralid and 2,4-D gave 80 to 86% control. Control with all herbicide treatments improved as the season progressed and crop competition contributed to wild buckwheat control. Thifensulfuron and tribenuron application resulted in the largest increase in large wheat kernels, 48% large, compared with untreated wheat, 33% large, which also improved the 1000 kernel weight by 11%. Clopyralid application also resulted in an increased percentage of large kernels, 47% large, and 1000 kernel weight compared with untreated wheat. Herbicide treatments did not affect gluten content and strength, kernel and semolina protein content, SDS microsedimentation value, or falling number compared with untreated wheat. At Fargo, treatments containing clopyralid or thifensulfuron consistently provided greater than 90% wild buckwheat control 21 days after application. Wild buckwheat control with thifensulfuron and tribenuron, 84% control, was improved by the addition of fluroxypyr or fluroxypyr and 2,4-D, 91 and 94% control. Clopyralid treatments resulted in increased gluten content, 2.5 to 3.7 percentage points; grain protein, 1.5 percentage points; and semolina protein, 1 percentage point. Herbicide treatments did not affect gluten strength, SDS microsedimentation value, kernel sizing, or falling number compared with untreated wheat. [Paper Number 119]

**EVALUATION OF MESOSULFURON IN CALIFORNIA WHEAT.** Matt Ehlhardt[1], Mick Canevari[2] and Mary Paulsgrove[3]. Technical Representative, Farm Advisor and Product Manager. [1]Bayer Crop Science, Chico, CA, [2]Univeristy of California Cooperative Extension, Stockton, CA and [3]Bayer Crop Science, RTP, NC.

*Abstract.* Evaluation of Mesosulfuron + Menfenpyr-Diethyl in California Wheat. W. Mick Canevari, UCCE Cooperative Extension , Matthew H. Ehlhardt, Bayer CropScience, Mary Paulsgrove, Bayer CropScience. Mesosulfuron + menfenpyr-diethyl is a new postemergence herbicide system being development by Bayer CropScience for control of grassy weeds in wheat. Mesosulfuron is an ALS inhibitor and menfenpyr-diethyl is muti-herbicide postemergent safener registered for use in wheat. For application in winter wheat, the two products are tank mixed in a ratio of one part herbicide to two parts safener. In the future, the two products will be preformulated together as a WG. In 2002, small plot trials were conducted by Bayer CropScience and University of California Cooperative Extension personnel to evaluate the activity of the herbicide system for the control of annual ryegrass and hood canarygrass in California winter sown wheat. Application timings ranged from 3 leaf to 3 tiller stage of wheat and weed sizes from 4 leaf to 3 tillers. The effects of adjuvants were evaluated where the herbicide was applied alone or in combination with a methylated seed oil plus nitrogen. Weed control of 90% or greater was obtained with rates of 6 – 10 gms/ha for hood canarygrass and 12 – 15 gms/ha for annual ryegrass when the adjuvants were added. Without the adjuvants annual ryegrass control was reduced by as much as 50%. Commercial California wheat varieties were evaluated for their tolerance to a 2X application and it was found to be safe when treated at the early seedling to mid tiller stage of growth. Broadleaf weed control programs were evaluated where mesosulfuron + menfenpyr diethyl were tank mixed with bromoxynil, dicamba, and MCPA amine. No adverse effects on the grassy weed or broadleaf weed control were noted with the tankmixes. [Paper Number 120]

**A PRECISION AGRICULTURE SPRAYER WITH APPLICATIONS FOR RESEARCH, EXTENSION, AND TEACHING.** David A. Claypool. Research Associate II. University of Wyoming, Laramie, WY.

*Abstract.* A new pesticide sprayer with state-of-the-art electronic controls, designed for precision agriculture applications, is giving the University of Wyoming Department of Plant Sciences (DPS) new possibilities for management, research, teaching, and extension education. Electronic controls produced by Raven were installed on a 30-foot, trailer-type sprayer. It features automatic rate control, programmed and variable rate applications, two pesticide injection systems, global positioning system, and a lightbar guidance system. Cost of the equipment was approximately $25,000 which includes the sprayer, tanks, pump, electronic controls, and cables. This equipment will support DPS programs in three general ways: 1) as a management tool for weed, insect, and disease control in field

research, 2) as a tool to research precision agriculture methods in Wyoming, and 3) as an education tool for students, producers, and extension personnel. Students who are familiar with precision agriculture equipment and methods will be more competitive in the job market. It is currently being used for a precision agriculture project funded by Western Region Integrated Pest Management. [Paper Number 121]

**BROADLEAF WEED CONTROL IN CHICKPEA AND LENTIL WITH FALL APPLICATION OF PURSUIT (IMAZETHAPYR).** Kenneth L. Sapsford[1], Frederick A. Holm[1], Eric N. Johnson[2] and Yanti Gan[3]. Mr., Prof., Mr. and Dr.. [1]Crop Development Centre, University of Saskatchewan, Saskatoon, SK, [2]Agriculture and Agri-Food Canada, Scott, SK and [3]Agriculture and Agri-Food Canada, Swift Current, SK.

*Abstract.* Broadleaf weed control options in chickpea and lentil are very limited. Preliminary trials found that spring applied imazethapyr at rates from 12.5 to 25 gai ha-1 resulted in severe injury to chickpea in some years. The objective of these trials was to evaluate fall application of imazethapyr in chickpea and lentil, at rates from 12.5 to 25 gai ha-1, for both crop tolerance and weed control efficacy. A 4-replicate trial was set up at Saskatoon, Sask. in 2000, 2001 and 2002 and at Scott, Sask. and Swift Current, Sask. in 2002. Imazethapyr was surface applied, with no incorporation, in the fall, at rates of 12.5, 16.7, 20.0 and 25.0 gai ha-1. Ethalfluralin (2000) or sethoxydim (2001, 2002) were applied to improve grassy weed control. The trials were direct seeded with low disturbance openers. There was excellent crop tolerance to fall applications of imazethapyr in both chickpea and lentil in all location-years. Some crop injury was evident at the higher rates of imazethapyr; however, yield was not reduced. Broadleaf weed control was inconsistent at the 12.5 gai ha-1 rate. Rates higher than 16.7 gai ha-1 rates resulted in excellent control of stinkweed (Thlaspi arvense L.), wild mustard (Sinapsis arvensis L.), wild buckwheat (Polygonum convolvulus L.), lamb's-quarters (Chenopodium album L.), redroot pigweed (Amaranthus retroflexus L.), Russian thistle (Salsola kali L.) and cleavers (Galium aparine L.) at all location-years. When compared to a post-emergence application of metribuzin, fall applied imazethapyr at 16.7 to 20 gai ha-1 resulted in similar to 20% higher seed yields in lentil and chickpea, respectively. Fall applied imazethapyr at 16.7 to 20 gai ha-1 resulted in consistent broadleaf weed control, low crop injury, and high crop yield. [Paper Number 123]

**CHILE RESPONSE TO ROTATIONAL CROPS FOR NUTSEDGE AND NEMATODE SUPPRESSION.** Cheryl Fiore, Leigh Murray, Ian Ray, Jill Schroeder and Stephen Thomas. Research Assistant, Professor, Professor, Professor and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* Chile peppers (Capsicum annuum, chile) were planted in 2001 and 2002 to compare the efficacy of a prior three year rotation to root-knot nematode (Meloidogyne incognita (RKN)) resistant alfalfa (Medicago sativa L.) to cotton (Gossypium hirsutum) for suppression of RKN and yellow (Cyperus esculentus (YNS)) and purple (Cyperus rotundus (PNS)) nutsedge populations. Alfalfa cultivars Magna8 (RKN resistant) and Doña Ana (RKN susceptible) were planted at high and low seeding rates in September 1997. Acala 1517 cotton was planted in the spring of 1998 through 2000 as a moderately RKN-susceptible control. In 2001, prior to planting chile, a nematicide (1,3-dichloropropene (1,3-D)) was applied to plots rotated from cotton for RKN suppression. Plots rotated from alfalfa were not treated with 1,3-D. The chile stand failed in 2001, but YNS and PNS above-ground biomass and RKN populations were sampled July 3, August 1 and 31. The data showed a significant early season suppression of nutsedge in plots rotated from alfalfa compared to cotton. In the spring 2002 plots rotated from cotton was treated with 1,3-D and chile was established successfully. In addition to the nutsedge biomass and RKN populations, chile was harvested in October to determine red pod yields. Nutsedge densities in plots rotated from alfalfa remained significantly lower overall compared with the plots rotated from cotton during the second season. By the last sample RKN populations in the plots rotated from Doña Ana averaged two to three times higher than 1,3-D treated plots or plots rotated from Magna 8. The average chile yield for all former alfalfa plots was 7318 kg/ha dry weight compared to 3944 kg/ha in former cotton plots (SE = 1140 kg/ha). This data supports the use of RKN resistant alfalfa as a low input management strategy for suppressing nutsedge and RKN. [Paper Number 124]

**MAPPING THE VEGETATION DISTRIBUTION ALONG THE IRRIGATION SYSTEM IN THE MESILLA VALLEY.** Joleen Rosson, Osama Elsebai and Robert Sanderson. Undergraduate, Research Specialist and Assoc Prof. New Mexico State University, Las Cruces, NM.

*Abstract.* The Elephant Butte Irrigation District (EBID) maintains over 300 miles of canals, laterals, and drains in the Mesilla Valley of southern New Mexico. Vegetation along the banks of this system varies considerably and most

of the vegetation is considered as weeds since it can restrict water flow, damage banks, and distribute unwanted seeds throughout the irrigation district. Extensive and costly weed management efforts are conducted during the year and information on the vegetation distribution and type is needed for efficient and timely control efforts. The differences in vegetation throughout the system are mainly due to changes in soil characteristics such as texture, organic matter, salinity, and moisture content. Two hundred and ninety-nine (299) sample locations have been established throughout the irrigation system and recorded using GPS equipment. Collection of vegetation and soil information at these locations started in 2002 and will continue into 2003. A spectroradiometers was used to measure the spectral reflectance signatures of plants found along the irrigation system and this will be used in the interpretation of remotely sensed aerial images collected during the year. The information collected is been put into a GIS system so as to provide a practical, easy to update information system about the vegetation distributions along the irrigation canals for use in planning vegetation management. This information will also be valuable in other disciplines, such as monitoring the establishment of invasive weeds and for beneficial and problematic insect monitoring. [Paper Number 125]

**CHEMICAL FALLOW WITH SULFENTRAZONE FOR KOCHIA CONTROL IN WHEAT-FALLOW CROPPING SYSTEMS.** Edward S. Davis[1] and Alvin J. Bussan[2]. Research Associate and Assistant Professor. [1]Montana State University, Bozeman, MT and [2]University of Wisconsin-Madison, Madison, WI.

*Abstract.* Kochia management in wheat-fallow cropping systems throughout Montana has been difficult due to prevalence of herbicide resistant kochia and poor crop competition during several years of drought. Sulfentrazone has post-emergence and pre-emergence activity on kochia, including sulfonylurea and phenoxy resistant biotypes. Several field trials were established to evaluate the efficacy of sulfentrazone on kochia during a fallow period when applied in the fall or spring at various application rates. Plant-back trials were also conducted to measure the soil residue effects of sulfentrazone on wheat growth and yield. Fall applied sulfentrazone provided a higher level of kochia control than spring applied treatments at equivalent doses. The 2.25 oz ai/A rate provided the highest level of kochia control during the fallow period without causing injury to subsequently planted wheat. Grain yields were not significantly reduced when at least four months passed between sulfentrazone applications and planting spring wheat or winter wheat at rates up to 2.25 oz ai/A. [Paper Number 127]

**RISKS OF WEED SPECTRUM SHIFTS AND HERBICIDE RESISTANCE IN GLYPHOSATE-RESISTANT CROPPING SYSTEMS.** Stephen D. Miller[1], Phillip W. Stahlman[2], Philip Westra[3], Gail W. Wicks[4], Robert G. Wilson[5] and Jeffrey M. Tichota[9]. Professor, Professor, Professor, Professor, Professor and Agronomic Research Manager. [1]University of Wyoming, Laramie, WY, [2]KSU Agricultural Research Center, Hays, KS, [3]Colorado State University, Ft. Collins, CO, [4]University of Nebraska, North Platte, NE, [5]University of Nebraska, Scottsbluff, NE and [6]Monsanto, Littleton, CO.

*Abstract.* Continuous long term experiments have been conducted at five sites in the central Great Plains since the spring of 1998 to determine if glyphosate use pattern in glyphosate-resistant cropping systems would influence weed control by placing selection pressure on weed species, alter weed population dynamics, and lead to the development of glyphosate-resistant weed biotypes. Experiments at Fort Collins, CO, Scottsbluff, NE, and Torrington, WY are irrigated sites and experiments at North Platte, NE and Colby, KS are rainfed sites. Two cropping rotations were established at each site: continuous glyphosate-resistant corn at all sites, glyphosate-resistant corn alternated with glyphosate-resistant sugarbeet at irrigated sites, and glyphosate-resistant corn alternated with glyphosate-resistant soybean at rainfed sites. Four in-crop herbicide regimes are imposed within each crop rotation: glyphosate at 0.375 lb ae/A twice each year; glyphosate at 0.75 lb/A twice each year; glyphosate at 0.75 lb/A twice each year and non-glyphosate conventional herbicides in alternate years; and the same non-glyphosate conventional treatment in alternate years used each year. Irrigated experiments are tilled between crop years; rainfed experiments are not. Thus, in addition to two in-crop glyphosate applications, all plots in rainfed experiments also receive at least one preplant burndown glyphosate appliation. Nine soil cores are collected from each plot in the spring of each year and elutriated to monitor changes in the soil seed bank, and weed population counts are taken at the same locations before the first postemergence application, two weeks after the second postemergence application, and prior to harvest in fall. After five years at all five sites, weed control has been consistently better with the high compared to the low rate of glyphosate. At most sites the treatment of alternating glyphosate and non-glyphosate conventional treatments in successive years has not been as effective as the higher rate of glyphosate applied twice each year because of poor control with the non-glyphosate herbicide treatments. Weed populations are shifting to species with

higher natural tolerance to glyphosate and to later emerging species. The most definite shift to date is a dramatic increase in common lambsquarters at the irrigated Scottsbluff site. Severe drought in 2001 and 2002 reduced crop competitiveness at the two rainfed sites, allowing puncturevine to proliferate at the Colby site. There is no evidence at any of the five sites after five years of selection pressure of any species developing resistance to glyphosate. [Paper Number 128]

**HERBICIDE RATE AND PLANTING DEPTH AFFECT SUNFLOWER TOLERANCE TO SULFENTRAZONE.** Gregory W. Kerr[1], Phillip W. Stahlman[2] and Johanna A. Dille[1]. Graduate Research Assistant, Professor and Assistant Professor. [1]Department of Agronomy, Kansas State University, Manhattan, KS and [2]Agricultural Research Center, Kansas State University, Hays, KS.

*Abstract.* Experiments were conducted in a greenhouse and at two field sites in western Kansas in 2000 and 2001 to evaluate the effects of herbicide rate and planting depth on sunflower tolerance to sulfentrazone. In repeated greenhouse experiments, sunflowers were planted 2 or 4 cm deep in a silt loam soil in 10-cm-diameter plastic pots and sulfentrazone was applied preemergence at 140, 210, or 280 g/ha. Pots were surface watered 2 hr after herbicide application and as needed thereafter to sustain plant growth. In rainfed field experiments, sunflowers were planted 1.9 or 3.2 cm deep and sulfentrazone was applied preemergence at 105, 140, 158, and 210 g/ha. All experiments included non-treated controls for each planting depth. In greenhouse experiments, sulfentrazone stunted sunflower plant growth and, averaged over planting depth, decreased plant dry weight at 21 days after treatment as rate increased from 140 up to 280 g/ha. Plant dry weights were higher for the deeper planting depth, signifying less sulfentrazone injury. In field experiments, leaf chlorosis and plant stunting increased with increasing sulfentrazone use rate at both planting depths; however, sunflowers planted 3.2 cm deep were stunted considerably less than sunflowers planted 1.9 cm deep. Visibly injured plants in field experiments recovered and seed yields did not differ among sulfentrazone rates within planting depth. Averaged across sulfentrazone rate, seed yield was higher for the deeper-seeded sunflower in 2000, but yields were similar in 2001. [Paper Number 129]

**WEED CONTROL WITH AE F130060 IN WINTER WHEAT.** Jason P. Kelley and Thomas F. Peeper. Sr. Agriculturist and Professor. Oklahoma State University, Stillwater, OK.

*Abstract.* Two field experiments were conducted in north central Oklahoma over the 2000-2001 and 2001-2002 wheat growing seasons to evaluate cheat (Bromus secalinus) control from AE F130060, Maverick (proposed common name sulfosulfuron), and Olympus (MKH 6561, proposed common name procarbazone-sodium) when applied in early March after the wheat had been grazed by cattle during the winter months. AE F130060 was applied at 0.0134 or 0.016 lb ai/A with the crop safener AE F107892 at a ratio of 1:2. Maverick and Olympus were applied at 0.031 and 0.04 lb ai/A. In both experiments, hard red winter wheat was seeded in late September at 105 or 120 lb/A into conventionally tilled seedbeds. Cattle were allowed to graze experiment area from mid-November until early March. Herbicide treatments were applied 4 to 14 days after the cattle were removed in either water + 0.5% v/v NIS or 28% UAN + 0.25% v/v NIS carrier at 20 GPA. Untreated check plots of water only and 28% UAN + 0.25% v/v NIS only were included for comparison purposes. In both experiments little wheat injury was seen 10 DAT when treatments were applied with water, but when applied with 28% UAN, Maverick, Olympus, and AE F130060 caused 14, 18, and 43% leaf burn, respectively, in 2000-2001 and 10, 13, and 20% leaf burn, respectively, in 2001-2002. Leaf burn from UAN + NIS with no herbicide was near 5% both years. Cheat was controlled 93 to 99% regardless of carrier or herbicide in both experiments. Wheat yields were increased compared to the untreated checks in both experiments. Five field experiments were conducted in north central Oklahoma during the 2000-2001 and 2001-2002 wheat growing seasons to evaluate cheat (Bromus secalinus) and Italian ryegrass (Lolium multiflorum) control with AE F130060 compared to standard herbicides. Herbicide standards for cheat included Maverick at 0.031 lb ai/A + 0.5% v/v NIS and Olympus at 0.04 lb ai/A + 0.25% v/v NIS. AE F130060 was applied with the crop safener AE F107892 at a 1:2 ratio. The standard herbicide for Italian ryegrass was Hoelon (diclofop) applied at 0.75 lb ai/A. In all experiments hard red winter wheat '2174' was seeded in late September or October at 65 to 70 lb/A. Herbicide treatments were applied in early December using a CO2 backpack sprayer delivering 20 GPA of water carrier. Cheat growth stage at application was two leaf to three tillers, Italian ryegrass growth stage was one leaf to four tillers, and wheat growth stage was three leaf to six tillers. Pooled over two sites in 2000-2001, AE F130060 at 0.0134 and 0.016 lb ai/A controlled Italian ryegrass 97 and 99%, while controlling cheat 43 and 50%. Maverick and Olympus controlled Italian ryegrass 54 and 42%, but both controlled cheat 99%. All treatments increased yield compared to the untreated check, but AE F130060 increased wheat yields more than Maverick or

Olympus due to increased Italian ryegrass control. In 2001-2002, in two experiments where Italian ryegrass was the sole grassy weed, AE F130060 at 0.0067, 0.0112, and 0.0134 lb ai/A controlled Italian ryegrass 99 to 100%, compared to 97 and 99% by Hoelon. Wheat yields in plots treated with AE F130060 and Hoelon were similar. In one experiment conducted in 2001-2002, AE F130060 at 0.0067, 0.0012, and 0.0134 lb ai/A controlled cheat 55, 64, and 71%, respectively, while Maverick and Olympus controlled cheat 99%. All AE F130060 treatments increased wheat yield, but not as much as Maverick or Olympus. No wheat injury was seen in the 2000-2001 experiments. In 2001-2002 wheat injury from AE F130060 at 14 DAT was 10 to 15% regardless of application rate, compared to 4 and 6% for Maverick and Olympus, while Hoelon caused no visible wheat injury. [Paper Number 130]

**PHOTOSYNTHETIC RESPONSE OF FIVE PLANT SPECIES TO POSTEMERGENCE MESOTRIONE AND ATRAZINE.** Earl Creech[1], Thomas A. Monaco[2] and John O. Evans[1]. Graduate research assistant, Ecologist and Professor. [1]Utah State University, Logan, UT and [2]USDA-ARS Forage and Range Research Lab., Logan, UT.

*Abstract.* Atrazine is frequently used to compliment other corn herbicides in tank-mixtures and generally improves weed control. The objective of this research was to examine the efficacy of foliar applications of mesotrione with and without atrazine in corn and four weeds commonly found in corn by measuring photosynthetic and growth responses at two plant sizes. A greenhouse experiment was conducted at Utah State University. Eight pots of each species were randomly assigned to each of the following treatments: 1) atrazine (280 g/ha), 2) mesotrione (105 g/ha), 3) atrazine (280 g/ha) plus mesotrione (105 g/ha), and 4) untreated control. Herbicides were applied at two different plant size-classes to evaluate photosynthetic response in small and large plants. Measurements of leaf photosynthesis were taken on three plants in each pot on days 0, 1, 3, 7, and 14 after treatment. Shoot and root dry mass were determined at the conclusion of the experiment. Long-term photosynthesis and dry mass of corn was not reduced by any of the herbicide treatments compared to untreated controls. Photosynthesis and dry mass of barnyardgrass, redroot pigweed, and velvetleaf were significantly reduced by mesotrione and atrazine alone and in combination. Long-term photosynthesis and dry mass of large green foxtail plants were not suppressed by either herbicide applied alone. The mesotrione plus atrazine treatment was the most effective treatment for grass weed control because both small and large plants did not regain photosynthetic capacity and had significantly lower dry mass. [Paper Number 131]

**COMMON SUNFLOWER *HELIANTHUS ANNUUS* AND GREEN FOXTAIL *SETARIA VIRIDIS* INTERFERENCE IN DRY BEANS *PHASEOLUS VULGARIS*.** Abdel O. Mesbah, Stephen D. Miller and Mike Killen. Research Scientist, Professor and Research Associate. University of Wyoming, Laramie, WY.

*Abstract.* Field experiments were conducted in 1994 and 1995 under sprinkler irrigation at the Research and Extension Center, Torrington, Wyoming to evaluate the effects of season-long and duration of interference effects of several common sunflower and green foxtail densities of on pinto beans. Pinto bean yields were reduced by all examined densities, alone or in combination. Pinto bean yield reduction ranged from 11 to 19% with a green foxtail density of 6 plants/m of row, while, common sunflower at 1.5 plants/m of row, reduced yields 27 to 34%. With a mixed density of 6 foxtails plus 1.5 sunflower plants/m of row, yield reductions were 36 to 45%. Compared to yield losses from each weed species alone, yield reductions from mixed densities were less than additive at higher densities. Dry bean yield reduction could be predicted with a linear regression model for green foxtail and a curvilinear regression model for sunflower. Pinto bean yield reduction increased as the duration of green foxtail and sunflower interference increased whether grown alone or in combination. Yield losses due to duration of interference could be predicted with curvilinear regression models. [Paper Number 132]

**REDSTEM FILAREE *ERODIUM CICUTARIUM* CONTROL IN SUGARBEETS *BETA VULGARIS*.** Abdel O. Mesbah and Stephen D. Miller. Research Scientist and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Field experiments were conducted at the Powell Research and Extension Center, WY to evaluate redstem filaree control in sugarbeets. Preplant treatments consisted of ethofumesate and/or pyrazon. Postemergence treatments consisted of full rate or micro-rate of desmedipham/phenmedipham/ethofumesate + triflusulfuron + clopyralid. Micro-rate system included 1.5% methylated seed oil with or without ethofumesate and pyrazon at 0.04 and 0.008 lb ai/A, respectively. Each treatment consisted of three or four applications made at 7 day intervals starting at cotyledon stage. Sugarbeet injuries were slightly higher with full rate than with micro-rate. Redstem filaree control with three applications was moderate with both full rate and micro-rate systems. Best control was

achieved with ethofumesate as preplant followed by four applications of micro-rate in combination with ethofumesate at 0.04 lb ai/A. Sugarbeet root yields were higher in herbicide treated compared to the check and yield increases were closely related to redstem filaree control. Sugar contents among all treatments including the check were similar. [Paper Number 133]

**INTEGRATION OF TECHNOLOGIES FOR HIGH ACCURACY WEED MAPPING IN LARGE PRODUCTION FIELDS.** Richard D. Dirks[1], Kevin D. Gibson[1] and Case R. Medlin[2]. Research Associate, Assistant Professor of Weed Science and Assistant Professor of Weed Science. [1]Purdue University, West Lafayette, IN and [2]Oklahoma State University, Stillwater, OK.

*Abstract.* Several studies have shown that weeds have patchy distributions and that management can be improved through site-specific methods. However, it is unclear whether this patchiness reflects underlying conditions such as soil fertility that might also be amenable to management. Determining the relationship between weed and environmental variation on a spatial scale requires the accurate and precise identification of weeds within a field. Researchers have relied on manually mapping weed populations but this can be a time consuming and labor intensive task. Automation of this process would offer researchers a tool to map large production fields with a high degree of accuracy in a timely manner. We are in the process of testing and evaluating a system to provide such automation. Our system relies on the integration of three technologies (vegetation-sensing devices, centimeter-accuracy global positioning system (GPS) and charge-coupled device (CCD) cameras). The Patchen WeedSeeker sensors detect weeds and trigger an image capture system to gather an image of the targeted weed. Using a fixed base station and mobile station linked by radio transceivers, a real-time kinematic GPS system provides centimeter-accuracy coordinates for each captured image. Images are labeled with GPS coordinates and stored in a computer database. Species identification is done post-process in the lab using the stored images. System evaluation will continue this spring as we initiate a study to relate weed species distribution and abundance to site characteristics. [Paper Number 134]

**USE OF QUINCLORAC (PARAMOUNT) AND 2,4-D FOR CONTROLLING FIELD BINDWEED IN FALLOW.** Roger M. Hybner. Director. University of Wyoming, Sheridan, WY.

*Abstract.* No single herbicide treatment provides long-term control of field bindweed. Experiments were initiated near Sheridan, WY, in 2000 to evaluate repeated herbicide applications for field bindweed control in a dryland hay barley/fallow rotation. Herbicides were applied post-emergence in the early summer of 2000, 2001, and 2002. Initial research plans called for early summer and fall applications, however, due to drought and poor field bindweed regrowth, the fall applications were cancelled. Herbicide treatments included quinclorac at 0.38, 0.25, and 0.125 lb ai/a in combination with 2,4-D Ester at 0.5 lb ai/a, picloram at 0.125 lb ai/a in combination with 2,4-D Ester at 0.5 lb ai/a, and 2,4-D Ester at 1 lb ai/a. Individual plots were rated for % control in late July of each year. Quinclorac plus 2,4-D applied annually did not perform as well as quinclorac plus 2,4-D applied the first two years with a 2,4-D application the third year, quinclorac applied the first year and 2,4-D applied the following two years, and quinclorac plus 2,4-D applied the first and third years with 2,4-D applied the second year. Picloram plus 2,4-D performed as well or better than all the quinclorac plus 2,4-D treatments. Picloram plus 2,4-D applied the first two years and 2,4-D applied the third year performed better than picloram applied the first year and 2,4-D applied the second and third years. [Paper Number 135]

**DRY BEAN CANOPY DEVELOPMENT, WEED SUPPRESSION, AND YIELD AS AFFECTED BY PLANT POPULATION AND ROW SPACING.** Jack T. Cecil[1], Craig M. Alford[2] and Stephen D. Miller[2]. Research Scientist, Research Scientist and Prof. Plant Sci.. University of Wyoming, [1]Torrington, WY and [2]Laramie, WY.

*Abstract.* Currently most dry beans in Wyoming are grown in 76cm rows. Research in other areas of the US and Canada suggest that there may be benefits to growing dry beans in narrower rows. The University of Wyoming has under taken an initative to investigate the benefits of growing other crops (corn, sugarbeets, and sunflowers) in narrower rows. As part of this initative the university has constructed a John Deere Maxemerge II planter that has the capability of planting multiple row spacings at varying populations. A field experiment was conducted under sprinkler irrigation on a Dunday loamy fine sand soil at the Research and Extension Center, Torrington, WY to determine canopy development, weed suppression and yield involving three row spacings (38,56,and 76 cm) and

four populations (200,000, 300,000, 400,000, and 500,000 plants/ ha). A black dry edible bean, Shiny Crow was planted 19 June 2002. Neither row spacing nor plant population showed any significant effect on crop yield. The weed biomass tended to be less at the 56 cm row spacing with populations of 200,000, and 300,000, than at the 38 cm or 76 cm with populations of 200,000, 300,000, and 400,000 plants /ha. Sunlight at the bottom of the canopy increased with increased row width however, population generally had no effect on light at the bottom of the canopy. There were no differences in disease incidence between row spacings or populations. [Paper Number 136]

**CONTROLLING JOINTED GOATGRASS IN WINTER WHEAT IN THE CENTRAL GREAT PLAINS WITH ROTATIONS, TILLAGE, AND WHEAT CULTIVARS, 1997-2002.** Gail A. Wicks, Gordon E. Hanson and Garold W. Mahnken. Professor, Technician and Techncian. University of Nebraska, West Central Research and Extension Center, North Platte, NE.

*Abstract.* The objective of this study was to determine the influence of best-integrated weed management practices for controlling jointed goatgrass (JGG) in winter wheat rotations. Similar practices to those used by ecofallow farmers were used. North Platte=s annual average precipitation is 19.3 inches. In 1996, we overseeded all plots with 200 JGG cylinders/m2 in four replications in 15 acres of a non-uniform JGG infestation. The three rotations were winter wheat-fallow (W-F), winter wheat-ecofallow corn-fallow (W-C-F), and winter wheat-ecofallow corn-corn-fallow (W-C-C-F). Each rotational phase is present each year. All plots were sprayed with herbicides during the fallow periods and half of the plots were tilled and the other half were not tilled. Half the corn plots were tilled in April or May and cultivated once in June. >Pronghorn=, >Alliance=, and >Vista= winter wheat cultivars were seeded in the third weed of September. Their stature was tall, medium, and short, respectively. In the tilled plots, preventing weed growth after wheat harvest with herbicides and beginning tillage for fallow and corn production in April provided conditions suitable for more JGG seed germination before wheat seeding than in no-till. This trend has been consistent. Wheat yields were equal between tillage and no-till except 1998 and 2002. In1998, JGG reduced wheat yields 6 bu/A, but in 2002 no-till wheat yielded 4 bu/A more than wheat grown in a tilled seedbed. Tillage did not reduce corn yields following the ecofallow period in 1998 and 1999 because of timely rainfall, but these yields were less than no-till in 1997, 2000, and 2001. In 2002, corn yields were zero because of drought. Over the years the trend has been that the tall wheat was more competitive with JGG than the shorter wheat. In 2002, Pronghorn was 3 inches taller than Alliance and 5 inches taller than Vista. In April of 2001, JGG plant density was 10 to 14 times greater in the W-F than W-C-C-F or W-C-F rotations. Hail May 31, 2001 reduced wheat yields to 15 bu/A in the 3 and 4 yr rotations. The wheat stubble protected the JGG and allowed for high JGG seed production in the W-F rotation, and a smaller quantity in the W-C-F rotation. In 2002, we experienced the driest year since 1907. No JGG germinated in the wheat in the fall after the wheat was seeded in September 2001. Spring and summer JGG germination was very low, but fall rains greatly increased JGG emergence. Several hundred JGG seedlings were killed in the fallow portion of the W-F rotation before wheat seeding September 23, 2002, but more germinated following 0.84 inches of rain after wheat seeding. JGG density in the W-F rotation before seeding wheat was 914 plants/m2 in the tilled plots and 1,020 plants/m2 in no-till. In the W-C-F rotation to be seeded to wheat in 2002, 58 JGG seedlings/m2 emerged in the tilled portion vs. 703 JGG seedlings/m2 in the no-till plots and 0 seedlings/m2 in the W-C-C-F rotation. These plants were killed with glyphosate before seeding wheat. In the W-F rotation, following wheat emergence 216 JGG plants/m2 were present in the tilled plots and 900 plants/m2 in the no-till that was tilled once before seeding. JGG densities in wheat in the W-C-F were 1.1 in the tilled and 0.1 seedlings/m2 in the no till. In the W-C-C-F rotation, tilled plots had 0.3 and no-till had 0.4 seedlings/m2. Crop management strategies must be changed to prevent yield loss in the next wheat crop. Adding one or two summer crops following wheat allows sufficient time to reduce viable JGG seed density to an amount that would not affect winter wheat yield in a dry year or an area that has less rainfall than North Platte. To date, JGG has not greatly reduced wheat grain yields in any of the rotations. However, this likely be will not be true in the 2003 wheat crop. [Paper Number 137]

**PHYSICAL AND BIOLOGICAL ATTRIBUTES OF AN ALTERNATE SALT FORMULATION OF GLYPHOSATE.** Jeffrey A. Koscelny, Joseph J. Sandbrink, David C. Heering and Paul G. Ratliff. Roundup Technical Manager, Roundup Technical Manager, Roundup Technical Manager and Roundup Biologist. Monsanto Company, St. Louis, MO.

*Abstract.* Since the commercial introduction of a glyphosate formulation in 1974, there has been continuous research and innovation efforts to further enhance performance. This continuous research and innovation has lead to

several breakthrough formulations as well as to the faster commercialization of new formulations. In addition, the introduction and acceptance of glyphosate tolerant crops has led to an increased use of glyphosate for broad-spectrum weed control in-crop. Despite previous formulation breakthroughs, customers continue to ask for complete, more concentrated formulations that perform across a wide range of environments. The objectives of this research was to develop a complete glyphosate formulation with 1) state-of-the-art handling efficiencies, 2) consistency of performance under ideal to tough conditions and 3) maintain excellent glyphosate tolerant crop safety. While there are several counter ions that can be used to formulate glyphosate salts as liquids, for each there is a load versus viscosity tradeoff. To achieve the desired higher glyphosate concentration, the potassium salt of glyphosate was chosen. Potassium glyphosate is unique in that it is a highly compact solvated ion pair allowing for more of these ion pairs in a volume of water without sacrificing viscosity. Greenhouse, growth chamber and field research trials were conducted to evaluate the potassium salt of glyphosate formulation. At labeled rates, this new glyphosate formulation provided excellent broad-spectrum weed control. Under less than ideal conditions, the new formulation provided statistically better weed control when compared to competitive glyphosate formulations. Glyphosate tolerant crop response to this formulation was minimal to no affect with no impact on yield. As a result of these positive results, MON 78270, a 4.5 lb ae/gal potassium salt of glyphosate formulation, has been commercialized in the US. [Paper Number 150]

**COMPARISON OF GLYPHOSATES, 2,4-D AND ADDITIVES FOR WEED CONTROL IN POST HARVEST FALLOW.** Robert N. Klein[1], Jeffrey A. Golus[1] and James T. Daniel[2]. Professor, Ext. Research Technologist and Product Develop Manager. [1]University of Nebraska, North Platte, NE and [2]United Agri Products, Johnstown, CO.

*Abstract.* A study was conducted to evaluate the efficacy of glyphosate and 2,4-D formulations along with additives in post harvest winter wheat stubble. Treatments included various combinations of glyphosate (isopropylamine salt and an acid formulation) and 2,4-D (isooctyl acid and dimethylamine salt). An additive containing lecithin, methyl esters of fatty acids and alcohol ethoxylate was included in all treatments. Ammonium sulfate and an experimental additive were included in some treatments. Treatments were applied with a 15 foot shielded boom sprayer (six 11003XR nozzles on 30 inch spacing). Nozzle pressure was 20 psi, carrier volume 10 gpa and speed 4.1 mph. Yellow foxtail (6 to 16 inches tall) and kochia (6 to 18 inches) were present in all plots. Many other weeds were also present, but not in all plots. Visual percent control ratings were taken on August 9 and August 23. The treatment containing glyphosate acid at the high rate (0.5 lb acid equivalent/acre) yielded 85% control of yellow foxtail on August 23. The next highest treatment yielded 50% control on the same date. The treatment containing isopropylamine salt of glyphosate at the high rate (0.5) with ammonium sulfate gave significantly better control (LSD = 5%) of yellow foxtail on August 23 than a similar treatment without ammonium sulfate. The treatment with glyphosate acid at the high rate (0.5) had 80% control of kochia on August 23, with the next highest treatment having 38%. Within the 2,4-D treatments, there were no significant differences between formulations at the same rate. [Paper Number 152]

**PHENOTYPIC COMPARISON OF WHEAT X JOINTED GOATGRASS HYBRIDS DERIVED FROM ROUNDUP READY WHEAT OR A NON-HERBICIDE RESISTANT NEAR-ISOGENIC WHEAT LINE AND JOINTED GOATGRASS.** Jennifer L. Hansen[1], Sara K. Pfeiffer[1], Michael J. Horak[2] and . Research Support Scientist 1, student, Study Coordinator and . [1]University of Idaho, Moscow, ID and [2]Monsanto Company, St. Louis, MO.

*Abstract.* The advent of transgenic wheat has raised concerns about the potential for the transgenic gene to confer a fitness advantage to hybrids between jointed goatgrass and wheat. A confined greenhouse study was established in 2001 at the University of Idaho to evaluate phenotypic characteristics of hybrid plants of Roundup Ready wheat x jointed goatgrass compared to hybrid plants of its isogenic non-transgenic control wheat x jointed goatgrass. Both vernalized and non-vernalized studies were initiated consisting of the hybrids, reciprocal hybrids, and the parental wheat and jointed goatgrass lines. Developmental data, including days to emergence and days to heading, and plant growth data, such as tiller number, plant height, number of spikes, length of spikes, kernel number, and plant dry weight, were recorded and analysed. Significant differences for some plant development or growth characteristics were observed in both the vernalized and non-vernalized studies between hybrid types with and without the Roundup Ready trait. However, these differences were not consistently associated with the presence or absence of the Roundup Ready trait. This lack of association supports a conclusion that the Roundup Ready trait is not

conferring a biologically meaningful fitness advantage to hybrid plants produced by crossing the Roundup Ready wheat and the jointed goatgrass over the non-transgenic wheat x jointed goatgrass hybrids. [Paper Number 153]

**PERFORMANCE OF THE CLEARFIELD SYSTEM IN OKLAHOMA WHEAT.** Brad W. Collier, Case R. Medlin and Thomas F. Peeper. Graduate student, Assistant Professor and Professor. Department of Plant and Soil Sciences, Oklahoma State University, Stillwater, OK.

*Abstract.* On-farm experiments were conducted at six sites in Oklahoma in the 2001-2002 winter wheat crop year to introduce Clearfield wheat technology to the hard red winter wheat industry. Two of the replicated on-farm experiments were infested with cheat, feral rye, and jointed goatgrass. Variables included herbicide treatments and application timing. An experimental imidazolinone-tolerant hard red winter wheat bred by Dr. B. Carver of Oklahoma State University was seeded at 83 lb/A, in 8-inch rows at each site in either September or October. The experiment design at each location was a randomized complete block with 12 by 30 ft plots and four replicates. At all sites treatments included Finesse (chlorsulfuron + metsulfuron 5:1) applied PRE at 0.38 oz ai/acre and an untreated check. POST treatments, applied in water carrier in November, February, and March, included Maverick (MON 37500) at 0.5oz ai/acre, Everest (MKH 6562) at 0.43 oz ai/acre, and Beyond (imazamox) at 0.5 and 0.63 oz ai/acre. These POST treatments were applied with appropriate additives. Beyond was also applied in 50% UAN carrier in February. Weed control was visually estimated in the spring and grain yield, grain moisture and dockage due to weed seed were determined by harvesting at maturity. All treatments except Finesse controlled cheat above 95% at both locations. Finesse is labeled for cheat suppression and it suppressed cheat 28 and 40% at the two sites. Maverick and Everest controlled cheat 95% or more at both sites, and had little effect on feral rye and jointed goatgrass. Imazamox at 0.5 oz ai/acre controlled cheat, feral rye, and jointed goatgrass 98% or more except that feral rye was controlled approximately 92% when the herbicide was applied in February in water carrier. Effective weed control reduced dockage and increased wheat yields. In some situations, weed control also reduced grain moisture, which could permit harvesting the crop earlier. [Paper Number 154]

**SEASON LONG DOSE RESPONSE OF SUGAR BEET TO SULFOMETURON.** Don W. Morishita[1], Pamela J. Hutchinson[2], Michael J. Wille[1] and Brent R. Beutler[1]. Professor, Assistant Professor, Support Scientist and Support Scientist. [1]University of Idaho, Twin Falls, ID and [2]University of Idaho, Aberdeen, ID.

*Abstract.* A study was conducted at the Kimberly and Aberdeen Research and Extension Centers located in southern Idaho to determine the dose-effect of soil-applied sulfometuron on the growth and yield of sugar beet (Beta vulgaris L.). Sulfometuron was applied preplant on April 24 and May 9, 2002, at Kimberly and Aberdeen, respectively. Sulfometuron rates were applied at targeted soil concentrations of 0, 7.5, 15, 30, 60, 120, 240, 480, and 960 ppt. Sulfometuron was incorporated immediately after application with a PTO-driven roto-tiller to a depth of 7.6 cm. Soil texture was a silt loam at Kimberly and a loam at Aberdeen. Sugar beet was planted April 25 at Kimberly and May 10 at Aberdeen. Due to a late frost May 7 and 8 at Kimberly, sugar beet was re-planted May 14 at a rate of 141,000 seed per hectare. All plots were sprayed three times with a tank mixture of ethofumesate & desmedipham & phenmedipham (efs&dmp&pmp) + triflusulfuron + clopyralid (applied only with the second and third applications). Efs&dmp&pmp was applied at 0.25 lb ai/A on the first application and 0.33 lb ai/A on the second and third applications. Triflusulfuron and clopyralid were applied at 0.0156 and 0.094 lb ai/A, respectively. An additional 60 ppt sulfometuron treatment was included in the experiment with no triflusulfuron included with any of the postemergence herbicide applications. Soil samples were collected at the 0 to 7.6 cm depth from each plot to determine a baseline sulfometuron concentration in the soil. Sugar beet injury was evaluated visually two times during the growing season and the crop was harvested October 8 and 10 at Kimberly and Aberdeen, respectively. Sugar beet injury with the sulfometuron treatments ranged from 0 to 99% at the first evaluation, which was about 75 days after treatment (DAT). At Kimberly, sugar beet injury at the 30 ppt concentration was 36% and significantly greater than the 7.5 or 15 ppt treatments. Injury from 120 to 960 ppt ranged from 78 to 95% and were not different from one another at P=0.05. At Aberdeen, sugar beet injury averaged 25% among concentrations ranging from 7.5 to 60 ppt. Injury at 120 and 240 ppt averaged 74 and 87%, respectively and were statistically different. At about 100 DAT, injury ratings from both sites ranged from 9 to 92% with a general decline in injury level at all sulfometuron concentrations. At Kimberly, injury level averaged 14% from 7.5 to 120 ppt, while at Aberdeen, sugar beet injury at 120 ppt was 43%, and significantly higher than the 7.5 to 60 ppt treatments, which averaged 13%. Sugar beet yields at Kimberly were significantly lower at soil concentrations greater than or equal to 30 ppt compared to the control. At Aberdeen, sugar beet yields were reduced at sulfometuron soil concentrations greater than 60 ppt compared to the

control. These data indicate that sugar beet growth and yield may be reduced by sulfometuron concentrations in the soil as low as 30 to 60 ppt. [Paper Number 155]

**INTEGRATED PEST MANAGEMENT USING PRECISION HERBICIDE APPLICATION.** David A. Claypool, Stephen D. Miller and Craig Alford. Research Associate II, Professor and Associate Research Scientist. University of Wyoming, Laramie, WY.

*Abstract.* The objective of this research is to establish the foundation for an integrated pest management program for control of skeletonleaf bursage (Ambrosia tomentosa Nutt.) in dryland cropping systems using the technologies of precision herbicide application (PHA), global positioning system (GPS), and geographic information systems (GIS). Skeleonleaf bursage (SB) is a noxious, perennial weed that is difficult and expensive to control. Little agonomic, economic, or biological information is available on this species. Treatments consisted of an unsprayed check, whole-field application (WFA), and PHA of clopyralid. The experimental design was a randomized complete block with four replicates and each plot was divided into three subplots for data collection and treatment application. GPS was used to map SB patches, subplots, and four height classes of corn (Zea mays L.) at tasseling. GIS was used to determine subplot area infested with SB. Subplots in the PHA treatment with an infestation level greater than 15% were sprayed. Samples were collected to correlate corn yield to SB density. Severe drought reduced herbicide effectiveness in 2001 and 2002. In 2001, treatments were not significantly different with respect to corn dry matter yield. Yields of subplots ranged from 1287 to 5466 kg /ha. Subplot area infested with SB ranged from 7.6 to 100 % and bursage percent cover ranged from 0.5 to 50 %. Correlation coefficients of data collected were as follows: infested area vs percent cover (0.818), percent cover versus yield (-0.651), infested area vs yield (-0.621). Correlation coefficient of yield to SB density was -0.794. In 2002, treatments were different at the P>0.10 level. Yields of subplots ranged from 58 to 2791 kg/ha. Subplot area infested with SB ranged from 0 to 100 % and percent cover ranged from 0 to 60 %. Correlation coefficients of data collected were as follows: infested area vs percent cover (0.899), percent cover versus yield (-0.465), infested area vs yield (-0.293). Correlation coefficient of yield to SB density was -0.801. The combination of GPS and GIS was effective in providing an illustration of the distribution of SB and corn yields in the study. Severest reduction in corn height generally occurred near the centers of SB patches. [Paper Number 156]

**SEASON LONG DOSE RESPONSE OF POTATO TO SULFOMETURON.** Pamela J.S. Hutchinson[1], Don W. Morishita[2], Brent R. Beutler[1] and Felix E. Fletcher[1]. Assistant Professor, Professor, Support Scientist and Research Technician. [1]Aberdeen Research and Extension Center, University of Idaho, Aberdeen, ID and [2]Twin Falls Research and Extension Center, University of Idaho, Twin Falls, ID.

*Abstract.* A study was conducted at the Kimberly and Aberdeen Research and Extension Centers located in southern Idaho to determine the effect of soil-applied sulfometuron dose on the growth and yield of potato (*Solanum tuberosum*). Sulfometuron was applied preplant on April 24 and May 9, 2002, at Kimberly and Aberdeen, respectively. Sulfometuron rates were applied at targeted soil concentrations of 0, 7.5, 15, 30, 60, 120, 240, 480, and 960 ppt. Sulfometuron was incorporated immediately after application with a PTO-driven roto-tiller to a depth of 7.6 cm. Soil texture was a silt loam at Kimberly and a loam at Aberdeen. 'Russet burbank' potato was planted April 25 at Kimberly and May 10 at Aberdeen. Soil samples were collected at the 0 to 7.6 cm depth from each plot to determine a baseline sulfometuron concentration in the soil. The entire trial area was treated with pendimethalin plus EPTC plus metribuzin preemergence, and kept weed-free with hand weeding during the growing season. Potato injury was evaluated visually during the growing season; a mid-season biomass collection, visual root and tuber ratings, and defected tuber counts were performed in July; and tubers were harvested from the two center rows of each plot September 19 and October 3 at Kimberly and Aberdeen, respectively. Tubers were graded according to USDA standards, and number of tubers misshapen, or with knobs, cracks, or folds was recorded. Potato injury at row closure approximately 6 weeks after treatment (WAT) consisted mainly of stunting, and ranged from 0 to 20%. At Kimberly, potato injury at the 240 to 960 ppt concentration was 6 to 20% and significantly greater than in the untreated check at P=0.05. At Aberdeen, potato injury at 120 to 960 ppt was 5 to 11%, and significantly greaterr than in the untreated check. Mid-season potato leaf and vine biomass was reduced significantly at 480 and 960 ppt compared to the untreated check at both locations. Mid-season visual root and tuber injury was greater in all sulfometuron treatments compared to the untreated check. Roots were stunted, pruned, and root hairs reduced. There was a greater percentage of misshapen, or cracked and folded tubers in sulfometuron treatments of 60 to 960, or 120 to 960 ppt, respectively. Total tuber yields in plots with initial sulfometuron soil concentrations of 960 ppt were

significantly less than in the untreated check plots at Kimberly, and U.S. No. 1 tuber yield was reduced by 240 to 960 ppt sulfometuron soil concentrations at both locations compared to yields in the untreated checks. U.S. No. 1 percent of total yield was reduced significantly by 60 to 960, or 240 to 960 ppt sulfometuron soil concentrations at Kimberly or Aberdeen, respectively. Percent of tubers with cracks or folds was greater in plots with 240 to 960 ppt, and percent misshapen tubers was greater in plots with 120 to 960 ppt sulfometuron soil concentrations compared to percent affected tubers in the untreated checks. Cull yields (tubers with more than one defect) increased significantly in plots with 240 to 960 ppt sulfometuron soil concentrations at both locations compared to the untreated check, and cull percent of total yield increased in plots with 60 to 960, or 240 to 960 ppt sulfometuron soil concentrations at Kimberly or Aberdeen, respectively. These data indicate that potato growth, yield, and tuber quality may be reduced by sulfometuron concentrations in the soil as low as 60 ppt. [Paper Number 157]

**THE DELIVERY OF ROUNDUP WEATHERMAX AS EFFECTED BY STARCH-BASE AND LECITHIN-BASED DRIFT REDUCTION AGENTS.** daniel L. Bergman. Director of Product Development. Loveland Industries, Greeley, CO.

*Abstract.* Droplet spectrum analysis was performed to determine the effect of Valid™ (lecithin-based) and Array® (starch-based) on droplet size production using New Roundup WEATHERMAX™ glyphosate formulation. Results show a decrease in the production of fine droplets (< 150 microns) with the addition of Valid or Array as compared to Roundup WEATHERMAX only. Valid showed an increase in mid-range droplet sizes (150-500 microns) as compared to Array or Roundup WEATHERMAX alone. An increase in the production of droplets larger than 500 microns were measured when using Array with Roundup WEATHERMAX. Additional studies were conducted to understand the effect of Valid and Array on spray pattern overlap when using Roundup WEATHERMAX. Valid resulted in a minimum change in the Coefficient of Variation (Cv) compared to Roundup WEATHERMAX alone. Array showed significant increase in the (Cv). [Paper Number 159]

**THE BIOLOGICAL AND CHEMICAL ACTIVITY OF METOLACHLOR AND S-METOLACHLOR IN FIVE MID-WEST AND GREAT PLAINS SOILS.** Dale Shaner[1], Philip Westra[2], Galen Brunk[2], Nick Polge[3] and Mike Johnson[3]. Senior Biologist, Professor, Research Scientist, Biologist and Senior Researcher. [1]ARS/USDA, Ft. Collins, CO, [2]Colorado State University, Ft. Collins, CO and [3]Syngenta, RTP, NC.

*Abstract.* Greenhouse and laboratory studies were conducted to compare the chemical and biological activity of r/s metolachlor and s-metolachlor in distinct soils (5) from WI, MN, NE, and CO. Approximate Kds for these soils were MN=7, NE=4.5, WI=4, CO G=2.2, CO S=1.7. There was no difference in soil binding in these soils for both form of metolachlor. Soil solution studies showed magnitude of differences similar to the Kd studies; the CO S soil water concentration (ug/ml) was 1.6 compared to 0.4 for the MN soil (following an application at 10 ppm). Greenhouse studies using barnyard grass and green foxtail as indicator species showed that the resolved isomer s-metolachlor was significantly more active across all soil types than the r/s metolachlor. In the WI soil the GR50 of s-moc was more than 2.5 fold lower than for r/s moc. In the MN soil the difference was 3 fold, while in the CO soils, the difference appeared to be the greatest. Green foxtail was more sensitive than barnyard grass to both forms of metolachlor. [Paper Number 160]

**VOLUNTEER CANOLA CONTROL IN CROPS AND FALLOW.** Richard K. Zollinger, Brian M. Jenks and Neil R. Riveland. Associate Professor, Weed Scientist and Agronomist. North Dakota State University, Fargo, ND.

*Abstract.* Field research was conducted at one location in 1998 and two locations in 2002 to evaluate control of glyphosate resistant canola volunteers from preplant treatments and herbicides used in small grains and soybean. Registered glyphosate premixes containing 2,4-D applied at rates registered for preplant use or mixtures of glyphosate + 2,4-D at comparable rates gave 88 to 94% control of volunteer glyphosate resistant canola. A registered premix of glyphosate + dicamba at 0.53 or 0.72 lb/A gave less than 40% control. Premix of thifensulfuron& tribenuron at 0.014 lb/A applied with 2,4-D at 0.25 lb/A gave 84 to 89% control but bromoxynil&MCPA at 0.5 lb/A applied with or without thifensulfuron&tribenuron + MCPA increased control to 93%. Most treatments applied in wheat gave greater than 94% control. The following treatments applied to cotyledon canola gave greater than 96% control: Thifensulfuron&tribenuron at 0.15 oz/A or reduced rates, 2,4-D, and carfentrazone. The following treatments applied to 3- to 4-leaf or 5-leaf canola gave greater than 94% control: carfentrazone, bromoxynil&MCPA, MCPA applied with thifensulfuron&tribenuron or tribenuron. Volunteer

glyphosate resistant canola control in soybean was variable. Control from the following soybean herbicides at label or reduced rates gave the following control: thifensulfuron less than 73%, carfentrazone less than 21%, cloransulam greater than 90%, fomesafen 99%, imazamox greater than 90%, and imazethapyr 99%. These studies demonstrate acceptable control of volunteer glyphosate resistant canola. Growers can add other products to glyphosate for preplant or in-crop (glyphosate resistant) to control small canola. [Paper Number 161]

**CONTROL OF ANNUAL AND PERENNIAL WEEDS WITH ROUNDUP TRANSORB IN ROUNDUP READY WHEAT IN CANADA.** Mark B. Lawton[1], Mark J. Kidnie[2], Bill M. Hamman[3], Rob C. Ripley[4] and Joe J. McNulty[5]. Technology Development DirectorDirector, Technology Development Rep, Technology Development Rep, Technology Development Rep and Technology Manager. [1]Monsanto Canada Inc., Guelph, On, [2]Monsanto Canada Inc., Edmonton, Ab, [3]Monsanto Canada Inc., Lethbridge, Ab, [4]Monsanto Canada Inc., Saskatoon, Sk and [5]Monsanto Canada Inc., Winnipeg, Mb.

*Abstract.* Applications of Roundup Transorb herbicide were made to Roundup Ready wheat (*Triticum aestivum*) to assess the control of annual and perennial weeds in 75 replicated trials from 1999 to 2001 in western Canada. A single application of 450 g ae/ha at the four to five leaf stage of Roundup Ready wheat provided excellent control of a large number of annual grass and broadleaf weeds 15 to 40 days after treatment. Greater than 90% control was recorded for all annual weeds such as wild oats (*Avena fatua*), green foxtail (*Setaria viridis*), redroot pigweed (*Amaranthus retroflexus*), common lambsquarters (*Chenopodium album*), and wild mustard (*Brassica kaber*). Increasing the rate to 675 g ae/ha did not significantly increase the level of control on these annual weeds however; 675 g ae/ha did significantly increase the control of wild buckwheat (*Polygonum convolvulus*) to >90% when compared to the 450 g ae/ha rate. A single application of 675 g ae/ha at the four to five leaf stage of Roundup Ready wheat provided >90% control of quackgrass (*Elytrigia repens*) and perennial sowthistle (*Sonchus arvensis*) 50 to 85 days after treatment. Increasing the rate to 900 g ae/ha did not significantly increase the control of quackgrass and perennial sowthistle. Canada thistle (*Cirsium arvense*) was commercially controlled (>80%) 50 to 85 days after application at 675 g ae/ha but increasing the rate to 900 g ae/ha significantly increased the level of control to >90%. Only the application of 900 g ae/ha of Roundup Transorb commercially controlled dandelion (*Taraxacum officinale*) in Roundup Ready wheat. No significant difference in control was observed in quackgrass, perennial sowthistle, Canada thistle and dandelion when a single 900 g ae/ha application was compared to sequential applications at 450 g ae/ha. No crop injury was observed in any trial. Results indicate that an application of Roundup Transorb at 450 to 675 g ae/ha will provide excellent control of a broadspectrum of annual grass and broadleaf weeds and that an application of 675 to 900 g ae/ha will provide commercial control of key perennial grass and broadleaf weeds in western Canada. [Paper Number 162]

**THE USE OF A DECISION-AID MODELING APPROACH TO IMPROVE WEED MANAGEMENT AND UNDERSTAND WEED SHIFTS IN IMPORTANT AGRONOMIC CROPS.** John Withrow and Phil Westra. Dept. of Bioagricultural Sciences and Pest Management, Colorado State University, Fort Collins, CO.

*Summary*. A new model known as WISDEM is presented as an effective management decision-aid tool in glyphosate-tolerant corn. [Paper Number 182]

**COMPARISON OF ACCUPULSE, A NEW SPRAY SYSTEM FOR IRRIGATED AGRICULTURE, WITH CHEMIGATION.** Loretta Sandoval[1] and Dale Shaner[2]. Student and Dr.. [1]Colorado State University, Fort Collins, CO and [2]Water Management Unit, USDA-ARS, Fort Collins, CO.

*Abstract.* AccuPulse is a new application that is attached to center pivot and linear irrigation equipment for applying pesticides and fertilizers. The system consists of accumulator/nozzles set at 125 cm intervals that discharge their contents in a pulse at specific intervals dependent on the movement of the irrigation towers. AccuPulse is intended as an alternative for ground or aerial application of chemicals. Comparisons were made between AccuPulse, chemigation, ground and aerial applications in terms of coverage and chemical deposition. Tests with water sensitive paper showed that the amount of coverage was ground application >AccuPulse>aerial, based on application rates of 250 l/ha for the ground application and AccuPulse and 100 l/ha for the aerial application. A study was done to compare the amount of chlorothalanil retained on potato leaves when applied through chemigation vs. AccuPulse with two applications one week apart. Potato leaves treated with AccuPulse had an average of 7.2 ug/cm2 of chlorothalanil versus 0.24 ug/cm2 with chemigation. One week after application the level on the leaves treated with

AccuPulse had declined to 0.8 ug/cm2 while the residue left on the chemigation treated leaves was .018 ug/cm2. [Paper Number 184]

**IMAZAMOX EFFICACY AND CROP TOLERANCE IN IMIDAZOLINONE-RESISTANT SUNFLOWER.** Phillip W. Stahlman[1], Patrick W. Geier[1], Gregory W. Kerr[1] and Troy M. Price[2]. Professor, Assistant Scientist, Assistant Scientist and Assistant Scientist. [1]Agricultural Research Center, Kansas State Univeristy, Hays, KS and [2]Northwest Research-Extension Center,, Colby, KS.

*Abstract.* Field experiments were conducted in 1999, 2001, and 2002 at Hays and in 2002 at Colby, Kansas to evaluate weed control and crop tolerance with imazamox-based treatments in imidazolinone-resistant sunflowers. Some experiments included an adjuvant comparison between methylated seed soil (MSO) and nonionic surfactant (NIS). In 1999, imazamox at 0.032 lb/A or higher plus NIS and urea-ammonium nitrate (UAN) at 0.25% v/v and 2 qt/A, respectively, controlled tumble pigweed, redroot pigweed, and green foxtail by 100% at 26 DAT. Control of hophornbeam copperleaf increased from 82 to 92% as imazamox rate increased from 0.032 to 0.096 lb/A. All imazamox treatments caused 10% or less chlorosis at 6 DAT but plants recovered within a few days and seed yields were not affected. At 4 WAT in 2001, imazamox at 0.032 lb/A or higher plus MSO and UAN at 1% + 2.5% v/v controlled tumble pigweed as tall as 12 inches by 90% or more; however, control declined 15 to 25% within the next 2 wk. Conversely, puncturevine control at 4 WAT ranged from 45% to 85% with imazamox at 0.032 to 0.128 lb/A and increased to 85 to 100%, respectively, at 6 WAT. Leaf chlorosis at 6 DAT increased from 10 to 25% with increasing rate up to 0.128 lb/A. However, plants recovered completely within 3 wk and sunflower seed yields did not differ within or among growth stages. In 2002, tank mixing imazamox and imazapyr at 0.032 + 0.01 lb/A plus NIS at 0.25% and UAN at 1% v/v compared to imazamox + NIS + UAN enhanced control of redroot pigweed and puncturevine in one of two experiments, and Russian thistle, large crabgrass and prairie cupgrass in single experiments by as much as 56%; both treatments controlled tumble pigweed 100%. In two of three experiments, imazamox was more efficacious when applied with MSO than NIS, and both with UAN. Sunflower chlorosis also was greater with MSO, but injured plants in all experiments recovered completely within 3 weeks. [Paper Number 185]

**CONTROL OPTIONS FOR MANAGING VOLUNTEER ROUNDUP READY SPRING WHEAT**. Douglas Ryerson, Sheldon E. Blank, Jefferey E. Herrmann, Craig M. Rystedt, and Luke L. Bozeman, Monsanto Agricultural Company, St. Louis, MO.

*Abstract.* Monsanto Company is developing glyphosate tolerant spring wheat for U.S. and Canadian growers. Monsanto is committed to the product because research indicates that North American spring wheat growers are seeking new weed control options. And, data generated from other corps indicates that this technology is a highly effective tool that saves growers time and money. This technology in wheat offers farmers a compelling value proposition. The benefits include broad-spectrum weed control, yield improvement, a new in-crop mode of action, increased crop safety, simplicity, conservation-tillage enhancement, cleaner grain and no crop rotation restrictions – all combined with the environmental benefits and safety profile of glyphosate products. As part of the development effort, Monsanto recognizes the importance of being able to control glyphosate tolerant volunteer spring wheat as easily as other volunteer wheat. Growers should be able to use all of the herbicides and other tools currently available to control volunteer wheat except glyphosate-based herbicides. Research efforts have focused on selective post-emergent graminicides and results indicate that they can provide acceptable control of volunteer glyphosate tolerant volunteers. A summary of ongoing research efforts to identify best management practices including optimum application timings, rates, and spray additives as well as potential watch-outs will be discussed. [Paper number 186]

**AN UPDATE ON THE REGISTRATION STATUS AND EFFICACY DATA FOR OLYMPUS (PROPOXYCARBAZONE-SODIUM), A NEW SELECTIVE GRASS HERBICIDE FROM BAYER CROPSCIENCE, FOR USE IN SPRING AND WINTER WHEAT.** W Dennis Scott. Sr. Field Development Specialist. Bayer CropScience, Caldwell, ID.

*Abstract.* Propoxycarbazone-sodium, MKH 6561, is a new, low rate experimental herbicide being developed by Bayer CropScience for postemergence grass and broadleaf control in wheat. Propoxycarbazone-sodium will be marketed in the United States as Olympus™ an easy to handle 70 WDG formulation. This chemistry is classified in the chemical class of Sulfonylaminocarbonyl-triazolinone and inhibits the enzyme actetolactate synthase (ALS). Applications can be made in both the fall and spring at rates from 0.61 to 0.92 ozs of product per acre. Olympus™ applications should be made to winter wheat when the majority of the plants have two leaves to a maximum of six total leaves on the main stem plus any number of tillers. Applications to spring wheat should be made when a majority of plants have one leaf to a maximum of 4 leaves on the main stem plus two tillers. In a review of data in replicated trials from across the United States Olympus™ applied at 0.92 ozs/acre gave greater than 90% control of several key grass weeds including Japenese brome, Cheatgrass, Downy brome (fall applications superior to spring applications), Wind grass and greater than 80% control of Wild Oat, Rescue grass, Rat-tail fescue. Olympus™ offers suppression of Jointed goatgrass and most Ryegrass species. This product also provides control greater than 90% of several broadleaf weeds including Red Root Pigweed, Black mustard. Wild Turnip, Shepherdspurse, Burr buttercup, Tansy mustard, Flixweed, Tumble mustard, Field pennycress, and greater than 80% contol of Tumble mustard, Tall wormseed and Bushy wallflower. Olympus™ is taken up into the plant by both root and foliar tissue and demonstrates some residual activity. Foliar uptake is improved by the use of a surfactant and therefore is recommended. The product is translocated within the plant both acropetally and basipetally. Olympus™ has shown excellent crop tolerance in most tested varieties of spring, durum and winter wheat. The registration package was submitted to the EPA in December of 1999. Review is currently underway with the expectation that the active ingredient will be on the agency's 2004 workplan and subsequently the federal registration issued in the first half of 2004. [Paper Number 187]

**POSTEMERGENCE WEED CONTROL WITH NICOSULFURON + RIMSULFURON + MESOTRIONE MIXTURES IN FIELD CORN.** Chris M. Mayo, Helen A. Flanigan and David W. Saunders. R&D Rep, R&D Rep and R&D Asset Manager. DuPont, Grand Island, NE.

*Abstract.* POSTEMERGENCE WEED CONTROL WITH NICOSULFURON + RIMSULFURON + MESOTRIONE MIXTURES IN CORN. Helen A. Flanigan, Chris M. Mayo, Michael T. Edwards and David W. Saunders, Development Representatives and Product Development Managers, DuPont Crop Protection, Wilmington, DE 19880-0705 In field trials the 2:1 premix of nicosulfuron and rimsulfuron applied at 0.56 ozai/acre provided excellent postemergence control of grass and some broadleaf weeds in field corn. The addition of mesotrione at 0.75–1 ozai/acre provided control of common lambsquarters, Eastern black nightshade, and velvetleaf. For control of Palmer amaranth, atrazine at 12 ozai/acre was required in the tank mixture. Evaluations of this and similar tank mixtures taken 56 days after treatment from 35 sites, demonstrated season-long control of common lambsquarter, common waterhemp, Palmer amaranth, velvetleaf and giant foxtail. [Paper Number 188]

**ALFALFA HERBICIDE POLLUTION PATHWAYS AND POTENTIAL MITIGATION PRACTICES.** Terry L. Prichard[3], John Troiano[2] and Mick Canevari[3]. Water Management Specialist, Chief, Monitering Division and Farm Advisor. [1]University of California Davis, Davis, CA, [2]Department of Pesticide Regulation, Sacramento, CA and [3]University of California Extension, Stockton, CA.

*Abstract.* Investigations on the pathway for movement of residues to ground water are needed to determine if mitigation measures can be developed that allow continued use, but that are also protective of underground aquifers. Such a field study was initiated in the winter of 1999 in the Tracy area of Central California. The soil at the site was a Capay with close proximity to the ground water table. Border check irrigation was used. The objectives were to: (1) evaluate the fate of diuron and hexazinone applied to an alfalfa crop; (2) determine potential for downward movement of water from the runoff holding ponds; (3) evaluate the effect of a surfactant on the offsite movement of hexazinone and diuron; (4) investigate the effectiveness of trifluralin and paraquat as potential replacements. Objective 1 was determined through sampling of soil in the field, collecting and sampling runoff water leaving the

checks, and sampling soil and water obtained from the holding pond. Objective 2 was determined by measuring water table depth in boreholes drilled near the pond and by coupling these results to the rate of loss of water from the pond. Objective 3 was an attempt to mitigate the movement of the residues by adding a surfactant to the spray mix, which theoretically would facilitate greater interaction between the pesticide residue and soil matrix. Objective 4 was a second mitigation effort, which substituted two herbicides that have a higher propensity to interact with the soil matrix and, thus, provide a greater probability for remaining onsite. A randomized complete block design with 4 replicate blocks was utilized to compare environmental fate and efficacy among the following three main treatment effects: (1) hexazinone and diuron applied at 0.56 and 1.68 kg/ha, respectively; (2) effect of a surfactant added to Treatment #1 at a rate of 18.71 L/ha; (3) efficacy and fate of alternative herbicides using trifluralin and paraquat applied at 0.56 and 1.68 kg/ha, respectively. Background sampling found about 8% of the application rate of diuron as a residual from the previous year's application. Movement of diuron and hexazinone in this cracking clay soil was confined to the upper reaches of the soil profile even though water percolated past the deepest depths sampled (1 meter). The mass of residues recovered from the total soil core length prior to the first irrigation represented a decrease from the application day values of 66% for diuron and 79% for hexazinone, however no measurable runoff occurred. The distribution of residues throughout the soil profile was different between diuron and hexazinone. Very little diuron was detected beneath the first 0- 69 mm depth, whereas, concentrations of hexazinone in the deeper segment were equal to those measured in the first segment. Little to no residues were measured for either herbicide in the third segment, which represented the 271-339 mm depth. Based on a comparison of their physical-chemical properties, greater movement through soil would be expected for hexazinone, caused primarily by its lower soil adsorption value (Koc). After the second irrigation (June), the magnitude of the residues for both pesticides was reduced to levels that were similar to those measured in the background samples. Statistical tests for effects of treatment and location were not significant. Trifluralin or paraquat was detected in soil samples. Significant differences in diuron concentration were measured between irrigations with the concentrations for the first irrigation runoff approximately twice the concentration of the second. Hexazinone concentrations also appeared greater at the first irrigation; however, the level of probability indicated only a trend (P= 0.0726). The addition of the surfactant did not significantly affect the concentration of herbicides in runoff water. No significant differences in the mass of herbicide leaving the field as runoff were found between treatments or irrigations. Although the concentration of diuron herbicide was reduced in half from the first irrigation, the runoff volume had tripled in the second irrigation resulting in no significant differences in the mass leaving the field. The results for hexazinone were similar. The mass of diuron and as mean of treatments was 1.97 grams per hectare for the two irrigation events. Hexazinone was lower at 0.0615g/ha. The mass was carried in 84 cubic meters of runoff water. Concentrations of both diuron and hexazinone decline with increasing runoff volumes. No trifluralin or paraquat was detected in runoff waters. A model constructed from collected data predicts less than one tenth the original runoff concentration (.2ppb) of diuron in the runoff water at a cumulative runoff of 460 cubic meters per hectare. The model constructed for hexazinone predicts less than 0.07 ppb at a cumulative runoff of 246 cubic meters per hectare at the same proportional reduction. The holding pond captured the unmeasured runoff from the entire field. The non-experimental area was treated with both diuron and hexazinone as in Treatment 1; however, runoff volume per acre was managed to be smaller than the experimental area. Given these differences, the runoff concentrations from the experimental area were similar to those measured in the pond. The mass of residues infiltrated for diuron was 10.13 grams while hexazinone was 0.79 grams as a result of the two irrigations. These values could have been larger or smaller depending on the runoff management. However even with a controlled runoff the model predicts the concentration to be relatively low by season's end. The rate of infiltration is rapid at near 17cm/$m^3$/day at maximum capacity. Infiltration rate declines with pond depth. It is suspected cracking of the pond wall during the drying cycle enhances the infiltration rate. The pond-infiltrated water has a direct effect of raising localized groundwater levels measured 6 meters south into the field. Each irrigation event increased the groundwater level as a direct response to pond filling and infiltrating stages. Concentration of diuron measured in the groundwater at season's end declined with distance from the pond starting at 2.5 ppb with a linear decline with distance to non-detectable at 12 meters. Hexazinone, by virtue of its lower soil adsorption value (Koc), was constant from the pond water to the farthest distance measured (49m). [Paper Number 189]

**INFLUENCE OF APPLICATION TIME OF GLYPHOSATE TREATMENTS ON BARNYARDGRASS.**
Gail A. Wicks, Gordon E. Hanson and Gary W. Mahnken. Professor, Technician and Technician. University of Nebraska, West Central Research and Extension Center, North Platte, NE.

*Abstract.* This experiment was initiated following an investigation of poor performance on control of barnyardgrass when glyphosate was sprayed in the evening. A producer sprayed glyphosate at 0.75 lb ai/A in the afternoon. The wind came up and spraying was delayed until 6:30 p.m. and was completed by 7:30 p.m. At 9:30 p.m. a trace of rain occurred. Three weeks later the evening application had to be resprayed. This raised the question if glyphosate was rainfast by 9:30 p.m. or was it due to spraying in the evening. Therefore, we performed an experiment to investigate the effect of time of day of glyphosate application on control of barnyardgrass. Glyphosate was applied at 2 and 7 p.m. July 27, August 6, August 10, and August 16, 2001 to barnyardgrass infested winter wheat stubble near North Platte, NE. Glyphosate rates were 0.5 and 0.75 lb ai/A with and without atrazine at 2.0 lb ai/A. Ammonium sulfate at 17 lb/100 gal was applied with each herbicide treatment in 10 gpa spray solution. Barnyardgrass was 14 to 16 inches tall July 27, 18 to 20 inches tall August 6, and 18 to 24 inches tall August 16. Barnyardgrass was under drought stress on the July 27 application date. The August 6 treatments followed 2.31 inches of rain between July 29 and August 1, while August 16 the barnyardgrass was headed and approaching maturity. Control readings were taken 30 days after treatment. Control with the 0.5 lb/A rate of glyphosate was equal to the 0.75 lb/A rate when the barnyardgrass was not under stress, but control was 78 vs. 90% in the afternoon when under stress. Control with glyphosate at 0.5 lb/A sprayed in the evening was less than the 0.75 lb/A rate treated July 27 and August 6. Atrazine antagonized the glyphosate when mixed together for both rates when glyphosate was applied July 27 and August 6 in the afternoon, and only with the 0.5 lb/A rate applied August 16. Treatments applied August 6 in the evening had no difference between glyphosate and glyphosate + atrazine rates. However, Aug. 10 and August 16 treatments showed that atrazine caused antagonism at the low rate in the evening. The high rate mixed with atrazine was less than glyphosate without atrazine. Barnyardgrass control with glyphosate following wheat harvest can be improved if under drought stress by increasing the glyphosate rate. It is always wise to add more glyphosate when combined with atrazine. At least 0.75 lb/A of glyphosate should be used when spraying barnyardgrass in wheat stubble in the evening. [Paper Number 190]

**SPRING WHEAT VARIETAL RESPONSE TO FLUCARBAZONE.** Chuck Cole, Jed Colquhoun, Bill D. Brewster, Carol Mallory-Smith and Rich Affleldt, Faculty Research Assistant, Extension Weed Specialist, Senior Instructor, Professor and Faculty Research Assistant, Oregon State University, Corvallis OR 97331

*Abstract.* Studies were conducted in 2002 to evaluate the response of spring wheat cultivars to flucarbazone applied alone or tank-mixed with thifensulfuron/tribenuron and/or 2,4-D amine at the 4-leaf and 2-node wheat growth stages. Cultivars included 'Alpowa,' 'Dirkwin,' and 'Penewawa.' Wheat response differed by cultivar. 'Alpowa' was injured most when flucarbazone or flucarbazone plus thifensulfuron/tribenuron were applied at the 2-node wheat growth stage. Injury from the 2-node flucarbazone application was alleviated with the addition of 2,4-D amine. Wheat yield was similar to the weed-free untreated check with all herbicide treatments. Injury to 'Dirkwin' wheat was severe at both application timings and with all herbicide combinations. Wheat yield was related to vegetative biomass and tiller number, and was reduced by all herbicide treatments with the exception of flucarbazone tank-mixed with thifensulfuron/tribenuron and 2,4-D amine at the 2-node wheat growth stage. While injury to 'Penewawa' was greatest when flucarbazone was applied alone or in a tank-mix at the 4-leaf wheat growth stage, wheat yield was not reduced when compared to the weed-free untreated check. Yields were less than the weed-free untreated check when herbicides were applied at the 2-node growth stage. [Paper number 195]

**TOLERANCE DEVELOPMENT OF IMIDAZOLINONE-RESISTANT (CLEARFIELD®) SUNFLOWER HYBRIDS.** Vince Ulstad, Mark L. Dahmer, and Gary L. Fellows. BASF Corporation. Fargo, ND.

Genes conferring tolerance to several imidazolinone herbicides, isolated from wild sunflower populations in 1996, have been successfully transferred to germplasm of cultivated sunflower. This accomplishment has provided opportunity for broad spectrum weed control systems to be developed in sunflower using imidazolinone chemistry. As sunflower breeding programs develop hybrids for commercial production, tolerance levels must provide adequate safety margin to accommodate variations in environment, product application rates, adjuvants used with the application, and sunflower growth stage at application.

BASF AG and partnering sunflower seed organizations have developed tolerance standards for hybrids intended for commercialization. Global and regional market standards provide clear and definitive tolerance expectations. Currently, eleven sunflower breeding programs in fifteen countries are developing Clearfield sunflower hybrids. Elite lines demonstrate excellent tolerance, in crop response after application and achene yield, to imazamox and

imazapyr applied at 2X and 3X levels. Tolerance in elite hybrids is stable across locations (environments), rates up to 3X of intended label product use, adjuvants, and sunflower growth stage at application. [Paper number 196]

**UPDATE ON MESOSULFURON FOR GRASS CONTROL IN WHEAT.** Monte Anderson, Charlie Hicks, Dean Maruska, Mike Smith, and Kevin Thorsness, Field Development, Field Development, Field Development, Field Research, and Technical Service, Bayer CropScience, RTP NC 27709.

*Abstract.* The development of mesosulfuron-methyl (AEF 130060) and the safener mefenpyr-diethyl (AEF 107892) for use in cereals has progressed rapidly over the past year. Mesosulfuron was granted reduced risk status by EPA on September 24, 2002. This is the first sulfonlyurea herbicide to achieve this designation. Mesosulfuron met reduced risk criteria by possessing a favorable environmental profile with reduced risks to human health compared to existing compounds. Expedited review may result in full registration by the end of 2003. Two unique concepts are being developed with mesosulfuron plus the safener mefenpyr. In all areas of winter wheat production, higher rates of herbicide with a lower ratio of mefenpyr will target wild oats and Italian ryegrass, with a proposed trade name of Osprey™. The use in spring wheat will initially be confined to areas permitting the use of very low rates of herbicide with a high ratio of mefenpyr for wild oat control, and the trade name will be Silverado™. New formulations of both concepts were evaluated in 2002 to provide combination products containing both the herbicide and the safener. [Paper number 198]

**POTENTIAL FOR USING NO-TILL TO INCREASE FORAGE AND GRAIN YIELDS OF WINTER WHEAT.** D.L. Bushong and T.F. Peeper; Department of Plant and Soil Sciences, Oklahoma State University, Stillwater 74078.

*Abstract.* In Oklahoma, more than half of the hard winter wheat (*Triticum aestivum* L.) is grown as a dual-purpose crop (forage plus grain). The objective of this study is to agronomically and economically compare no-till and conventional tillage production systems in continuous wheat grown for forage only, forage plus grain, and grain only. Experiments were established in May 2002 in Northern Oklahoma at three on-farm locations. Planting dates varied with the intended use of the crop. An early September planting date was used for forage only, forage plus grain, and forage only plus a summer forage crop (foxtail millet (*Setaria italica* (L.) Beauv)) treatments. A late September planting date was used for additional forage and grain treatments and an October planting for grain only treatments. In May 2002, forage was removed from forage only plots. Foxtail millet was planted in appropriate forage-only plots in late May and the remaining wheat was harvested for grain in June. Glyphosate was broadcast at 0.84 kg a.i./ha on the no-till treatments that did not contain foxtail millet. Conventional tillage plots were moldboard plowed and later disked to control weeds during the fallow period. In August, foxtail millet was harvested and yields were determined on a dry weight basis. Prior to wheat planting, plots were either sprayed with glyphosate at 0.56 kg a.i./ha or disked. Wheat was planted in early September, late September, and October. In mid-November the September-planted wheat was clipped and samples were dried to obtain forage yield. Averaged across locations, the foxtail millet yield was 4770 kg/ha in the conventional treatments and 5450 kg/ha in the no-till treatments. Wheat forage yields in the forage only treatments (without foxtail millet double cropped) averaged 1860 kg/ha in conventional tillage plots and 2700 kg/ha in no-till plots. In the forage plus foxtail millet treatments, the conventional wheat forage averaged 1500 kg/ha versus 1590 kg/ha in the no-till treatments. The early-September planted treatments used for forage plus grain had an average wheat forage yield of 2630 kg/ha in conventional treatments and 3250 kg/ha in no till treatments. In the late-September planted wheat used for forage plus grain, the conventional tillage treatments averaged 1180 kg/ha versus 1110 kg/ha in the no-till treatments. At all three locations, pigweeds (*Amaranthus* spp.) and carpetweed (*Mollugo verticillata*) were the primary weeds during the summer months. At one of the locations kochia (*Kochia scorparia*) was also present and at another there were few other summer annual weeds growing. Late in the summer, volunteer wheat appeared at all locations. The glyphosate applications controlled the weeds present in the experiments. [Paper number 199]

**IMAZAMOX RATE AND TIMING COMBINATIONS IN CLEARFIELD WHEAT.** Anthony D.White, Phillip W. Stahlman, and Patrick W. Geier, Kansas State University, Agricultural Research Center, Hays KS.

*Abstract.* Clearfield wheat combines leading wheat varieties from public and private breeding programs with the imidazolinone herbicide resistance trait. The technology was developed using traditional breeding techniques and because no foreign DNA was introduced or inserted into the wheat plant at any time during the development process, it is not considered a genetically modified organism (GMO). Clearfield wheat allows the use of imazamox

(Beyond), an imidazolinone herbicide developed by BASF, to be applied for selective postemergence weed control. Several experiments were conducted in Kansas to evaluate weed control and crop response to various rates and application timings of imazamox in Clearfield wheat. Data from experiments showed that imazamox caused little or no crop injury when wheat was treated within recommended growth stages (3 leaves to pre-jointing). Spraying earlier or later than recommended increased the risks of growth and mature plant height reductions and increased the intensity and duration of temporary chlorosis (yellowing). In one experiment, applying imazamox at the onset of jointing caused considerably greater injury than when applied prior to the 3 leaf growth stage. Crop response often was more pronounced if the crop was growing under stressful environmental conditions. Though good to excellent jointed goatgrass and downy brome control was achieved with spring applications, results were more variable than when applied in fall. To achieve consistent control of feral rye, Imazamox should be applied before feral rye plants begin to tiller. The order of susceptibility to imazamox is: jointed goatgrass > downy brome >> feral rye. [Paper number 200]

**INFLUENCE OF RATE, TIMING, AND ADDITIVE ON IMI-TOLERANT WINTER WHEAT.** John C. Frihauf and Steve Miller. Graduate Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Jointed goatgrass (*Aegilops cylindrica*), downy brome (*Bromus tectorum*), and feral rye (*Secale cereale*) are troublesome winter annual grasses in winter wheat (*Triticum aestivum*). The Clearfield winter wheat system is a new technology developed to allow selective control of winter annual grasses in this system. However, cultivar response to different imazamox rates, additives, and timings of application has not been investigated. Irrigated and dryland field experiments were conducted in southeastern Wyoming to evaluate the response of five imidazolinone-tolerant winter wheat cultivars to imazamox as influenced by rate, additive, and application timing. Wheat injury was greatest at the irrigated site. Yields were reduced 25 and 16% with early and late fall imazamox applications of 108 g ai/ha at the irrigated site. Wheat yields were influenced by cultivars at the dryland site. Spring evaluation of imazamox injury of winter wheat was greatest with fall imazamox application of 108 g ai/ha with methylated seed. Injury with this treatment at the irrigated and dryland sites averaged 50 and 27%. [Paper Number 59]

**EVALUATION OF IMAZAMOX AND IMAZETHAPYR IN SPRING-SEEDED ALFALFA IN SOUTHEASTERN NEW MEXICO.** Martina W. Murray and Elizabeth A. Hanson. Assistant Professor and Technician. New Mexico State University Agricultural Science Center, Artesia, NM.

*Abstract.* Alfalfa is New Mexico's leading cash crop, and about 39% of the state's production is in Chaves, Eddy, and Lea Counties in southeastern NM. An important market for NM hay is the dairy industry. NM dairy producers prefer first and second cutting alfalfa hay because of quality considerations. Early weeds are a concern in spring-seeded alfalfa because the crop is not large or dense enough to compete with weeds, yet herbicide options are more limited on young plants. Weeds can reduce palatability and quality of hay. A field study was conducted near Artesia, NM, to test the efficacy of imazamox, alone and in combination with imazethapyr, applied postemergence on spring-seeded alfalfa. Alfalfa (cv. Signal 7000) was planted May 7, 2002. On June 13, when weeds were generally no more than 4 inches in size, herbicide treatments were applied using a $CO^2$-pressured backpack sprayer. Bromoxynil and chlethodim were included in treatments for comparison. At the time of application, redroot pigweed infestation was moderate to heavy, prostrate pigweed was moderate, and yellow nutsedge was heavy in some areas of the field. Barnyardgrass, stinkgrass, and feather fingergrass infestations were generally light, though heavier patches were present. Crop injury was rated on June 20, weed control was rated on July 9, and plots were harvested on July 17. Fresh forage samples were taken from each plot, dried, and ground. Ground samples from all three replications were combined for each treatment and analyzed for quality with near infra-red reflectance spectroscopy. Crop injury was observed in treatments with bromoxynil injury due to high temperatures at the time of application. There was no significant injury due to imazamox or imazethapyr. As expected, bromoxynil alone was weak on pigweed control. All treatments containing imazamox and/or imazethapyr provided excellent control of redroot pigweed, and imazamox treatments and the high rate of imazethapyr (0.06 lb ae/A) provided excellent control of prostrate pigweed. Imazethapyr at 0.03 lb ae/A provided less prostrate pigweed control (85-88%). All herbicide treatments provided excellent control of barnyardgrass, but only those containing clethodim showed excellent control of feather fingergrass. Stinkgrass was also controlled by treatments containing clethodim, as well as by some of the imazamox/imazethapyr combinations. While treatments containing imazamox and imazethapyr appeared to offer some suppression, the results suggest that a grass herbicide may be needed if infestations of feather fingergrass or stinkgrass are heavy. Both imazamox and imazethapyr appeared to suppress yellow nutsedge, but the best control

was generally from treatments containing imazethapyr at the high rate, or combinations of imazethapyr and imazamox. Forage yield of the untreated control was significantly higher than of other treatments due to high weed mass, with little difference among other treatments. Crude protein of the untreated control, however, was 2 to 4% lower than other treatments and relative feed value was 33 to 67 less. [Paper Number 60]

**ANNUAL GRASS CONTROL WITH GLYPHOSATE FORMULATIONS AND APPLICATION TIMINGS IN DIRECT SEED, DRYLAND WINTER WHEAT CROPPING SYSTEMS IN THE INLAND NORTHWEST.** Thomas M. Ireland[1], Donn C. Thill[1], Dan Ball[2] and Joe Yenish[3]. Graduate Student, Weed Scientist, Weed Scientist and Extension Weed Scientist. [1]University of Idaho, Moscow, ID, [2]Oregon State University, Pendleton, OR and [3]Washington State University, Pullman, WA.

*Abstract.* Weed management in direct seed cropping systems relies on burn down herbicides during the fallow period, which is defined as any period when a crop is not present. The objective of this study was to compare annual grass weed control with four glyphosate-containing herbicide products, applied at several rates with and without ammonium sulfate (AMS). Trials were established in standing wheat stubble near Davenport and Ritzville/Ralston, WA; Moro and Pendleton, OR; and Lewiston and Moscow, ID in spring 2001 and 2002. Roundup Ultra, Roundup Original, Touchdown IQ, and Engame were applied at 315, 421, and 630 g ae/ha with and without AMS. Control of annual grass weeds was evaluated visually 7, 14, 21 and 28 days after treatment (DAT) and above ground biomass was collected 28 DAT. Control ranged from 59 to 100% 28 DAT at all locations during both years for all herbicide treatments. Engame and Roundup Ultra, at all rates, consistently control annual grass weeds 97 to 100% at all locations in 2001 compared to control with other herbicide treatments (59 to 100%). In 2002, Engame controlled annual grass weeds 93 to 99%, which was equal to or greater than Roundup Ultra and Roundup Original and Touchdown IQ (81 to 98%). In 2001 and 2002, weed control ranged from 95 to 100% when AMS was added to all treatments applied at 315 and 421 g ae/ha compared to 89 to 99% control without AMS. On average, weeds were controlled 86, 88, 90% with 315, 421, 630 g ae/ha of glyphosate, respectively. [Paper Number 61]

**EFFECT OF SUGARBEET ROW SPACING, PLANT POPULATION AND HERBICIDE TREATMENT ON WEED GROWTH.** Craig M. Alford, Katherine K. Nelson and Stephen D. Miller. Graduate Research Associate, Graduate Research Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Today's agricultural economy dictates that producers fine-tune their farming practices to maximize yields and minimize production costs. To help identify practices that might benefit sugarbeet producers, the University of Wyoming conducted a two year study on the role that row spacing, population and herbicide treatments had on weed growth and sugarbeet yield. The study was conducted on a Mitchell sandy loam soil at the University of Wyoming Agricultural Experiment Station at Torrington, WY with glyphosate tolerant sugarbeet. The experiment was conducted as a split plot with three replications. In year 1 main plots were the three sugarbeet row spacings (38, 56 and 76 cm) and subplots a factorial arrangement of three plant populations (49,400, 98,800 and 148,200 plants $ha^{-1}$) and weed management level (2 applications of glyphosate at 0.42 or 0.84 kg $ha^{-1}$, 4 micro-rate applications of desmedipham-phenmedipham plus triflusulfuron plus clopyralid and methylated seed oil (MSO) at 90 + 4.5 + 25 g $ha^{-1}$ + 1.5% v/v, 3 applications of a conventional rate of desmedipham-phenmedipham-ethofumesate at 290 and 370 g ai $ha^{-1}$, a hand weeded and a weedy check plot. For year 2 the study was conducted at a single population, 98,800 plant $ha^{-1}$. In both years the 38 cm row spacing produced the highest yields, least weeds and highest sucrose. Weed control and yields were best in the hand weeded and 2 glyphosate application treatments. In 38 cm rows weed biomass was reduced by 20 and 54% compared to 56 and 76 cm rows respectively. [Paper Number 63]

**EFFECT OF IMAZAPIC ON CROP, WEED AND NATIVE LEGUMES.** Margaret M. Rayda and Stephen D. Miller. Graduate Research Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Studies were conducted in the greenhouse facilities at the University of Wyoming to evaluate the tolerance of twenty-four legumes to four rates of imazapic (35, 70, 105 and 140 g/ha). Experimental conditions included a day time temperature of 25 C and a night time temperature of 19 C with a 14 hour photoperiod. Plants were well watered and were never under moisture stress. Herbicide treatments were applied with a moving nozzle pot sprayer delivering 187 l/ha at 276 kpa to legume species in the two to three trifoliate leaf stage. Injury was evaluated at 7, 14, and 21 days after treatment (DAT) and plants were harvested 28 DAT. Slimflower scurf pea was extremely tolerant, exhibiting less than 10 percent injury at rates as high as 140 g/ha. Peas (Cv. Wyo Dunn) were

moderately tolerant exhibiting injury less than 25 percent at rates as high as 140 g/ha. Yellow sweetclover and black medic were extremely susceptible, with injury ranging from 50 to 85 percent depending upon rate applied. All other species fell into one of these three classes of tolerance. Injury generally increased as rate increased and as evaluation time after treatment increased. Percent dry weight reductions were generally lower than visual injury ratings with all species. [Paper Number 64]

**THE BIOLOGICAL AND CHEMICAL ACTIVITY OF DIFFERENT GLYPHOSATE FORMULATIONS APPLIED TO VELVETLEAF AND CORN.** Philip Westra[1], David Belles[1], Dale Shaner[2], Jim Daniel[3] and Scott Parrish[3]. Professor, PhD Graduate Student, Senior Scientist, Biologist and Biologist. [1]Colorado State University, Ft. Collins, CO, [2]ARS/USDA, Ft. Collins, CO and [3]UAP, Greeley, CO.

*Abstract.* Greenhouse and laboratory studies were conducted to evaluate the biological and chemical activity of Roundup formulations and Engame on corn and velvetleaf. Engame is an acid based formulation of glyphosate. The surfactant used with Engame in these studies was Liberate. In a rate comparison study with velvetleaf, the Engame formulation was at least twice as active, rate for rate, as Roundup Ultra. Time course radiolabeled glyphosate studies on velvetleaf showed that more than twice as much Engame was absorbed as Roundup Ultra. With the Engame formulation, more glyphosate accumulated in the apical meristem, roots, and remaining plant tissue. The slopes of the response curves show that the rate of Engame uptake was at least double that of Roundup Ultra and that at 72 hours significantly more Engame was absorbed. In a greenhouse study comparing the activity of Roundup Ultra Max and Engame on velvetleaf, Engame was at least twice as active as Roundup Ultra Max; the higher inherent activity of Engame was particularly evident at low rates of application. Growth analysis on corn showed that the Engame formulation was at least 4 times as active as Roundup Ultra Max. The increased activity of Engame appears to be due to the unique acid form of the glyphosate molecule as well as additives that are applied with this formulation. Field studies by various scientists over several years have confirmed the enhanced activity of Engame on a variety of weeds. [Paper Number 65]

**WEED CONTROL PROGRAMS IN FIELD CORN WITH MESOTRIONE APPLIED PREEMERGENCE.** Earl Creech and John O. Evans. Graduate research assistant and Professor. Utah State University, Logan, UT.

*Abstract.* Increased occurrence of herbicide-resistant weeds has created a need for the introduction of new herbicidal modes of action. Experiments were conducted at four locations in northern Utah in 2002 to evaluate the efficacy and utilization of preemergence mesotrione applications in corn weed control programs in the intermountain west. The study was a randomized complete block design with four replications. Treatments included preemergence mesotrione (210 and 269 g/ha) applied alone and in combination or sequentially with labeled rates of other commonly used preemergence or postemergence herbicides. Weed control was visually evaluated 14, 28, and 56 days after postemergence treatment (DAT). Corn injury and yield were also determined. Means were separated using Fisher's Protected LSD ($P<0.05$). Mesotrione caused slight bleaching at some locations shortly after application but injury was not evident as the season progressed. Mesotrione treatments at both rates provided greater than 98% common lambsquarters, 95% redroot pigweed, and less than 20% green foxtail control across all locations at 28 DAT. Each combination or sequential application with mesotrione improved grass control over mesotrione applied alone while maintaining broadleaf weed control. Greater than 98% control of all species was obtained by preemergence mesotrione applied either in a tank-mix with acetochlor, or sequentially with postemergence nicosulfuron or nicosulfuron plus rimsulfuron treatments. [Paper Number 69]

**PRESENCE AND DISTRIBUTION OF ALS RESISTANT KOCHIA SCOPARIA IN THE BIG HORN BASIN OF WYOMING.** Bryon L. Lorenz and Steve Miller. Graduate Research Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* The purpose of this research was to collect data on the presence and distribution of ALS resistant *Kochia scoparia* in the Big Horn Basin area of Wyoming. The Big Horn Basin is contained with in the following counties Bighorn, Hot Spring, Park, and Washakie. The sites were verified in a three-step process consisting of visual observation of possible sites, GPS data collection and laboratory experimentation for confirmation of resistance. The results are being distributed as appropriate to prevent further expansion of the ALS resistant kochia population. [Paper Number 70]

**WEED POPULATION DYNAMICS IN GLYPHOSATE RESISTANT CROPS.** Lisa L. Boggs and Stephen D. Miller. Graduate Assistant and Professor. University of Wyoming, Laramie, WY.

*Abstract.* Glyphosate resistant crops were first introduced in 1997. Since that time, their use has expanded greatly. This increased useage of crops allowing the application of one effective herbicide puts selection pressure on weed populations in cropping systems. In turn, this may result in weed shifts in surviving populations or cause development of herbicide resistant weeds. Rotation of herbicides may slow down or avoid development of resistance because it allows susceptible phenotypes to regenerate and dilutes the resistant phenotypes in the soil seed bank. Crop rotation also affects weed shift patterns. Monoculture cropping systems may promote development of a particular complex of weeds over time. Crop rotation disrupts patterns of weed communities and can prevent establishment of dominant weeds through various management practices. This project has two objectives: 1) to investigate weed population dynamics under chisel plow tillage, with two rotation sequences and continuous glyphosate application at different rates in glyphosate-resistant corn, sugarbeets, and spring wheat and 2) to determine which weed management strategies avoid or delay development of herbicide resistance of weed shifts or herbicide resistant weeds. Results of studies from 1998 through 2001 showed that both common lambsquarter (Chenopodium album) and volunteer corn (Zea mays) increased in all treatments. In 2002, there was no significant increase in common lambsquarter except rotating or low glyphosate treatments. An increase in volunteer corn was observed in all treatments and ALS (acetolactase synthase) resistant kochia (Kochia scoparia) was present in the non-glyphosate treatments. Grassy weeds such as foxtail (predominately green foxtail Seteria virdis) and longspine sandbur (Cenchrus longispinus) increased significantly in the non-glyphosate treatments spring wheat. [Paper Number 171]

**GLYPHOSATE-TOLERANT SUGARBEET: WEED CONTROL, ECONOMICS, AND ENVIRONMENTAL IMPACTS.** Andrew R. Kniss[1], Robert G. Wilson[1], Dillon M. Feuz[1] and Alex R. Martin[2]. Graduate Research Assistant, Professor, Associate Professor and Professor. [1]University of Nebraska, Scottsbluff, NE and [2]University of Nebraska, Lincoln, NE.

*Abstract.* Weed control is a costly and necessary part of sugarbeet production, relying heavily on repeated herbicide application, cultivation, and hand labor. The development of sugarbeet tolerant to the broad spectrum herbicide glyphosate through genetic engineering could give growers a more convenient, cost-effective, and environmentally friendly alternative to conventional sugarbeet herbicides. The objectives of this research were to compare weed control, economics, and environmental aspects of glyphosate applied to different glyphosate-tolerant sugarbeet varieties to that of conventional herbicide programs applied to near-isogenic non-glyphosate-tolerant conventional varieties. Field experiments were conducted near Scottsbluff, Nebraska in 2001 and 2002. Glyphosate applied two or three times at two-week intervals beginning when weeds were 10 cm tall provided excellent weed control, yield, and net economic return regardless of variety. Three applications of phenmedipham plus desmedipham plus triflusulfuron plus clopyralid with or without preemergence ethofumesate provided the greatest weed control among conventional herbicide treatments, but did not always result in the greatest yield. One application of glyphosate generally resulted in similar sugarbeet root yields as conventional herbicide treatments. All conventional herbicide treatments resulted in similar net returns. Although the conventional sugarbeet varieties 'HM 1640' and 'Beta 4546' responded similarly to herbicide treatments with respect to sucrose content, 'Beta 4546RR' produced roots with over 1% more sucrose than 'HM 1640RR'. Due to this yield difference a producer planting Beta 4546RR could afford to pay nearly twice as much for glyphosate-tolerant technology as could a producer planting HM 1640RR. When averaged over varieties and herbicide treatments, it is estimated that a producer could afford to pay an additional \$385 ha $^{-1}$ for glyphosate-tolerant technology without decreasing net return. A switch to glyphosate tolerant sugarbeet may result in a modest increase in the amount of postemergence herbicide applied per hectare. However, output from computer modeling programs FIRST and GENEEC suggest that environmental concentrations of glyphosate would be less than those of most conventional sugarbeet herbicides 60 days after application. [Paper Number 173]

**KOCHIA CONTROL AND GRAIN SORGHUM RESPONSE TO FLUROXYPYR-BASED TREATMENTS.** Mark D. Lubbers[1], Phillip W. Stahlman[2] and Kassim Al-Khatib[1]. Graduate Research Assistant, Professor and Associate Professor. [1]Department of Agronomy, Kansas State University, Manhattan, KS and [2]Agricultural Research Center-Hays, Hays, KS.

*Abstract.* Most herbicides currently registered for postemergence use in grain sorghum have limited crop selectivity or do not effectively control some important weeds such as kochia. Fluroxypyr is a pyridine-based herbicide that effectively controls kochia and other annual broadleaf weeds in cereal grain crops and has potential for use in grain sorghum. Field studies were conducted at Hays, KS in 2001 and Arlington, KS in 2002 to evaluate fluroxypyr efficacy as affected by tank mixtures applied at two growth stages of sorghum, and to compare the effects of adjuvants on fluroxypyr efficacy. Experiments were overseeded with kochia and *S*-metolachlor was applied preemergence at 660 g ai $ha^{-1}$ to control grass weeds. Regardless of growth stage (8 to 13 or 20 to 25 cm tall sorghum), fluroxypyr at 140 g ae $ha^{-1}$ tank mixed with atrazine and crop oil concentrate (COC) at 560 g ai $ha^{-1}$ + 1% v/v or metsulfuron and non-ionic surfactant (NIS) at 2.1 g ai $ha^{-1}$ + 0.5% v/v controlled kochia more than fluroxypyr at 140 g $ha^{-1}$ plus NIS or dicamba + atrazine at 310 g ae $ha^{-1}$ + 590 g $ha^{-1}$; each were more effective than atrazine + COC at 560 g $ha^{-1}$ + 1% v/v. Fluroxypyr + metsulfuron + NIS severely stunted crop growth and caused temporary chlorosis in both years, however grain yield did not differ from that of the hand-weeded check. In the adjuvant study, none of the adjuvants evaluated (Premium COC, MSO concentrate oil, Herbimax, LI 700, Liberate, Dispatch 111, or Activator 90) enhanced kochia control with fluroxypyr at 105 g $ha^{-1}$. [Paper Number 175]

**LANCELEAF SAGE GROWTH ANALYSIS AND COMPETITION WITH HARD RED SPRING WHEAT AND SOYBEAN.** Mathew G. Carlson and Kirk A. Howatt. Graduate Research Assistant and Assistant Professor. North Dakota State University, Fargo, ND.

*Abstract.* Lanceleaf sage is an annual broadleaf weed found throughout the central United States. It was observed in North Dakota in 1989. Field and greenhouse studies were conducted from 2001 to 2003 to evaluate lanceleaf sage competition with wheat and soybean and effects of soil type on lanceleaf sage growth parameters. Lanceleaf sage population did not cause a reduction of hard red spring wheat yield in either year, but wheat competition resulted in 0 to 100% mortality of lanceleaf sage. Soybean yield in 30-cm row spacing was 71% lower with 58 lanceleaf sage plants per $m^2$ when compared to weed free checks in 2001. Soybean yield in 15-cm row spacing was 29% lower with 63 lanceleaf sage plants per $m^2$ when compared to the weed free check. Lanceleaf sage plants emerged earlier and were more competitive with soybean in 30-cm row spacing than 15-cm row spacing. Lanceleaf sage population in 2002 did not significantly affect soybean yield. Lanceleaf sage emerged at least 2 weeks after soybean emergence in 2002 compared with 0 to 5 days after soybean emergence in 2001. North Dakota has diverse soil types throughout the state. Plants grown in coarse textured sandy loam and loamy sand soils tended to have the largest roots, but all soils generally produced plants with similar growth. While lanceleaf sage is present throughout North Dakota, populations are not rapidly increasing. These experiments show that crop selection and emergence patterns influence lanceleaf sage population dynamics more than soil type in North Dakota. [Paper Number 176]

**INFLUENCE OF TILLAGE AND SEEDBANK DENSITY ON WEED SEEDLING RECRUITMENT IN WESTERN CANADA.** Glen G. Forster and Steven J. Shirtliffe. Graduate student and Assistant Professor. University of Saskatchewan, Saskatoon, SK.

*Abstract.* The relative importance of microsite limitation on weed seedling recruitment has largely been undefined in the agroecosystem. The objective of this study was to determine if contrasting tillage systems and weed seeding densities resulted in differential weed seedling recruitment due to varying availability of microsites within the soil profile. A 2-year, 2-location weed seed addition experiment was implemented comparing 2 tillage systems, 3 weed species (*Sinapis arvensis* L., *Setaria viridis* (L.) Beauv., and *Avena fatua* L.), and weed densities ranging from 20 to 62,500 weed seeds $m^{-2}$. Seedling recruitment counts were conducted each week and weed biomass production was observed at the completion of the experiment. Under less arid conditions in 2001, tillage increased microsite availability for weed seedling recruitment, but with minimal spring moisture at the timing of tillage in 2002, no significant effect of tillage was observed. The three weed species exhibited different microsite requirements for seedling recruitment. *Setaria viridis* (L.) Beauv. exhibited minimal effect of density on percent seedling recruitment, while *Avena fatua* L. and *Sinapis arvensis* L. exhibited significant reductions in seedling recruitment at densities

greater than 500 seeds $m^{-2}$. This illustrates that seedling recruitment of different species largely depends on their species-specific microsite requirements. [Paper Number 179]

**WEED MAPPING STRATEGIES FOR PRECISION WEED CONTROL.** Scott O'Meara and Phil Westra. Colorado State University, fort Colins, CO.

*Summary*. Weed density maps were created using geostatistics with correlated field variables. Maps were examined for significance across nutrient management zones, separate fields, and sampling techniques. [Paper Number 180]

## TEACHING AND TECHNOLOGY TRANSFER (PROJECT 4)

**WEEDIT - WEED INFORMATION TRANSFER FOR EDUCATIONAL FUNCTIONS.** Jingkai Zhou, Janet D. Davidson-Harrington and Calvin G. Messersmith. Research Specialist, Research Specialist and Professor. North Dakota State University, Fargo, ND.

*Abstract.* WeedIT (weed Information Transfer) is a comprehensive software application being developed for growers, extension agents, consultants, students, and researchers who will benefit from access to North Dakota weed control information. The primary goal of this application is building a convenient tool to retrieve research information from an efficient database that can optimize research and weed control practices. The database contains original field research data and related herbicide and weed identification information. To achieve this goal, the system architecture of WeedIT consists of four integrated components: weed field research database, weed control information, user interface, and function modules. WeedIT is implemented as a multi-functional tool providing a wide range of potential applications for growers, weed science education, extension, and research. The educational functions provide weed, herbicide, weed control, and crop response information through a series of interfaces such as weed identification, herbicide information, annual weed control, perennial weed control, sugarbeet weed control, resistant weed management, and crop rotation restrictions. [Paper Number 27]

**WEED MANAGEMENT AREAS: BUILDING HEALTHY LANDS TOGETHER.** Janet K. Clark. Director. Center for Invasive Plant Management, Montana State University, Bozeman, MT.

*Abstract.* Throughout the West, communities are organizing Weed Management Areas (WMAs) to pool resources to battle invasive plants and to restore and maintain healthy and productive lands. WMAs often replace jurisdictional boundaries in favor of natural boundaries that facilitate cooperation, coordination, and implementation of effective integrated weed management plans. Plans generally include public awareness campaigns; a prevention program; a common inventory, mapping, monitoring, and reporting procedure; and methods of integrated weed management. WMAs draw together diverse groups for a common purpose. Participants have included private landowners, schoolchildren, sportsmen's groups, realtors, conservation organizations, Chambers of Commerce, ranchers, hikers and bikers, as well as local, state, and federal land managers. The Center for Invasive Plant Management supports the formation and maintenance of WMAs through grants and other educational resources. [Paper Number 28]

**ON FARM SAMPLING OF WEED MANAGEMENT SYSTEMS IN VEGETABLE PRODUCTION.** David E. Hillger[1], Kevin D. Gibson[1] and Stephen C. Weller[2]. Research Associate, Assistant Professor of Weed Science and Professor of Weed Science and Molecular Biology. [1]Purdue University, Dept. of Botany and Plant Pathology, West Lafayette, IN and [2]Purdue University, Dept. of Horticulture and Landscape Architecture, West Lafayette, IN.

*Abstract.* Recent concerns over herbicide use, in addition to economic and registration constraints have limited the number of herbicides available for use in minor crops such as vegetables. The adoption of multi-option integrated weed management systems is vital to the sustainability of vegetable production. However, information on the effects of alternative management systems must be available to producers before they alter their current management systems. The objective of this two year study is to investigate how the management practices of producers affect weed communities and weed control in vegetable production. An advisory board composed of farmers, extension personnel and county agents has been formed to identify continuing and emerging problems in weed control, facilitate on-farm data collection, and assess the relative advantages and limitations of different management systems. Conventional, integrated and organic producers recruited through extension personnel, grower meetings

and trade shows have agreed to participate in a two phase research project. In the first phase, multivariate statistics will be used to characterize weed management systems based on detailed questionnaires completed by the farmers. In the second phase, weed communities will be sampled on-farm and data analyzed to determine if associations exist between weed communities and different weed management systems. Information collected during this project will be used to develop paper and web-based manuals for conventional and alternative vegetable crop production systems. [Paper Number 29]

**EXTENSION WEED MANAGEMENT EDUCATIONAL STRATEGIES AND THEIR EFFECTIVENESS WITH ADULT LEARNERS.** Mary K. Corp. Assistant Professor. Oregon State University, Pendleton, OR.

*Abstract.* Herbicide-resistant wheat combined with the expanding incidence of herbicide-resistant weeds will place an even greater importance on weed management educational efforts in the Pacific Northwest. Weed management education is a cooperative effort in Oregon combining the efforts of county-based crop faculty, weed specialists and weed scientists. This team approach allows for various resources such as consultations with county faculty, and weed scientists; published resources such as weed control handbook, Extension Cereal newsletter, and research reports; and various educational events such as workshops, seminars, field days and tours. A 14-item survey was developed to evaluate the effectiveness of different weed management educational strategies. The intent of the survey was to determine what resources were used by the respondents, and to rate the perceived effectiveness of different educational tools they utilized. A random sample of 313 respondents was chosen from the Umatilla County Cereal Newsletter database. Respondents were asked to complete the survey and return it in the enclosed stamped return envelope. The response rate was 41% (N=127). The respondents were representative of the overall pool. Thirty-nine (30%, N=39/127) respondents had attended the Columbia Basin Cereal seminar in 2002 where they received instruction on herbicide resistance management utilizing three different teaching tools. One hundred twenty five (98%, N=125/127) respondents rated weed control as very important or important to their farming operation or agribusiness. The resources used with greatest frequency were: local field consultant (84%, N=106/127), Extension Cereal newsletter (66%, N=84/127) and field and crop tours (60%, N=77/127). Other resources used were pesticide label (57%, N=72/127), workshops and seminars (56%, N=71/127), weed control handbook (35%, N=45/127), university scientist or county based faculty (35%, N=44/127) and web-based information (10%, N=13/127). Respondents (71%, N=91/106) rated Extension Cereal newsletter as a very effective or effective educational tool. On-farm trials, experiment station research trials and weed research reports were all rated the same effectiveness (57% N=72/98, very effective or effective). Educational tools rated on the low end for effectiveness were hands-on computer lab, card game and herbicide poster. A comparison of respondents who attended the seminar versus other respondents showed that the educational message on the importance of rotating herbicide groups was having impact. Seminar attendees (97%, N=37/38) rated the rotational strategy as important or highest importance. Other respondents (82%, N=62/75) rated the rotational strategy as important or highest importance. A Chi-Square of .10 between the two variables is approaching significance and appears to indicate that attendance effected choice of weed management strategies. The implications for effective Extension educational teaching methods are that Extension newsletters, on-farm and experiment station trials and workshops/tours should be recognized for their importance as educational tools. As other less traditional tools are used such as web-based information, card games and herbicide posters, it is important to consider its appropriateness for a specific audience. The educational tools being used appear successful in getting out educational messages on effective weed management strategies and should continue to be used. [Paper Number 164]

**PESTICIDE CLEARANCES FOR SMALL-ACREAGE CROPS IN THE SOUTHWESTERN U.S.** Dudley T. Smith[1] and Rodney M. Holloway[2]. Professor and Extension Specialist. [1]Dept. of Soil & Crop Sciences, Texas A&M University,, College Station, TX and [2]Dept of Entomology, Texas A&M University, College Station, TX.

*Abstract.* Pesticide markets for major U.S. crops, such as cotton,corn, and soybeans provide ample market incentive to support pesticide development. Fruits, vegetable, and minor crops generate over $17 billion annually, which amounts to 44% of all crop income in 18 western states. Since pesticide development for small acreage crops is limited due to high costs and risks for registrants, the IR-4 program was established for pesticides for minor crops. IR-4 consists of a partnership, involving the IR-4 Headquarters and Regional Offices, USEPA, the land grant universities, USDA/ARS,pesticide registrants, and numerous grower organizations. Pesticide Clearance Requests are submitted and reviewed by IR-4, priorities are established, and GLP protocols are developed for field and lab residue work. Petitions are prepared to expand labels of new and existing pesticides. EPA and IR-4 have organized

800 crops into 20 Crop Groups based on botanical smilarities and edible plant parts. Representative crops in each Group act as a surrogate and provide residue data for the whole group. For example,carrot serves as the representative for Group 1 (Root and Tuber Crops) so that tolerance data can be used for labeling uses in other root and tuber crops, such as table beets or sweet potato. Crop Groupings provide for more efficient registrations, benefitting growers and consumers. Since 1963, more than 6,600 tolerances have resulted from IR-4 work, 42% of all tolerances granted by EPA. [Paper Number 165]

**PLANT SCIENCES EXTENSION TRAINING, EDUCATION AND CONFERENCES VIA THE INTERNET.** Duane R. Berglund. Professor and Extension Agronomist. Plant Sciences, North Dakota State University, Fargo, ND.

*Abstract.* The North Dakota State University (NDSU) Extension Service crops specialists have been conducting weekly conference telephone calls for the past 25 years (since 1978). These calls were initiated from the NDSU main campus at Fargo, ND and involved 8 to 10 state crop specialists , four to five Area Extension Agronomists plus a number of Extension county agents in eastern ND. During the past year the use of video conferencing has been utilized for this purpose. Individuals involved include: Agronomists, Weed Scientists, Soil Scientists, Entomologists, Plant Pathologists and Agricultural Engineers. The calls have been held on a weekly basis ( Tuesday mornings) from late April until mid summer. Topics that have been addressed include: weed problems, drought and flooding issues in crops, weed resistance, pesticide labeling, general crop conditions, integrated pest management strategies for North Dakota crops, new and alternative crop management, soil fertility issues , plus disease and insect control management. Statewide crop and pest newsletters are then written and compiled by specialists on the day following the conference call and distributed statewide via the internet on the web and by postal mail. The NDSU crop science Extension group ( State and Area specialists) have developed PowerPoint presentations on CD rom for distribution to County Agents during the past five years (1999 to 2003). Each CD has averaged approximately 20 plus presentations or updates that can be used for education or training purposes by those in counties or regional areas of the state. The CD rom for each year is entitled Crop and Pesticide Presentation (current year). These presentations are intended to be used only by those in Extension or Agricultural Research currently employed within the NDSU system. During the winter and spring of 2002 and 2003, CD rom presentations have and will be used for training of county agents. Conference calls via telephone will be used with 8 to 12 county staff utilizing the presentations loaded on each participants computer. Discussion, questions and notes are taken as the training proceeds. These training periods last for approximately one to two hours in duration. This has proven to be an effective and efficient technique to train our field extension staff as both time and funds have been saved by this method. The video conferencing technology has also enabled NDSU extension state specialists and area specialists to conduct planning meetings, develop program opportunities and interview potential candidates for hire within our system. Several specialists are also utilizing the video-teleconferencing to present programs at producer meetings at the Research and Extension Centers throughout North Dakota. The future on how Extension delivers information and how we interact with our co-workers is rapidly changing. [Paper Number 166]

**ECOLOGICAL INVASIVE PLANT MANAGEMENT: TAMING WILD WESTERN WEEDS ON THE WEB.** Susan B. Kelly, Center for Invasive Plant Management, Bozeman, MT.

*Summary*. The Center for Invasive Plant Mangement supports invasive plant mangement education and training for federal, state and prive land mangers. The Center is meeting this goal through the creation of an online web-based course developed to meet the needs of federal land managers. This 10-week web-based course, Ecological Invasive Plant Management, was offered during the Fall of 2002. [Paper Number 167]

**TEACHING HERBICIDE MODE OF ACTION WITH LESSONS AND ANIMATIONS AVAILABLE ONLINE.** Scott J. Nissen[1], Tracy M. Sterling[2], Deana M. Namuth[3], Susan M. Fritz[3], Alex Martin[3], Brady Kappler[3] and Carol Mallory-Smith[4]. Associate Professor, Professor, Distance Education Lecturer, Associate Professor, Professor, Extension Specialist, Professor. [1]Colorado State University, [2]New Mexico State University, [3]University of Nebraska-Lincoln, [4]OregonState University.

*Abstract.* TEACHING HERBICIDE MODE OF ACTION WITH LESSONS AND ANIMATIONS AVAILABLE ONLINE. Scott J. Nissen1, Tracy M. Sterling2, Deana M. Namuth3, Susan M. Fritz3, Alex Martin3, Brady Kappler3 and Carol Mallory-Smith4. Associate Professor, Professor, Distance Education Lecturer, Associate

Professor, Professor, Extension Specialist, Professor. 1Colorado State University, 2New Mexico State University,3University of Nebraska-Lincoln, 4Oregon State University. The most commonly recommended strategy for managing herbicide resistant weeds involves combining or rotating herbicide modes of actions. This requires that producers, crop consultants and land managers understand how various herbicides work. Most land grant universities have de-emphasized training in herbicide physiology over the past two decades resulting in inadequate resources to extend herbicide mode of action information to audiences in need. A grant from the American Distance Education Consortium provided the resources to develop Internet-based modules dealing with applied and advanced biochemical information on herbicide mode of action. The modules were designed to be suitable for credit and non-credit offerings as well as providing computer animations that could be downloaded for classroom or outreach educations. A total to ten lessons are in various stages of development and when completed these will cover 1) herbicide absorption, translocation and metabolism, 2) herbicide modes of action, 3) herbicide resistance. In addition to providing text, figures and animations, a quiz feature has also been developed so that learners and educators can evaluate information transfer. In more formal classroom or distance education settings quizzes can track student progress and validate performance. In the future, this technology could be used to provide credits for continuing education for pesticide applicators. Development of these online modules has been a collaborative effort between several universities with some educational materials being provided by BASF. Modules are currently being hosted by the University of Nebraska-Lincoln at http://croptechnology.unl.edu; however, the WSWS has provided funding to support a mirrored site at www.wsweedscience.org. [Paper Number 168]

## WETLANDS AND WILDLANDS (PROJECT 5)

**RESULTS OF A SURVEY OF UC ACADEMICS REGARDING THE HORTICULTURAL ORIGIN OF INVASIVE PLANTS.** Carl E. Bell[1], Cheryl A. Wilen[1], Karen L. Robb[1] and James I. Greishop[2]. Regional Advisor, Area Advisor, Farm Advisor and Specialist. [1]UCCE-San Diego, San Diego, CA and [2]UC Davis, Davis, CA.

*Abstract.* Nationally about half of the invasive plants of natural areas were intentionally introduced into the country for landscape or other purposes. This situation creates a conflict of interest between horticulturalists, such as nurseries, landscapers, and botanic gardens, and the environmental community that wants to maintain or restore native ecosystems and habitats. Within the Land Grant Universities, such as the University of California, a similar conflict might exist because university academics provide support through research and education to people on both sides of this issue. In order to investigate this issue within the University of California Agriculture and Natural Resources (UC-ANR), the division that includes the Agricultural Experiment Station and Cooperative Extension, we conducted a survey of academics with assignments in natural resource programs and/or horticulture regarding perceptions and attitudes regarding invasive plants of horticultural origin. The results of the survey indicate that academics within UC-ANR, regardless of assignment, recognize that non-native landscape ornamentals now occur in California?s Wildlands. Responses to the survey varied over which species were most troublesome, on the impact of these plants on natural areas, about what should be done about the problem, and whether UC should have a policy on the issue. In general, the horticulture academics did not view the problem as severely as the natural resource academics, but the differences were not great. These data can be used to provide training to UC academics on this issue and to help facilitate discussion between the different groups. [Paper Number 138]

**TRIAL OF SEVERAL HERBICIDES AND APPLICATION TECHNIQUES FOR CONTROL OF TREE-OF-HEAVEN.** Guy B. Kyser and Joseph M. DiTomaso. Staff Research Associate and Extension Weed Specialist. University of California, Davis, CA.

*Abstract.* During October 2001 we tested several treatment methods using three herbicides for control of tree-of-heaven along Putah Creek in Yolo County, California. Herbicides tested were imazapyr, triclopyr ester, and glyphosate. Methods included cut stump, hack-and-squirt, cut and hack, and basal bark applications. Stump treatments were applied at several time intervals after cutting. We evaluated canopy reduction and stump sprouting in August 2002. *Cut stump:* There were no differences among times of application from 0 to 1 hr after cutting. 30.0% of stumps treated with glyphosate resprouted, compared with 0% of stumps treated with imazapyr and 20.7% of stumps treated with triclopyr. Cut stump applications using imazapyr would be a useful treatment in situations where immediate tree removal was desired. *Hack-and-squirt:* Hack-and-squirt treatments using glyphosate, imazapyr, and triclopyr reduced standing tree canopy by a mean of 82.3%, 99.9%, and 66.7% respectively. Hack-and-squirt using imazapyr was an effective treatment for use where standing snags are permissible. *Cut and hack:*

Trees were cut and a hack-and-squirt treatment applied to stumps. Stumps treated with glyphosate, imazapyr, and triclopyr resprouted in proportions of 85.7%, 35.7%, and 60.7%, respectively, with no differences among times of 0 to 1 week after cutting. *Basal bark:* Almost all basal bark treatments with imazapyr or triclopyr (20% each in Hasten) resulted in 100% canopy reduction. This was a successful technique requiring minimal equipment. Because of the possibility of imazapyr being washed off the trunk and damaging nearby vegetation, triclopyr may be preferable for basal bark treatments in sensitive areas. [Paper Number 139]

**DOES SIZE REALLY MATTER(FOR BIOCONTROL OF PURPLE LOOSESTRIFE)?.** Debra R. Eberts. Research Botanist. United States Bureau of Reclamation, Denver, CO.

*Abstract.* The level and rapidity of biological weed control has traditionally been assumed to be linked to the size of the weed infestation and numbers of insects released, with smaller sites and higher insect release numbers reaching control first. This assumption was tested for a system using a mix of the leaf-feeding beetles *Galerucella calmariensis* and *Galerucella pusilla* on the wetland weed purple loosestrife (*Lythrum salicaria L.*). Biocontrol insects were established at four sites ranging in size from 0.5 to 20,000 acres. Monitoring of plant and insect paramenters was conducted over an 8-year period at a number of permanent, marked locations at each site. Number of insects released per site acreage ranged from 6200 at the smallest site to two at the largest site. According to traditional assumptions, control should have been achieved at the smallest site long before any changes were seen at the largest site. Data and photographs showed that this was not the case. Five years post-release the smaller three sites had decreases in flowering, plant height and stem density of about 90%, 65%, and 55 % respectively. At that same stage post-release, nearly the entire 20,000 acres of the largest site had been completely defoliated several times and was converting to desired wetland vegetation. The smaller sites have also exhibited a ?boom and bust? cycle of the predator (insect) and prey (loosestrife). Larger sites may initially provide more abundant food so that more larvae to survive to adulthood, and later provide refugia of plants so a large population of insects may persist and maintain a high degree of control on the loosestrife. [Paper Number 140]

**MANAGEMENT OF ALS RESISTANT KOCHIA IN BARLEY-SUGAR BEET ROTATIONS.** Nicole D. Flowers and James A. Mickelson. Research Associate and Assistant Professor. Montana State University, Huntley, MT.

*Abstract.* Kochia is a very competitive and troublesome weed that infests most sugar beet fields in Montana and the intermountain West. Triflusulfuron is an ALS inhibitor herbicide that has been relied upon almost exclusively in recent years to control kochia in sugar beet. Repeated use of ALS herbicides in these cropping systems and along the railroad has selected for kochia populations that are resistant to ALS herbicides. Therefore, triflusulfuron is no longer effective at controlling kochia in many sugar beet fields. Kochia seeds have relatively short longevity in the soil. Thus, effective kochia control in the crop year prior to sugar beet is likely to improve kochia control in sugar beet. The objective of this study was to evaluate the effectiveness of managing ALS-resistant kochia in sugar beet by using non-ALS inhibiting herbicides in barley the year prior to sugar beet. The experiment was a randomized complete block with a split plot restriction on randomization and 4 replicates. Main plots were 4 barley treatments in the first year. Subplots were 10 sugar beet treatments in the second year. The experiment was repeated. Main plot treatments in barley were treated with fluoroxypyr + MCPA and bromoxynil + MCPA, weed free, and an untreated check. The barley was harvested in July. Tillage was not conducted until after a killing frost in September to represent the worst-case scenario in which any uncontrolled kochia in barley would produce viable seed in the fall. Sugar beet was planted to the site in the second year and each of the main plot treatments from the previous year were subdivided into 10 sub plots, that each received a herbicide treatment. The herbicide treatments applied to sugar beet included conventional and micorate treatments containing desmedipham + phenmedipham+ clopyralid, or desmedipham + phenmedipham + clopyralid + triflusulfuron, and micro-rate treatments containing additional ethofumesate. Minimizing kochia seed production in barley greatly improved kochia control in sugar beet and resulted in higher sugar beet yields in fields containing either low or high initial densities of kochia. The lack of kochia control in the untreated barley plots resulted in poor kochia control in sugar beet and reduced sugar beet yields compared to the weed-free barley plots. The addition of ethofumesate to microrate treatments in sugar beet improved kochia control and sugar beet yields. The best control and yields in this experiment were achieved with conventional rates of triflusulfuron + desmedipham + phenmedipham + clopyralid or microrates of triflusulfuron + desmedipham + phenmedipham+ clopyralid + ethofumesate. From a kochia management standpoint, barley is a good rotational crop to grow the year prior to sugar beet. [Paper Number 141]

**USING GPS POINT FEATURES TO DESCRIBE SPOT, LINE, AND AREA INFESTATIONS IN WILDLAND WEED SURVEYS.** Melanie Ballard, Steven Dewey and Kimberly Andersen. Research Assistant, Professor and Research Assistant. Utah State University, Logan, UT.

*Abstract.* The intended use of results must be considered carefully when choosing the types of data collected in wildland weed surveys. For example, general information about the location and size of weed infestations may be sufficient for surveys intended solely to inventory numbers of acres infested and to aid land managers in designing and implementing field-scale control programs. However, if goals also include monitoring for changes in the size, shape, and/or density of individual weed patches over time, additional survey data could be needed. Current GPS technology allows the choice between recording weed infestations as points, lines, or polygon (area) features. Each option has its advantages and disadvantages. Point data generally requires less time to collect, allowing more acres to be surveyed per day. However, a single point coordinate may not adequately represent the size or shape of a weed patch, especially large, linear, or irregularly shaped infestations. During weed surveys conducted in 2002 by Utah State University a modified use of point features was adopted to map the majority of all weed infestations up to 5 acres in size, regardless of their shape. In this procedure a GPS point was recorded at the center of each distinct weed patch. All patches 0.5 acre in size or less, as well as larger patches of a somewhat spherical, square, or rectangular shape were envisioned as single dots covering either 0.1, 0.25, 0.5, 1.0, 2.5, or 5 acres. Weed patches were assigned to the size category most closely representing their estimated square footage. By adjusting printed dot size to scale, the acreage of individual point infestations could be represented visually on maps. When the shape or orientation of a linear or polygon-shaped weed infestation covering greater than 0.5 acre was considered important, it was recorded as a cluster of multiple contiguous smaller points, generally 0.1 to 0.25 acre each. These dot clusters printed to scale provided a recognizable representation of patch size and shape, as well as allowing notation of differences in density within a single infestation. It is believed that the use of point features as described in this paper can offer a valuable compromise between the traditional time-saving point data and the more geographically descriptive line and area GPS features. [Paper Number 142]

**PURPLE LOOSESTRIFE(*LYTHRUM SALICARIA* ERADICATION IN ALBERTA.** Shaffeek Ali. P.Ag. Alberta Agriculture, Food and Rural Development, Edmonton, AB.

*Abstract.* Purple Loosestrife ( *Lythrum salicaria*) is a herbaceous wetland perennial that was introduced to North America from Europe in the early 1800's. The infestation of this plant has been expanding at the expense of native wetlands. It invades wetland areas, competes with and replaces desirable native vegetation. Wildlife that depend on the native plants for food and shelter are forced to move to new areas. In Canada, Purple Loosestrife is well established in the Maritime Provinces, Quebec and Southern Ontario. Pioneer communities are appearing in the Prairie Provinces and in British Columbia. The first infestation of Purple Loosestrife in Alberta was reported in 1990. A program to eradicate all infestations and to prevent the establishment of Purple Loosestrife in Alberta was established in 1991. By 1997, a total of 80 infestations were recorded and eradication measures were taken at each site. In 2002, there were a cumulative total of 200 sites, 123 of which have recorded zero plants and 26 have no plants for 5 or more years. [Paper Number 143]

**PURPLE LOOSESTRIFE CONTROL WITH HERBICIDES: SINGLE YEAR APPLICATION.** Stevan Z. Knezevic. As. Prof. Univ. of Nebraska, Concord, NE.

*Abstract.* The introduction and spread of exotic plant species is one of the most serious threats to biodiversity. Purple loosestrife (Lythrum salicaria) is one such species that is currently invading wetlands and waterways in mid-Western states including an estimated 12,000 acres in Nebraska. Once a wetland is taken over by loosestrife, the natural habitat is lost and the productivity of native plant and animal communities is severely reduced. Field studies were conducted in 2000 and 2001 at two locations in each year with the objective to evaluate performance of a single application of 14 herbicide treatments. Evaluation at 70 days after treatment (DAT) suggested that excellent season-long control (>90%) of purple loosestrife was achieved with glyphosate at 3.36 kg ae/ha; 2,4-D at 2.8kg ae/ha; triclopyr at 2.1kg ae/ha; imazapyr 1.68 kg ai/ha; and with the two mixtures of 2,4D+triclopyr at 1.4+1.26 kg ae/ha and 2,4-D+metsulfuron at 1.4ae/ha+0.044kg ai/ha. Evaluation at 365 DAT suggested excellent control (>90%) that can last more than one season was achieved only with imazapyr at 1.12 and 1.68 kg ai/ha and metsulfuron at 0.070 and 0.175kg ai/ha. The two imazapyr treatments however caused detrimental effects on the native vegetation indicating limited use of those treatments. Therefore, results of this study suggest that a single application of most of

the tested herbicides did not provide satisfactory control of loosestrife that can last more than one season, indicating the need for multi-year applications [Paper Number 144]

**TOWARDS DEFINING THE COMPETITIVE LIMITS TO YELLOW STARTHISTLE DISTRIBUTION.** Brett S. Bingham and Tim S. Prather. Graduate Research Assistant and Assistant Professor. University of Idaho, Dept. PSES, Moscow, ID.

*Abstract.* Yellow starthistle, originally from the Mediterranean region, was found in the United States in the mid 1800's and has spread throughout western North America. Defining the competitive limits of yellow starthistle would aid identification of plant communities susceptible to infestation. A previous yellow starthistle occurrence model was built for the canyon grasslands of Northern Idaho. The occurrence model defines environmental gradients useful for construction of experiments that characterize competitive and physiological limits to a species distribution. Initial biomass, final biomass, and biomass accumulation rate along the plant occurrence gradient were collected in the field for the 2002 growing season. An indicator of plant biomass, the Normalized Difference Vegetation Index (NDVI), was calculated through the growing season. In the field the southerly aspect where yellow starthistle occurred frequently was used to study competition along a slope gradient. NDVI showed an increase earlier in biomass accumulation on the south slopes and a later increase of biomass on north slopes. NDVI showed earlier senescence on the south slopes compared to the north slopes. A series of plant exclusion distances from a yellow starthistle plant was laid out at 0.2, 0.4, 0.6, 0.8, and 1.0 meter. Individual exclusion biomass was taken at the end of the growing season. Each of the exclusion trials was on a south slope at differing gradients. Initial results of the competitive exclusion experiment showed competition intensity in the grasslands was higher at gentle versus steep slopes. [Paper Number 191]

**FIELD TECHNIQUES FOR IMPROVING THE ACCURACY AND EFFICIENCY OF GPS WILDLAND WEED SURVEYS.** Kimberly A. Andersen, Steve Dewey and Melanie Ballard. Research Assistant, Professor and Research Assistant. Utah State University, Logan, UT.

*Abstract.* Accurately determining the size and location of individual infestations is an essential part of wildland weed surveys. GPS technology has greatly improved the ease and accuracy of obtaining such information, but still there can be a high degree of subjectivity involved in some aspects of the mapping process. For example, weed infestations less than a few hectares in size are often recorded as individual points, and the surveyor must estimate patch size visually. Even under ideal conditions of uniform landscape and good visibility, surveyors can find it difficult to maintain consistency and accuracy when estimating distance and area. Pacing or using a tape measure to determine infestation length and width can improve accuracy, but takes considerable time and is often impractical. Relatively inexpensive laser rangefinders now provide precise and rapid measurement of distances up to 800 meters or more, allowing surveyors to determine the length and width or radius of a weed patch and quickly calculate its area. When access into the middle of an infestation is not feasible, such as in the case of dense woody or thorny species, the coordinates of its center can be determined by recording half of the location points at one edge of the patch, pausing the GPS while walking around to the opposite side, and then collecting the remaining half of the points. The GPS unit averages the data and places the feature near the center of the infestation, halfway between the two clusters of points. Using a compass, laser rangefinder, clinometer, calculator, and the "offset" feature of some GPS units, it is possible to remotely map the location and size of inaccessible weed infestations up to 500 meters away. This is particularly valuable when rivers, cliffs, or rugged canyons make access to a visible weed patch extremely difficult or unsafe. Survey skips and overlaps are minimized by programming each GPS unit to automatically record its location every 25 to 300 yards. At the end of each day a map can be produced showing routes traveled by individual surveyors. The interval between non-feature points can be set by each surveyor to represent the maximum distance at which they are confident in detecting at least 90 percent of targeted weed infestations in a given terrain. It is felt that these and other simple field techniques have significantly improved the accuracy and efficiency of recent wildland weed surveys conducted by Utah State University. [Paper Number 193]

**BIOLOGICAL CONTROL OF SALTCEDAR - FIRST DRAMATIC CONTROL SEEN AFTER FIELD RELEASES OF AN ASIAN LEAF BEETLE.** Culver J. DeLoach[1], Raymond I. Carruthers[2], Tom L. Dudley[3], Debra Eberts[4], David J. Kazmer[5], Jeff B. Knight[6], Gregory C. Abbott[7], Bao Ping Li[8], Roman Jashenko[9] and Ivan Mityaev[10]. Research Entomologist, Research Leader, Research Associate, Botanist, Research Entomologist, State Entomologist, Plant Protection Quarantine Officer, Professor, Professor and Professor. [1]USDA-ARS, Temple, TX,

[2]USDA-ARS, Albany, CA, [3]University of Nevada, Reno, NV, [4]USDI-Bureau of Reclamation, Denver, CO, [5]USDA-ARS, Sydney, MT, [6]Nevada Department of Agriculture, Reno, NV, [7]USDA-APHIS, Richfield, UT, [8]Nanjing Agricultural University, Weigang, Nanjing, Jiangsu, CH, [9]Tethys Scientific Society, Almaty, KZ and [10]Tethys Scientific Society, Almaty, KZ.

*Abstract.* Saltcedar is the most devastating exotic weed ever to invade western U.S. riparian ecosystems. Dense thickets often completely replace native plant communities, degrade wildlife habitat, increase wildfires and soil salinity, use great amounts of water, and reduce recreational usage. Conventional controls damage native vegetation in natural areas, are temporary, and expensive. Many prospective control insects are reported in the homeland of saltcedar in Eurasia. Biological control research began by ARS in 1987 at Temple, TX and 1998 at Albany, CA. Some 20 insects have been tested overseas and 10 in quarantine in the U.S. A leaf beetle, *Diorhabda elongata* from Fukang, China and Chilik, Kazakhstan, was released into field cages at 10 sites in Texas, Colorado, Wyoming, Utah, Nevada and California during 1999 and 2000, and into the open field at 7 of these sites in May 2001. It successfully overwintered at 6 of the more northern sites in 5 states, but not in Texas or southern California, because of too short a daylength in the southern sites. We observed population increases and damage to saltcedar at 6 sites, with dramatic early control at Pueblo, CO and Lovelock, NV. *Diorhabda* beetles from Turpan, China and Crete, Greece are active at shorter daylengths and are promising for control in the areas south of the 37th parallel. [Paper Number 194]

**EVALUATION OF A PRESCRIBED BURN PRIOR TO HERBICIDE APPLICATION FOR CANADA THISTLE ( *CIRSIUM ARVENSE* ) CONTROL.** Andrea J. Travnicek[1], Rodney G. Lym[1] and Chad Prosser[2]. Graduate Research Assistant, Professor and Ecologist. [1]North Dakota State University, Fargo, ND and [2]Theodore Roosevelt National Park, Medora, ND.

*Abstract.* Canada thistle is a herbaceous perennial weed that is highly competitive and occurs in a wide range of habitats. Prescribed burning in Theodore Roosevelt National Park (TRNP) has played an important role in maintaining natural ecosystems. However, changes in plant community dynamics caused by burning may also lead to an invasion of weedy species, such as Canada thistle. The objectives of this research were to evaluate the effect of burning prior to herbicide application on Canada thistle control and to evaluate the soil seed bank within Canada thistle infestations in TRNP. A prescribed burn was conducted on one-half of each plot in a split block design in both the North and South Units of TRNP in the fall of 2001. In the spring of 2002, clopyralid, clopyralid plus triclopyr, and picloram were applied to the whole plots. Following the prescribed burn, the number of Canada thistle stems was 72% higher in the burned compared to the unburned treatments but densities were similar by fall 2002. Canada thistle control averaged 74% 2 months after treatment and was similar regardless of herbicides or prescribed burn. The soil seed bank was analyzed to determine what species may replace Canada thistle once the weed has been controlled. Approximately 40 species were recorded, of which 52% were native. However, two perennial species, Canada thistle and stinging nettle were dominant. Thus, long-term management of Canada thistle can include prescribed burns and should include reseeding of desirable species. [Paper Number 170]

**BIOLOGICAL CONTROL OF PURPLE LOOSESTRIFE (*LYTHRUM SALICARIA* L.) WITH *GALERUCELLA* SPP. IN NORTH DAKOTA.** Laurie A. Janzen and Rodney G. Lym. Graduate Research Assistant and Professor. North Dakota State University, Fargo, ND.

*Abstract.* Purple loosestrife has been sold as an ornamental plant under several cultivar names, including lythrum, for almost 50 yr. It was added to the North Dakota noxious weed list in 1996 and reported infestations of purple loosestrife increased from 15 ha in 1997 to 103 ha in 2001. The largest infestations were generally found near urban drainage areas. Biological control of purple loosestrife may be the preferred control method in urban areas where the public is often apprehensive about herbicides. The objective of this research was to evaluate the effect of *Galerucella* spp. biological control agents for purple loosestrife control in urban areas. *Galerucella calmariensis* and *G. pusilla* were released in 1998 in Chautauqua Park, Valley City, North Dakota, within an established purple loosestrife infestation along the Sheyenne River. *Galerucella* spp. established and began to decrease the purple loosestrife stem height from an average of 1.4 m in 1998 to 0.2 m in 2002, and also decreased plant density at the release point from 15/m$^2$ in 1998 to 2/m$^2$ in 2002. The number of *Galerucella* spp. eggs gradually increased to 119/m$^2$ in 2002, and eggs were found at least 15 m up- and down-stream from the release point, indicating the *Galerucella* spp. have established. In a second location, the *Galerucella* spp. did not establish due to insecticides

applied in a mosquito control program. Biological control using *Galerucella* spp. can be an effective alternative to herbicides for purple loosestrife control near urban areas when insecticides are not used. [Paper Number 172]

**APPROACHES FOR ASSESSING THE INVASIVE THREAT OF *CYNARA CARDUNCULUS* IN CALIFORNIA GRASLANDS.** Virginia A. White and Jodie S. Holt. GSR and Professor. University of California, Riverside, CA.

*Abstract.* Understanding the conditions necessary for germination and establishment is critical to formulating successful management plans for invasive species. Experiments investigating the environmental physiology of Cynara cardunculus, artichoke thistle were conducted at field sites, in greenhouses, and in germinators. A field study comparing germination and establishment of artichoke thistle seeds planted into four different plant communities was conducted near Laguna Beach, CA. Over the three years of the experiment, percent germination was highest in thistle and south-facing coastal sage scrub communities and was significantly different from other communities. To determine how site-specific characteristics affect germination and establishment, greenhouse and germinator experiments were conducted testing the effects of cover, temperature range, water availability and competition. In a greenhouse cover experiment, germination was greater in treatments in which seeds were covered with soil or plant thatch versus treatments in which seeds were left exposed on the soil surface. In a germinator experiment, high temperature and low soil water potential resulted in low seed germination and delayed the germination of those that did germinate. In a greenhouse competition experiment, artichoke thistle target plant size was always reduced compared to controls when the competitors were also invasive species. Competition with a native grass significantly reduced artichoke thistle target plant size, but only when it was planted one month prior to the target plant. The results of these comprehensive experiments will provide land managers with critical information required for detecting areas sensitive to invasion and site-specific characteristics of likely invasion foci. [Paper Number 178]

**SITE SENSITIVE CONTROL MEASURES FOR JAPANESE KNOTWEED (*POLYGONUM CUSPIDATUM* SIEB & ZUCC.).** Ron P. Crockett[1] and Phillip Burgess[2]. [1]Monsanto Co., Vancouver, WA and [2]Clark Co. Weed Control, Vancouver, WA.

*Summary.* Japanese Knotweed is a serious invasive weed in riparian, and upland sites in the western United States. Control options are discussed using unique approaches field-tested the last two years. [Paper number 201]

## BASIC SCIENCE (PROJECT 6)

**DEVELOPMENT OF WEED RESISTANCE AS AFFECTED BY FREQUENCY OF HERBICIDE APPLICATION.** Dan A. Ball, Donn C. Thill, Mike Ensminger, Kirk Howatt, Steve Seefledt, Phil A. Banks and Randy L. Anderson. Weed Scientist, Weed Scientist, Weed Scientist, Weed Scientist, Weed Scientist, Consultant and Agronomist. WSWS Herbicide Resistance Committee, Newark, CA.

*Abstract.* A key strategy for managing weed resistance is to reduce frequency of herbicide use, thus minimizing the herbicide's selection pressure on the weed community. Simulation models based on population dynamics of wild oats (Avena fatua L.) and jointed goatgrass (Aegilops cylindrica Host.) are available to predict rate of resistance development. Our objective was to quantify the impact of reducing use frequency in managing herbicide resistance. Our first case examines wild oats and its resistance to ACCase inhibiting herbicides. Cavan et al., (Weed Sci. 49:236; 2001) estimated rate of resistance development based on the frequency of ACC-inhibiting herbicides use across years. In a no-till system, resistant wild oats appeared within 13 years if ACCase-inhibiting herbicides were applied every year. If applied once every two years, resistance biotypes appeared after 30 years. A surprising trend, however, occurred when the herbicide was applied only once every three years; resistant plants did not appear until after 126 years. Applying an ACCase-inhibiting herbicide every year imposed 10-fold more selection pressure on wild oats than applying the herbicide once every three years. The contrast between applying the herbicide every two years versus every three years was more than four-fold. A second simulation model evaluated the relationship between frequency of use and ALS-inhibiting herbicide resistance development in the jointed goatgrass seedbank. In this model developed by Hanson et al., (Weed Technol. 16:156-163) seedbank abundance of imazamox-resistant jointed goatgrass increased and surpassed the abundance of susceptible jointed goatgrass in the seedbank after 4 years when imazamox was used each year in continuous, imazamox-resistant winter wheat. In a winter wheat –

fallow crop rotation, resistant jointed goatgrass seedbank abundance surpassed susceptible numbers after 9 years if imazamox-resistant wheat and imazamox were used every crop year. In a simulation of a winter wheat – fallow crop rotation with imazamox-resistant wheat grown every other crop (once in four years), an imazamox-resistant jointed goatgrass population did not surpass the susceptible population during the 10 year simulation. These simulation models demonstrate the impact of herbicide use frequency on rate of resistance development. Selection pressure on the weed community can differ 10-fold between yearly applications and less frequent use, such as one application every three years. In some regions of the Western U.S., producers are diversifying their rotations because of no-till systems; it will help resistance management if crop sequences could be developed that reduce frequency of herbicide use within a mode of action to once every three years. [Paper Number 30]

**PHYSIOLOGICAL AND MOLECULAR BASIS OF ALS-INHIBITOR RESISTANCE IN SPINY SOWTHISTLE.** Kee-Woong Park, Judy Kolkman and Carol Mallory-Smith. Mr., Dr. and Dr.. Department of Crop and Soil Science, Oregon State University, Corvallis, OR.

*Abstract.* Suspected thifensulfuron-methyl resistant spiny sowthistle was identified near Colfax, Washington, in winter wheat and lentil rotation fields previously treated with thifensulfuron-methyl and imazethapyr herbicides. Studies were conducted to confirm the resistance of spiny sowthistle to ALS inhibitors (thifensulfuron-methyl and imazamox), and to determine the physiological and molecular basis for herbicide resistance. Whole plant dose-response experiments confirmed that the biotype was resistant to thifensulfuron-methyl and imazamox. The rates of thifensulfuron and imazamox required for 50% biomass reduction ($GR_{50}$) were 479 and 14 times greater for the resistant biotype, respectively, compared to the susceptible biotype. Using an in vivo acetolactate synthase (ALS) assay, the concentrations of thifensulfuron-methyl and imazamox required for 50% ALS inhibition ($I_{50}$) were 624 and 17 times greater for resistant biotype, respectively, compared to susceptible biotype. Degenerate primers were designed based on homologous regions of the ALS sequence between two other Compositae species, *Xanthium strumarium* and *Lactuca serriola*, and used to amplify ALS from spiny sowthistle using PCR. The partial sequences of three ALS genes (*als1*, *als2*, and *als3*) were identified from cloned PCR-amplification products derived from both resistant and susceptible biotypes. DNA sequence analysis of the ALS genes demonstrated a single-point mutation from C to T at the als1 gene, conferring the exchange of the amino acid proline to leucine in the resistant biotype at c197. This research indicates that the resistance of spiny sowthistle to ALS inhibitors is based on altered target site and is due to point mutation in the *als1* gene. [Paper Number 31]

**HOMOGENEOUS GRANULAR BLENDS FOR CROP PROTECTION.** Luann M. Pugh, Timothy T. Obrigawitch and Wayne J. Schumacher. Senior Research Associate, Global Technical Product Manager and Global Product Manager. E.I. DuPont de Nemours and Co., Inc., Wilmington, DE.

*Abstract.* DuPont has pioneered homogeneous blends of dry granules as a new option to prepare mixture products that offer a broad spectrum of pest control. These blends are prepared after carefully controlling physical properties of the component granular products, such as bulk density and granule geometry so that the product remains homogeneous during shipping, handling and when dispensing subsamples from the container. If these factors are not adequately controlled, segregation can occur in the blend giving inconsistent composition of measured portions from a container. A wide range of blend combinations is possible and can provide tailored active ingredient ratios to meet specific customer needs. Some of the first blends introduced by DuPont include Ally Extra® (3- way blend of tribenuron + thifensulfuron + metsulfuron), and Oustar® (blend of hexazinone + sulfometuron). DuPont currently has 7 commercial herbicide blends available in the United States and the United Kingdom with several more herbicide blend products pending registration. [Paper Number 32]

**INFLUENCE OF SPRING AND FALL HERBICIDE TREATMENTS ON CARBOHYDRATE AND 1-FEH ENZYME ACTIVITY IN ROOTS OF CANADA THISTLE.** Lori A. Howlett and Robert G. Wilson. Research Assistant and Professor. University of Nebraska, Scottsbluff, NE.

*Abstract.* Field experiments were conducted near Scottsbluff, NE to examine the changes in glucose, fructose, sucrose, fructans and fructan 1-exohydrolase (1-FEH) activity in roots of Canada thistle following herbicide treatment. The herbicides 2,4-D at 1.1 kg ha -1, dicamba at 0.56 kg $ha^{-1}$, dicamba plus diflufenzopyr at 0.2 plus 0.09 kg $ha^{-1}$, glyphosate at 1.68 kg $ha^{-1}$, and clopyralid at 0.28 kg $ha^{-1}$ were either applied in the spring when Canada thistle was in the bud growth stage or in the fall one day after the first freeze (-2 C). Thirty days following treatment

roots of Canada thistle were exhumed from the soil and analyzed. Carbohydrates were characterized using high performance anion exchange chromatography combined with pulsed amperometric detection (HPAEC-PAD) with a Dionex 500 ion chromatography system. The activity of 1-FEH was determined by incubation of root extracts with inulin and analysis of products by HPAEC-PAD. On July 25, 30 days following herbicide application the activity of 1-FEH in roots of untreated plants was 7 nmol $g^{-1}$ FW $min^{-1}$, in plants treated with 2,4-D and glyphosate 1-FEH activity had increased 600% while in plants treated with other herbicides the activity of 1-FEH had increased approximately 400%. Glyphosate increased the concentration of fructose in Canada thistle roots while all herbicides decreased the concentration of 1-fructofuranosyl-nystose. In the fall 30 days following the first frost, 1-FEH activity in roots of untreated plants had increased 888%. Dicamba and clopyralid caused 1-FEH activity to increase and quantities of 1-kestose to decrease in Canada thistle roots. In contrast glyphosate treated plants had greater concentrations of sucrose in roots. [Paper Number 33]

**SEASONAL CHANGES IN GLUCOSE, FRUCTOSE, SUCROSE, AND FRUCTANS IN THE LEAVES, SHOOTS, AND ROOTS OF QUACKGRASS.** Patricia M. Nielsen and Robert G. Wilson. Research Assisant and Professor. University of Nebraska, Scottsbluff, NE.

*Abstract.* Laboratory and field studies were conducted to develop methods for characterization of glucose, fructose, sucrose, and fructans in the leaves, shoots, and roots of quackgrass. Plants were collected each month from July through February. Quackgrass plants were removed from the soil to a depth of 25cm. Soil was washed from plants with water and plants were allowed to air dry. Plants were divided into leaves, shoots, and roots and a composite sample of plant materials from plants was combined and processed in juicer. Juice extracts were diluted with deionized water and filtered through a 0.45 m filter before analysis. Carbohydrates were characterized using high performance anion exchange chromatography combined with pulsed amperometric detection with a Dionex 500 ion chromatography system. Glucose, fructose, sucrose, and fructan polymers (inulin) were separated in a PA-100 column utilizing eluents of sodium hydroxide and a combination of sodium hydroxide an sodium acetate. Short chain-length fructans (1-kestose,1-nystose, and 1-fructo-furanosylnystose) were present in leaves, shoots, and roots on all sampling dates. Concentration of short chain-length fructans and sucrose were present in greater quantities in roots than in leaves or shoots during August and September. After the occurrence of cooler temperatures and frosts in October the concentrations of short chain-length fructans declined in roots while the concentration of sucrose increased dramatically in roots, leaves, and shoots. In summary we found this technique to be an effective tool for characterization of free sugars and fructans in leaves, shoots, and roots of quackgrass [Paper Number 34]

**INVESTIGATION OF THE MUCILAGINOUS COATING ON LANCELEAF SAGE SEED.** Eric E. Dvorak, Kirk A. Howatt and Luis E. Del Rio Mendoza. Graduate Research Assistant, Assistant Professor and Assistant Professor. North Dakota State University, Fargo, ND.

*Abstract.* Laboratory experiments were conducted in 2002 and 2003 to examine the mucilaginous seed coat of lanceleaf sage for allelopathic and antimicrobial effects on common weed species and field pathogens found in North Dakota. Lanceleaf sage, wild oat, and rye seeds were soaked in distilled water to remove water-soluble chemicals from the seeds. These solutions were used to germinate black nightshade, green foxtail, kochia, lanceleaf sage, red root pigweed, and wild oat on filter paper in a growth chamber. Germination of all species in each water treatment did not differ from control seeds germinated on distilled water. Imbibed lanceleaf sage seeds were placed on potato dextrose agar in petri plates. The plates were inoculated with Aphanomyces cochlioides, Fusarium graminearum, Pseudomonas syringae, Pythium sp., Rhizoctonia solani, Sclerotinia sclerotiorum, or Xanthomonas campestris pv. phaseoli and allowed to develop. Once the pathogen came into contact with the seed, the mucilaginous seed coating provided a temporary physical barrier to infection against Fusarium graminearum, Rhizoctonia solani, Pythium sp., and Sclerotinia sclerotiorum for up to 12 hours after which the pathogen overtook the seed, causing death. Aphanomyces cochlioides, Xanthomonas campestris pv. phaseoli, and Pseudomonas syringae did not appear to overwhelm the seed and prevent germination. All pathogens initiated growth on the mucilaginous seed coat once they had completely encompassed the seed. Results indicated that no chemical antibiotic agent was present in the mucilaginous seed coat. [Paper Number 35]

**COMPARISON, IMPROVEMENT AND APPLICATION OF MICROCHIP SEED TAGGING METHODS.** David W. Wilson and Stephen D. Miller. Associate Lecturer and Professor. University of Wyoming, Laramie, WY.

*Abstract.* A method for tracking and testing weed seed viability in tillage systems using microchip tags and GPS technology was developed in 2001. This new procedure allows comparison of weed seed viability in various tillage versus reduced tillage systems. With solid information on the effects of tillage on seed survival, recommendations for optimal control and management of weed seed banks can be made. Initially, feasibility and preliminary studies were conducted on 134 khz, 11mm microchips. This information was presented orally at the 2002 WSWS meetings. Continued improvement to this original methodology progressed through the summer of 2002. Testing was conducted on tags of four varied sizes (11mm to 25mm) with 125 and 134 khz frequency ratings to establish the optimal microchip for field use. The tags were tested and compared for readability and reliability in water and soil. Additionally, 11mm microchips from a field trial established in 2001 were recovered after one year. Ease of recovery and survivability of the microchips after one year was noted. [Paper Number 36]

**ALS-RESISTANT HYBRID SUNFLOWER RESPONSE TO FOLIAR APPLICATION AND SOIL RESIDUES OF ALS-INHIBITING HERBICIDES.** Kirk A. Howatt[1], Ron F. Roach[1], Kristin R. Johnson[1], Richard K. Zollinger[1], Greg J. Endres[2] and Paul E. Hendrickson[2]. Assistant Professor, Research Specialist, Undergraduate Student, Associate Professor, Area Extension Specialist and Irrigation Specialist. [1]North Dakota State University, Fargo, ND and [2]Carrington Research and Extension Center, Carrington, ND.

*Abstract.* Commercialization of imidazolinone- (IMI-) and sulfonylurea- (SU-) resistant sunflower hybrids will increase chemical options for broadleaf weed control in sunflower. Field and greenhouse experiments were established to evaluate the cross-resistance of IMI- and SU-sunflower to different chemical families of ALS-inhibiting herbicides and to evaluate crop response to soil residues of ALS-inhibiting herbicides with the intended outcome of determining whether restricted planting intervals may be reduced for herbicide-resistant sunflowers. Post-emergence application of 0.06 oz/A metsulfuron, 0.23 oz/A thifensulfuron, 0.5 oz/A AEF 130360, or 0.5 oz/A chloransulam resulted in 70 to 99% injury to IMI-sunflower, 2 weeks after application. Imazamox at 0.5 oz/A did not cause IMI-sunflower injury, but 0.19 oz/A tribenuron or 0.5 oz/A nicosulfuron resulted in as much as 33 and 68% IMI-sunflower injury, respectively. Tribenuron at 0.19 oz/A did not cause SU-sunflower injury. Other herbicide treatments generally resulted in 25 to 75% SU-sunflower injury, while 0.5 oz/A chloransulam caused 98 to 99% injury. Pre-plant incorporation of 0.008 to 0.5 oz/A imazethapyr did not reduce IMI-sunflower height or dry weight compared to control plants. At 4 weeks after emergence, 0.06 oz/A metsulfuron reduced IMI-sunflower dry weight to 48% of the control, but rates of 0.015 or less did not reduce dry weight. Metsulfuron at 0.001 oz/A reduced conventional sunflower dry weight to 29% of control plants. While visible injury was observed, heights and dry weights of SU-sunflower growing in soil treated with 0.001 to 0.06 oz/A metsulfuron, 0.008 to 0.5 oz/A imazethapyr, or 0.006 to 0.42 oz/A flucarbazone were similar to control plants. Dry weight of conventional sunflower in soil treated with 0.004 oz/A metsulfuron was 54% of control plants at 4 weeks after emergence. [Paper Number 37]

**ROOT KNOT NEMATODES AND TUBER SIZE AFFECT EARLY SEASON GROWTH OF PURPLE AND YELLOW NUTSEDGES.** Brian J. Greenfield, Jill Schroeder, Stephen H. Thomas and Leigh Murray. Graduate Student, Professor, Professor and Professor. New Mexico State University, Las Cruces, NM.

*Abstract.* Studies were conducted during the winter to early-summer months of 2000 and 2002 to determine the influence of root-knot nematodes (*Meloidogyne incognita*) and initial tuber size on purple nutsedge (*Cyperus rotundus*) and yellow nutsedge (*Cyperus esculentus*) emergence and tuber development. Tubers were sized by weight into three categories per nutsedge species. For purple nutsedge, the weight categories were 0.1 to 0.3 g, 0.51 to 0.71 g, and 0.92 to 1.12 g. For yellow nutsedge, the weight categories were 0.02 to 0.04 g, 0.07 to 0.09 g, and 0.14 to 0.18 g. At the New Mexico State University Plant Science Research Center, five tubers of similar size, nutsedge species, and root-knot nematode level (developed in the presence or absence of root-knot nematodes) were planted into entrenched 15cm azalia pots containing a sand/soil mix. Four pots of each nutsedge-nematode-tuber size combination were harvested at 21, 28, 35, and 42 days after emergence. Emergence was defined as at least one shoot in at least 60% of the pots. For purple nutsedge the emergence dates were May 28, 2000 and April 1, 2002, for yellow nutsedge, the emergence dates were May 2, 2000 and April 19, 2002. Results indicate that large and medium mother-tubers of purple nutsedge produced more shoots, greater shoot biomass, and more tubers than small mother-

tubers. Yellow nutsedge had similar results. The presence of nematodes increased yellow nutsedge shoot and tuber counts, shoot and tuber dry weight in 2000 and increased tuber fresh weight at the last sample in 2002. Root-knot nematodes increased purple nutsedge shoot counts and yellow nutsedge shoot and tuber counts and weights in 2000. In 2002 root-knot nematodes had no effect on purple nutsedge shoot and tuber-counts or shoot dry weight. Interactions indicate root-knot nematodes, medium, and large tubers tended to increase yellow nutsedge shoot and tuber counts and weights at a higher rate in 2000, and increase tuber counts at a higher rate in 2002. Purple nutsedge tuber weight was reduced in 2000 for large tubers, but had no effect on small and medium tubers when root-knot nematodes were present until the last harvest date where large, infested, mother tubers produced larger tuber weights compared to non-infested tubers. These results indicate that both tuber size and presence of root-knot nematodes may enhance early season nutsedge development. [Paper Number 38]

**TILLAGE AND HERBICIDE EFFECTS ON JOINTED GOATGRASS (*AEGILOPS CYLINDRICA*) GERMINATION.** Lynn Fandrich and Carol Mallory-Smith. Graduate Research Assistant and Associate Professor. Oregon State University, Corvallis, OR.

*Abstract.* Producers in Eastern Oregon have observed that initial control of jointed goatgrass often leads to the establishment of secondary populations. This study was conducted to determine whether germination of the secondary seed in jointed goatgrass spikelets could be manipulated through removal of the primary seedling. Spikelets collected during the 1998 and 2000-2002 growing seasons were individually planted 1 cm deep in small pots and maintained in the greenhouse. The number of seedlings established from spikelets was quantified visually two weeks after planting. Pots containing one seedling received a simulated tillage treatment, a glyphosate application, or were left undisturbed. Two weeks after treatment, pots were scored for the absence or presence of a secondary seedling. If present, the secondary-seedling was harvested and shoot biomass oven-dried. Germination tests were conducted simultaneously in the greenhouse using 2001 and 2002 seed sources. As jointed goatgrass spikelets aged, the secondary seed became less dormant and germinated when imbibed and exposed to greenhouse conditions. Jointed goatgrass collected from different locations and years responded differently to herbicide and tillage treatments. Removal of the primary seedling in the Athena 2001 jointed goatgrass population promoted germination of the secondary seed. Sequential herbicide or tillage treatments may be justified for control of secondary seedlings in fields with a history of jointed goatgrass infestation. An understanding of the processes that influence weed seed banks may be used to manipulate and manage weeds more effectively. [Paper Number 39]

**CHARACTERIZATION OF CRYPTOCHROMES AND PHYTOCHROMES INTERACTION IN BLUE LIGHT-INDUCED COILING AND PREHAUSTORIA DEVELOPMENT OF DODDER (*CUSCUTA CAMPESTRIS*) SEEDLINGS.** Mustapha A. Haidar, American University of Beirut, New York, NY.

*Summary.* A synergistic interaction between phytochromes (Pr) and cryptochromes and an antagonistic interaction between phytochromes (Pfr) and cryptochromes in mediating coiling and prehaustoria development in dodder seedlings. [Paper Number 40]

**ENGAME™ CAUSES COTYLEDON AND LEAF SURFACE LESIONS AND COLLAPSE OF SUB-EPIDERMAL TISSUES OF GLYPHOSATE-SENSITIVE SPECIES.** William T. Molin[1], Kevin C. Vaughn[1] and Kangetsu Hirase[2], [1]USDA-ARS, Stoneville MS and [2]Mitsui Chemicals, Mobara-shi JP.

*Abstract.* Engame™ Causes Cotyledon and Leaf Surface Lesions and Collapse of Sub-epidermal Tissues of Glyphosate-sensitive Species William T. Molin[1], Kevin C. Vaughn[1] and Kangetsu Hirase[2], [1]Plant Physiologists and [2]Chief Researcher, Technical Service, Agrochemical Group, [1]USDA-ARS, Southern Weed Science Research Unit, Stoneville, MS, and [2]Mitsui Chemicals, Inc., Mobara-shi, Japan The efficacies of Roundup UltraMax and Engame formulations of glyphosate were compared for control of velvetleaf (*Abutilon theophrasti* Medik.), hemp sesbania (*Sesbania exaltata* (Raf.) Rybd. ex A. W. Hill), barnyardgrass (*Echinochloa crus-galli* (L.) Beauv.), and yellow nutsedge (*Cyperus esculentus* L.). Estimates of the $GR_{50}$ for inhibition of growth decreased with time and stabilized at about three WAT. The $GR_{50}$ for the Engame™ formulation was 2- to 4-times lower than Roundup UltraMax for each of the weed species. Engame was also evaluated on Roundup Ready cotton and soybean, and injury was transient and did not exceed 20 percent. Cotyledon and leaf surface injury on cotton was observed within one hour after application of the Engame formulation, but no perturbations were observed with the Roundup UltraMax formulation. Scanning electron microscopy of the glyphosate-sensitive cotton cotyledons following Engame

treatment showed that cuticular waxes were perturbed resulting in the formation of cuticular pits. AMADS (1-aminomethanamide dihydrogen tetraoxosulfate), a proprietary mixture of urea and sulfuric acid used in the Engame formulation, did not cause cuticle perturbations unless applied with a surfactant. Transmission electron microscopy of Engame-treated leaves showed catastrophic cell death beneath the cuticular pits. Perturbations of the cuticular waxes, rapid uptake and cell death may account of the greater efficacy of the Engame formulation of glyphosate. [Paper Number 42]

**WEED SURVIVAL IN YARDWASTE MULCH.** Oleg Daugovish, Ben Faber and Jim Downer. UCCE Advisor, UCCE Advisor and UCCE Advisor. University of California Cooperative Extension, Ventura, CA.

*Abstract.* Ground yardwaste is widely used in Southern California for weed control and soil amendments. However, the survival of weed propagules in the mulch has not been studied. Experiments conducted in spring and summer of 2002 near Oxnard, California compared survival of purple nutsedge tubers, bermudagrass rhizomes, and seed of little mallow and California burclover in 7.6 m3 piles of freshly ground mulch and 18 mo old mulch. Heat resistant permeable bags with weed propagules were placed at 0, 0.15, 0.3 and 1 m depths in the mulch piles and removed at 0.25, 1, 2, 4, 7, 14, 21, 28 and 56 d. Survival of propagules differed among the weed species. However, all weed propagules were killed in freshly ground mulch after 2 d at 1 m and after 7 d at 0.3 m, weed germination and viability were variable at 0.15 m and not affected at 0 m. Weed germination and viability at all depths and removal times were not affected in 18 mo old mulch. Temperatures greater than 60 C generated at depths greater than 0.3 m in freshly ground mulch were likely responsible for destruction of weed propagules. [Paper Number 146]

**MOLECULAR EVIDENCE FOR THE RETENTION OF WHEAT CHROMATIN IN WHEAT BY JOINTED GOATGRASS BACKCROSSES.** Lori J. Kroiss[1], Pradeep Tempalli[1], M. Isabel Vales[1], Oscar Riera-Lizarazu[1], Carol A. Mallory-Smith[1], Jenny L. Hansen[2] and Robert S. Zemetra[2]. Graduate student, Graduate student, Assistant Professor, Assistant Professor, Associate Professor, Support Scientist and Professor. [1]Oregon State University, Corvallis, OR and [2]University of Idaho, Moscow, ID.

*Abstract.* With the advent of herbicide-resistant wheat (*Triticum aestivum*), there has been a concern with the potential for gene flow between wheat and jointed goatgrass (*Aegilops cylindrica*). This is especially true for any genes on the D genome since this genome is shared by wheat and jointed goatgrass. To study the potential for gene migration, $BC_1$ and $BC_2$ plants were produced with jointed goatgrass as the recurrent parent. To determine if wheat chromatin was retained at expected Mendelian frequencies in these backcrosses, 14 SSR molecular markers associated with the arms of the D genome chromosomes were used. For the majority of the markers, wheat chromatin was retained in both the $BC_1$ and $BC_2$ generations at expected Mendelian frequencies. Furthermore, wheat and jointed goatgrass markers for the same chromosome were found to be associated in the backcross generations indicating that recombination could occur between the D genome chromosomes of the two species. Based on these results, it appears likely that a herbicide resistance gene on the D genome of wheat could move into jointed goatgrass if the $BC_1$ and $BC_2$ generations are allowed to be produced in the field. Prevention of gene movement between the two species then depends on proper management and placement of the herbicide resistance gene on the unshared A and B genomes of wheat. [Paper Number 147]

**EFFECTS OF SEED BANK DENSITY AND SEED SOURCE ON WILD OAT SEEDLING EMERGENCE AND SEED MORTALITY.** James A. Mickelson[1] and Corey V. Ransom[2]. Assistant Professor and Assistant Professor. [1]Montana State University, Huntley, MT and [2]Oregon State University, Ontario, OR.

*Abstract.* Weed seed bank research is important to the development of weed management practices that consider the effects of current weed populations on future weed management and crop production. Little information is available on factors affecting weed seed mortality in the soil. A field experiment was conducted at two locations (Huntley, MT and Ontario, OR) to determine the effects of seed bank density and seed source on wild oat seedling emergence and seed mortality. Experiments were initiated in late October of 2001 by establishing wild oat seed banks that were 10 cm by 10 cm in area and 15 cm deep. The experiment was a randomized complete block – split plot design with four replicates. Main plots were two seed sources (MT and OR) and subplots were 8 seed bank densities (500, 1,000, 3,000, 6,000, 10,000, 20,000, 40,000, and 80,000 seeds $m^{-2}$). Wild oat seedling emergence was determined during the growing season by counting and removing newly emerged seedlings at 7 to 10 day intervals. Seed banks were removed in October of 2002. Wild oat seeds were removed from the soil by washing soil through a sieve. Seed

viability was determined with a tetrazolium test. At Ontario, emergence percentage was similar between seed sources (22% for MT and 18% for OR), however, at Huntley, greater emergence occurred from the OR seed source (46%) than the MT seed source (31%). Seed source also affected seed mortality. The OR seed source had greater mortality than the MT seed source at Ontario (61 vs. 45%) and at Huntley (34 vs. 29%). Total seed bank decline (emergence plus mortality) was greater for the OR seed source than the MT seed source at Ontario (79 vs. 66%) and at Huntley (80 vs. 60%). Linear regression was used to relate seedling emergence, seed mortality, and seed bank decline to seed bank density. Seed bank density significantly influenced wild oat seedling emergence of the OR seed source at Ontario, but did not influence emergence of the MT seed source at Ontario or either seed source at Huntley. Seed bank density influenced seed mortality of the OR seed source at Huntley, but did not influence mortality of the MT seed source at Huntley or either seed source at Ontario. Seed bank density influenced total seed bank decline of both seed sources at Ontario, but did not influence seed bank decline of either seed source at Huntley. Results suggest that seed source can have a large effect on emergence and mortality in wild oat seeds. Seed bank density can influence emergence and mortality, but this effect is dependent on environmental and seed source effects. Furthermore, the effects of seed bank density appear to be minimal at densities found naturally in agricultural fields (less than 10,000 seeds $m^{-2}$). [Paper Number 148]

**AN AUXIN-BINDING PROTEIN (ABP) IN DICAMBA-RESISTANT *KOCHIA SCOPARIA*.** William E. Dyer. Professor. Montana State University, Bozeman, MT.

*Abstract.* Resistance (R) to the auxinic herbicide dicamba has been verified for kochia biotypes in several areas of the United States. Dose response studies show that the inbred R line HRd from northern Montana is 4- to 5-fold more tolerant to dicamba than susceptible (S) plants. HRd is also impaired in several auxin-mediated developmental responses, including shoot gravitropism and apical dominance. Resistance is not due to altered rates of herbicide uptake, translocation, or metabolism. DNA sequencing of a partial cDNA encoding an auxin binding protein (ABP) revealed that HRd contains two mutations in conserved domains thought to be necessary for auxin binding. Protein structure modeling shows that one of these mutations is adjacent to the proposed auxin binding site and thus may interfere with auxin binding. Altered auxin binding could be responsible for the HRd auxin phenotypes listed above. Although the binding site of dicamba (and other auxinic herbicides) is not known, we speculate that these mutations may also reduce dicamba binding and thus confer resistance. [Paper Number 149]

**MECHANISM OF COMMON WATERHEMP RESISTANCE TO PROTOPORPHYRINOGEN OXIDASE (PROTOX)-INHIBITING HERBICIDES.** Douglas E. Shoup and Kassim Al-Khatib. Graduate Research Assistant and Associate Professor. Kansas State University, Manhattan, KS.

*Abstract.* A biotype of common waterhemp (*Amaranthus rudis*) difficult to control with protox- inhibiting herbicides was reported near Sabetha, KS in 2000. Greenhouse experiments confirmed resistance to protox-inhibiting herbicides as well as acetolactate synthase-inhibiting herbicides. The objectives of this study were to determine if differences in absorption, translocation, metabolism, soluble protein and total chlorophyll are the basis for protox-resistance in common waterhemp. At 13 to 18 cm tall, susceptible (S) and resistant (R) common waterhemp plants were treated with $^{14}C$ labeled acifluorfen or lactofen. Six, 12, 24, and 72 h after herbicide application, plants were separated into treated leaf, foliage above treated leaf, foliage below treated leaf, and roots. In general, absorption increased over time, however, absorption was similar for both biotypes and herbicides. For both biotypes, 85-95% of acifluorfen and lactofen remained in the treated leaf. An organophosphate insecticide interaction experiment was conducted to determine if cytochrome P450 was involved in the mechanism for resistance. Resistant plants were treated with a recommended rate of malathon or diazinon followed by a 1x rate of acifluorfen or lactofen. Acifluorfen and lactofen rates required to induce 50% visible injury were not different when herbicides were applied alone and with an insecticide. Total soluble protein and chlorophyll contents were determined in R- and S-biotypes. Leaf material was homogenized in appropriate buffer solution, and soluble protein and chlorophyll contents were determined photometrically. The R-biotype had 25 and 28% less protein and chlorophyll than the S-biotype. This research showed that resistance is not due to insufficient absorption, translocation, or cytochrome P450 metabolism. In addition, the S-biotype had a slightly higher protein and chlorophyll content compared to the R-biotype. [Paper Number 57]

**ABSORPTION, TRANSLOCATION, AND METABOLISM OF BAY MKH 6561 IN ALS-INHIBITOR RESISTANT- AND SUSCEPTIBLE-DOWNY BROME (*BROMUS TECTORUM*) BIOTYPES.** Kee-Woong Park, Lynn Fandrich and Carol Mallory-Smith. Mr, Ms and Dr. Department of Crop and Soil Science, Oregon State University, Corvallis, OR.

*Abstract.* Experiments were conducted to investigate the absorption, translocation, and metabolism of BAY MKH 6561 in ALS inhibitor resistant downy brome biotypes (AR and MR) and susceptible biotypes (AS and MS). Absorption and translocation of $^{14}$C-BAY MKH 6561 were similar in all biotypes. The majority of absorbed radioactivity remained in the treated leaf and only 20% of the absorbed translocated to the shoot and roots 48 HAT. Most of the BAY MKH 6561 was metabolized by 72 HAT in all biotypes. However, BAY MKH 6561 was metabolized more rapidly in the MR biotype than the other biotypes. The half-life of BAY MKH 6561 in the MR biotype was 8.9 h and was 40% shorter than in the susceptible biotypes. The half-life of BAY MKH 6561 in the AR biotype was similar to those of the susceptible biotypes. When $^{14}$C-BAY MKH 6561 was applied with 1-aminobenzotriazole, an inhibitor of cytochrome P450, the rate of metabolism of BAY MKH 6561 in the MR biotype decreased from 63% to 43% at 12 HAT. ALS assay and gene sequence analyses showed that the mechanism of resistance of the AR biotype was target site based while resistance of the MR biotype was not. These data indicate that the different sensitivity of the MR biotype to BAY MKH 6561 is due to the relatively rapid rate of BAY MKH 6561 metabolism compared to the other biotypes. It also is proposed that cytochrome P450 is involved in the metabolic degradation of BAY MKH 6561 in the MR biotype. [Paper Number 58]

**ETHYLENE PRODUCTION AS AN INDICATOR OF AUXINIC HERBICIDE TOLERANCE IN *KOCHIA SCOPARIA*.** David S. Belles, Scott Nissen and Phil Westra. Graduate Student, Associate Professor and Professor. Colorado State University, Fort Collins, CO.

*Abstract.* Ethylene, an important plant hormone, is produced in response to auxin and auxinic herbicides. Reduced ethylene production has been shown to occur in auxinic herbicide resistant plants such as wild mustard (*Brassica kaber*) and yellow starthistle (*Centaria solstitialis*). Ethylene has also been implicated in causing epinasty and apoptosis in susceptible plants. The ethylene production in dicamba resistant and susceptible kochia (*Kochia scoparia*) was investigated with dose response and time course experiments. Dicamba was applied to 7 cm tall kochia. Ethylene was measured using a gas chromatograph with an FID detector. Susceptible kochia produced more ethylene than resistant kochia and reached a level 2 to 4 times higher than resistant kochia at 280 g ha$^{-1}$ of dicamba. As herbicide dose increased, ethylene production leveled off. The rate of ethylene production was 2.5 times greater for susceptible compared to resistant kochia. Addition of the ethylene inhibitor (aminooxy)acetic acid eliminated ethylene production in susceptible and resistant kochia and eliminated epinastic symptoms. Resistant and susceptible plants treated with fluroxypyr did not differ in ethylene production 48 HAT. [Paper Number 66]

**DEVELOPMENT OF AN IN VIVO BIAOASSAY TO DETERMINE AHAS ACTIVITY IN CLEARFIELD WINTER WHEAT AND WINTER ANNUAL GRASSES.** Reginald Sterling, Phil Westra, Dale Shaner, and Scott Nissen. Colorado State University, Fort Colins, CO.

*Abstract.* Clearfield winter wheat (imazamox resistant) was commercially developed in 2002 for the control of troublesome winter annual grasses including jointed goatgrass, downy brome, and feral rye. The mechanism of resistance in Clearfield winter wheat is a modified AHAS enzyme. However, the level of resistant enzyme is approximately 35% of the total enzyme activity. It is not known how rapidly AHAS activity recovers in Clearfield winter wheat after application of imazamox. In addition, the development of resistance in winter annual grasses is also a concern. We determined if the in vivo AHAS assay could be used to measure the recovery of AHAS in Clearfield wheat as well as to monitor AHAS activity in the winter annual grasses. The activity was measured using five millimeter stem segments. In vivo AHAS activity was reduced approximately 50% at 3 and 7 days after treatment (DAT) in Clearfield wheat treated with four ounces of imazamox, but had recovered to the untreated level by 14 DAT. In contrast, in vivo AHAS activity in a susceptible winter wheat was reduced more than 80% after imazamox treatment and never recovered. The in vivo AHAS assay worked well with all of the winter annual grasses and showed their sensitivity to imazamox. [Paper Number 67]

**GERMINATION RESPONSE OF WINTER AND SPRING JOINTED GOATGRASS (*AEGILOPS CYLINDRICA*) COHORTS.** Lynn Fandrich and Carol Mallory-Smith. Graduate Research Assistant and Associate Professor. Oregon State University, Corvallis, OR.

*Abstract.* Although jointed goatgrass is reported to be a 'strict winter annual,' it has been observed growing in the Pacific Northwest in spring crops. This study was conducted to compare germination and spikelet parameters of jointed goatgrass collected in spring crops and winter wheat. In 2001, jointed goatgrass spikelets were collected at weed and/or crop maturity from multiple field populations in Oregon and Washington. The 'spring' and 'winter' collections were grown in common nurseries at Pendleton, Moro, and Corvallis, Oregon. Sub-samples of spikelets from nursery cohorts were weighed, and germination assays were conducted on freshly harvested 'winter' and -20 C stored 'spring' nursery-produced spikelets. In infested fields, jointed goatgrass 'spring' cohorts had lower population densities, and plants were shorter, less mature, and produced fewer tillers than 'winter' cohorts. Differences in plant phenotypes between 'spring' and 'winter' cohorts were not observed in the jointed goatgrass nurseries. 'Spring' and 'winter' cohorts did not differ in spikelet mass. The temperature range over which 'winter' cohorts germinated was more narrow than the range for 'spring' cohorts. Therefore, 'winter' cohorts may be considered more dormant than 'spring' cohorts. 'Winter' jointed goatgrass cohorts grown at Corvallis were more dormant than 'winter' cohorts grown at Pendleton and Moro. 'Spring' adapted cohorts of jointed goatgrass may have been selected through spring cropping. Environmental conditions during seed development also may affect levels of post-harvest dormancy in jointed goatgrass. Greenhouse and laboratory studies are being conducted to measure seed production per plant and quantify vernalization requirements for 'spring' and 'winter' cohorts. [Paper Number 68]

**WEEDS OF RANGE AND FOREST (Continued from page 35)**

**CHEMCIAL CONTROL STRATEGIES FOR AFRICAN RUE (*PEGANUM HARMALA*).** Chrles R. Hart, Texas Cooperative Extension, Fort Stockton, TX .

*Summary.* African rue is an introduced invasive plant found in the southwest. Its very aggresive nature, drought tolerance, lack of natural enemies, and reproductive characteristics have given it a competitive advantage over native vegetation. It is known to be poisonous to livestock and also extremely hard to control with chemicals. Biology of African rue and chemical control trial results will be discussed. [Paper Number 85]

**WEEDS OF AGRONOMIC CROPS (Continued from page 81)**

**WEED CONTROL SYSTEMS IN IMIDAZOLINONE-TOLERANT (CLEARFIELD) SUNFLOWER.** Gary M. Fellows, Mark C. Boyles, Chad H. Fabrizius, Paul J. Ogg, and Vince L. Ulstad. BASF Corporation

*Abstract.* Clearfield sunflowers tolerant to postemergence use of Imazamox (Beyond) herbicide have been evaluated for crop tolerance and weed control systems in the US sunflower growing areas. The incorporation of the non-GMO tolerant trait into both oil and confection seed sunflowers has given sunflowers commercially acceptable tolerance to Imazamox. Field testing at multiple locations had confirmed this tolerance. Low levels of transient chlorosis can occur, but are quickly overgrown with no resulting yield reduction. Weed control programs using imazamox (0.032 lbai/a) control many problem broadleaf and grass weeds in sunflower production. Major broadleaf weed control include: marshelder, cocklebur, lambsquarters, redroot pigweed, nightshade spp, and most mustards. Grass weeds controlled include: foxtails, barnyardgrass, wild oats, and volunteer cereals. Based on evaluations of field trials over three years, the efficacy of a sequential program of pendimethalin followed imazamox, resulted in an increase in overall weed control of small seeded broadleaves, and grasses. Trials conducted on multiple tillage systems (no-till to conventional tillage) demonstrated the utility of Imazamox in sunflower production across diverse cultural practices. [Paper number 197]

## EDUCATION AND REGULATORY

Chairperson: William B. McCloskey

*Topic 1: Presenting Cooperative Extension Education Materials via the WEB;Jenny Jones, University of Arizona Maricopa Agricultural Center – Arizona Crop Information Site (ACIS) webmaster*

Following an introduction by Bill McCloskey who discussed the frustrations of finding weed control information on the WEB using Timothy weed control as an example, Jenny discussed the Arizona Crop Information Site (ACIS) by logging on to the web site (http://ag.arizona.edu/crops) and demonstrating how it is used to present Cooperative Extension education materials via the web. She indicated that the web site has limited resources and that employee turnover is an issue for web sites such as ACIS. Jenny discussed and demonstrated a number of topics using ACIS and other web sites at Western Land Grant Universities including: web site considerations (before you begin), what am I trying to accomplish?, who is my audience?, content, layout, construction and maintenance support, and the importance of advertising (build it and they may or may not come). The discussion that followed addressed presenting decision making tools via the web and noted the problem of getting users to update their copy of the decision making tool, discussed web access by Cooperative Extension clientele, and discussed review policies for material on the web. Review policies should probably be similar to those used for paper publications but the discussion suggested that review policies are inconsistent among universities. It was also noted that even a reviewed and posted article does not remain correct or up-to-date so posted materials should be dated.

*Topic : Development and Delivery of Short Courses for Field Practitioners via the WEB*
*Susan Kelly – Education Program Coordinator, Center for Invasive Plant Management, MSU*

Following a short introduction by Bill who discussed teaching a traditional 1 unit short course to producers and pest control advisors, Susan Kelly discussed the development and delivery of short courses (1 credit hour courses) for field practitioners via the web as an alternative method of delivering in-depth educational content to traditional Extension clientele and other types of land managers. Susan presented information on distance education, web access by clientele and shared her experiences and knowledge gained from organizing and presenting such a course. She demonstrated WebCT and the course mechanics by logging on to the course web site, discussed her role as course coordinator, and discussed the challenges of working with faculty at various Land Grant institutions to provide course content. In the discussion that followed Tracy Sterling (New Mexico State University) and Scott Nissen (Colorado State University) discussed the herbicide mode of action modules sponsored by WSWS and available or soon to be available through the University of Nebraska. Scott passed out post cards with the URL (http://croptechnology.unl.edu).

*Topic 3: Copyright Issues in Web Publishing*
*Kristen Anderson – Hamilton Library, University of Hawaii*

Kristen presented and led a discussion of the current status of copyright issues related to presenting information, images, video and other types of content on the web. She provide URLs to copyright basics (http://www.copyright.gov/circs/circ1.html) and to a site, CopyOwn: A Resource on Copyright Ownership for the Higher Education Community (http://www.inform.umd.edu/CompRes/NEThics/copyown/) that was devoted to understanding the emerging conflicts over copyright ownership within the higher education community and that seeks to find appropriate solutions.

**PROJECT 1: WEEDS OF RANGELAND AND FOREST**
Tim Prather, Chair

*Topic: Early Detection and Rapid Response*

Attendance: John Brock, Janet Clark, Rob Hedberg, Allen Mooney, April Fletcher, Harold Taira, Mary Corp, Shaffeek Ali, Virginia White, Lauren Quinn, L. D. Walker, Nilton T. Matayoshi, Rita Beard, Jodie Holt, Tracy Sterling, Kai Umeda Jennifer Vollmer, Ron Honea, Joe Vollmer, Guy Kyser Curt Johnson, George Beck, Jason Sutton Carl Bell, Nelroy Jackson, Dottie Knecht, Keren Gundersen, Rob Hauff, Mindy Wilkilson Joe DiTomaso, Tim Prather

Rob Hedberg: Great value in early detection and rapid response with two efforts taking place. 1. FICMNU launched a workshop in Colorado Springs in June 2002 resulting in a drafting of a national invasive species plan. Tom Bewick is approaching the task with an all taxonomic view.

How do you assess what is needed when a species is discovered? There are 500 naturalized species in California and it is impossible to monitor all of them.

Construct a hit list:

Many species are unknown and spread is hard to predict.

Put many of the little known species on a watch list and develop a database for this.

If the weed isn't A rated then the weed isn't a priority. A very touchy subject that may be remedied by a database system.

Classification System for New Mexico is an A, B, C, system. Trying to create our own bureaucracy rather than using what is already in place.

What is the best way to look at a system, *i.e.*. an all taxonomic approach or an individual taxon .

There is a perception that bringing plants into the US isn't strict.

Plant protection act has stricter enforcement of plant introduction into Idaho.

Include public view or perception when developing a system for network detection.

Detection procedure
a. intentional – coordinated by state and local government
b. passive – someone finds a plant in the course of other work.
FICMNU – several pilot programs to test use of local levels and herbaria to identify species sent to them and then enter into a national clearinghouse database. Some survey efforts on focused areas can provide many good distributions of invaders.

Plant species reported to whom? Important to establish where people need to report new invaders.

National data standards in place for survey.

Plant diagnostic centers at universities educate people where to send the detected species. It seems to work in some states but not others, possibly due to funding.

Much of the current information just sits at many different organizations. However we do have databases like the Invaders database for northwestern states.

Risk assessment
Species are not invasive everywhere.

How should you address which species cannot be sold in a specific state.

Control – greater trust on the local level. Control should not be attempted at a national level. How do you track and report control/eradication? To whom does the report go?

Discussion topic for next year is Risk Assessment.

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| Chairperson: | Tim Prather<br>prather@uidaho.edu | Chairperson-elect: | Janet Clark<br>cipm@montana.edu |

**PROJECT 2: WEEDS OF HORTICULTURAL CROPS**
Chairperson: Tom Lanini

*Topic: Current and future uses of precision weed management in horticultural crops*

Chair and moderator Tom Lanini (University of California, Davis) began the session at 9:00 a.m. with an overview of the topic, "Current and future use of precision weed management in horticultural crops." He introduced Lori Wiles (USDA-ARS, Fort Collins, Colorado), who presented information regarding Colorado State University's development of Site Specific Weed Management technology, including Weed Site software, and a video weed mapping system, using a tractor-mounted unit capable of recording weeds encountered during tillage or other field operations. From these images, weed species and size could be determined and field maps generated. There was also discussion involving linking a postemergence sprayer system for use in orchards (W. McCloskey, University of Arizona) based on presence/absence of vegetation which had been linked to GPS technology, which recorded field locations of when the sprayer was operated, giving the grower an better idea of where weed problems occurred prior to application of preemergence herbicides. A similar system was under development at Purdue University (K. Gibson and R. Dirks) for use in row crops.

Tom then provided some details about a precision sprayer (UC Davis) using pin-point application through individually controlled syringes of postemergence herbicides to weeds that had been detected and differentiated from crop plants using a guidance camera and a recognition camera. The system was suggested as a way to apply nonselective organic or conventional products and gain better levels of control. There was some discussion regarding the use of heat/flame on these seedlings in order to improve weed control from organic products (such as heated vinegar or clove oil), although it was pointed out that cost of pre-heating was often not cost effective. Use of auto-guidance GPS systems to lay out rows and transplant crops also provide some usefulness for spray systems.

Discussion then turned to the ability to use satellite imagery for field applications. Concern over cloud cover and such issues currently don't allow for good remote-sensing, precision systems at this time, although resolutions to one meter are currently possible. Using such systems during the cropping year or in the fall may offer some ability to predict where the weed problems may be the following year, however. It was also noted, that the harvesting process may move weed seed as far as 50 feet along the direction of travel from where it was produced. There was also discussion regarding the use of precise field soil mapping to determine appropriate rates of herbicides given particular soil types (e.g., clay vs. loam vs. sand). Such maps may be of use to augment weed maps for precision weed control systems.

2004 Officers of Project 2:

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|---|---|---|---|
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**PROJECT 3: WEEDS IN AGRONOMIC CROPS**

Don W. Morishita, Chair
Jeffery E. Herrmann, Chair-elect

*Topic: Weed Science Research Equipment, Tools, and Methods- Innovations Among Public and Private Researchers*

The Weeds of Agronomic Crops Project 3 met Tuesday afternoon March 11. Approximately 65 people attended.

An email request was sent out prior to the meeting to university and industry weed scientists asking for their participation in the discussion. Respondents submitted one to several slides of various kinds of unique equipment used for conducting field research. All of the slides were combined into a single PowerPoint file. Each person who submitted slides was given up to 5 minutes to present and lead the discussion of the equipment or apparatus they used.

Two types of plot boom calibration stands were presented by Joan Campbell, University of Idaho, and Corey Ransom, Oregon State University. Both of these calibration stands were simple in design yet very functional for calibrating plot sprayer booms.

Three tractor-mounted or pulled sprayers were presented. by;; and. Each of these sprayers had design qualities that were unique for their use. Mick Mickelson, Montana State University, showed a sprayer he build that was designed with multiple boom widths including a 20 foot boom for spraying larger areas. Dave Claypool, University of Wyoming, presented a sprayer designed for precision agriculture applications that utilizes GPS technology as well as the ability to mix and apply different herbicides for different weeds on the go. Bob Klein, University of Nebraska, designed a sprayer with a hood for use in windy conditions. This sprayer can also be folded for easy transport on a trailer.

Two types of plot planters were presented. Craig Alford, University of Wyoming presented a John Deere Maximerge row crop planter that is designed to easily adjust to different row spacing ranging from 38 (15 inches) to 78 cm (30 inch). It also has the ability to adjust the seeding rate at the same time. The other planter presented by Bob Klein was a cereal grain drill that can be used in reduced tillage operations.

Bob Stougaard, Montana State University, discussed several items he uses for field research. His simplest gadget was using an electrical wire reel for winding rope or cord used for establishing plots. He finds this useful with the large variety trial plots he establishes each year. His second item was a plastic storage case with dividers that he uses for storing and carrying his plastic spray bottles. The third item discussed was the setup of his Almaco combine with a weigh bucket, test weight, and moisture sampler. The last two items were a grain dockage sampler and de-awner for removing awns from barley and wild oat.

Gail Wicks, University of Nebraska, presented information on a crop canopy analyzer that he has been involved. The analyzer mounts on a tractor and can be useful for quantitatively measuring crop injury and weed control.

At Oregon State University, Ed Peachey has been using several apparatus for studying weed seed biology/ecology in soil. One of the pieces was used for establishing differential soil temperatures; another for establishing temperature gradients for seed germination studies; and another for tracking weed seed movement in soil.

The last item discussed was a spray droplet/drift analyzer. This was presented by Bob Klein. This system can be used to quantify spray droplet deposition and drift potential comparisons with different nozzle tips.

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**PROJECT 4: TEACHING AND TECHNOLOGY TRANSFER**
Chairperson: W. Mack Thompson

*Topic: Effective and efficient use of digital photography.*

Mack Thompson led the discussion with approximately 70 members present.

Several brands of digital camera manufacturers were mentioned and some of their differences discussed. Canon, Nikon, and Olympus were mentioned as companies that were traditionally makers of film cameras and have a history of fine optics. Sony was heavily into electronics and companies like Kodak were in other aspects of the photography industry, but now produce digital cameras as well. Camera types include point-and-shoots, advanced P&S's and hybrids ranging in cost from around $100 to over $5,000. Versatile Single Lens Reflex (SLR) digital cameras start in the $1600-$1,800 range.

Most cameras have optical and digital zoom capabilities. Digital zoom was dismissed as a gimmick because it often results in poorer quality images. Many advanced P&S's have 3x optical or better zoom capabilities. Digital SLR's are dependent upon which lenses are purchased.

A pixel was defined as each unique recorded dot or light image and a megapixel as 1 million pixels based on area. Many of the new digital cameras starting at about $500 have 4 MP sensors with a new Canon digital SLR sporting 11+MP. A 3 MP image is sufficient to print out an 8x10" photo.

The discussion moved into how to handle digital images for print and presentation. For most applications, 200 dpi images are adequate for printing. An exception would be for photo quality images using a high quality photo printer. Screen or electronic presentations should use 96 dpi images. An example was used to show how monitor size and settings affect resolution. It was mentioned that images 750 pixels wide was adequate for web use. It was discussed that most individuals use images at a much higher resolution than needed for electronic presentations. PowerPoint XP has image compression capabilities built into the program that allow the user to compress one or all of the images in the presentation to either print (200 dpi) or screen (96 dpi) settings. It was stressed that once the resolution of an image is reduced, the full quality image can not be recovered; therefore, always save edited images as different files and preserve the original image.

Several other considerations were discussed including sensor sensitivity and batteries. Digital cameras differ in their ability to adjust the sensitivity of the capture device which is equivalent to using different film speeds in film photography. Types of batteries were discussed—rechargeable, lithium, etc. It was mentioned that even lithium batteries may not be effective in very cold conditions like those found in Fargo, ND. The conclusion was, "Don't go to Fargo."

File sizes and types were discussed extensively. Differences between JPEG, TIFF and RAW file types explained. RAW files are high quality, lossless, uncompressed (or lossless compression), have large file sizes, and often need proprietary decoders; however, these are the highest quality images and can be manipulated and saved in compressed formats such as JPEG. RAW files are useful as originals of highest quality images. JPEG files are the most used because of their compression, but TIFF files are often requested by publishers because JPEG files deteriorate with every manipulation. File sizes for 3 MP images are about 1.4 MB for JPEG file and 3+ MB for 5 MP file. TIFF files would be much larger. Keep in mind that doubling the image size quadruples the number of pixels and thus could quadruple the files size. $2 \times 2 = 4$ and $4 \times 4 = 16$. Sixteen is four times the number of pixels as four, but the image is only twice as large (4 pixels wide compared to 2 pixels wide).

Several types of memory used to store images on the camera and how to transfer images to computer were discussed. Most of the discussion centered on Compact Flash cards. Newer CF cards are 512M MB to 1 GB in size and record images faster than previous versions. Micro drives that fit in CF slots were also mentioned. It was noted that CF cards can be read by PCMCIA card slots in laptop computers. All that is needed is an adapter so the card will fit the slot. These cards can also be used as portable/additional hard drive space. It was suggested that users reformat CF cards after each download to help avoid artifacts and data loss. USB is probably the most widely used method to transfer images from camera to computer. Other storage devices include secure digital, smart media, and memory stick cards, and writing directly to CD-R and DVD-R. High end and future cameras may use IEE1394 (firewire, i-link) ports for transfer.

File management was then discussed. The need for a method to send comments with images was expressed. JPEG files will record the camera settings, date and time image was taken, but comments added later are often stored in a separate database

and are not transferred with image files such as when images are sent via email. Canon's database Zoombrowser EX was discussed as well as ACDC. Other image software was discussed along with uses and costs. It was stressed that image files should be backed-up and that CD-R's should not be considered permanent storage because there are examples of these disks deteriorating over time.

Additional uses for digital photography mentioned include counting, weed ID, canopy and residue coverage and stand counts. Concerns for digital photography compared to film photography were discussed. These concerns include data loss, legal concerns, low light situations, and batteries.

Jed Colquhoun, Oregon State Univ., is the Chair for 2004. Cheryl Wilen, Univ. of California-Davis, was elected Chair-Elect.

## PROJECT 5: WETLANDS & WILDLANDS

Chairperson: Nelroy Jackson

*Topic 1: Ecological Amplitude of Invasive Plants (led by Rita Beard)*
*Topic 2: Pathways of Introduction (led by Nelroy Jackson)*

There were 32 participants in the discussion group.

### Ecological Amplitude of Invasive Plants

#### Introduction

It is difficult to go to a single location and get information on the ecological amplitude of an invasive plant. There is information on distribution by state and even counties through the PLANTS database http://plants.usda.gov/ but this really does not give you ecological range information. A model may be the largest tree registry, which tracks information on the location, size and other pertinent information on the largest tree for a species. A similar system for invasives would look at the extremes in range based on a given set of ecological criteria. The sum of these criteria would then determine the ecological range and amplitude for a species. The following questions will provide the focus for this discussion.

1. Is there useful, specific information readily available on the ecological amplitude of invasive species?
2. If not, is it useful information that should be compiled?
3. What are the significant factors that determine ecological amplitude?
4. What is an appropriate way to pursue this information?

#### Discussion

It strikes me that there is no place that a person can go and find the information on where leafy spurge stops. It turns out that most of the saltcedar in WY is hybrid of 2 species and that these genetic differences may be responsible for the expansion of saltcedar further and further north into Wyoming and Montana. A species may have not only physical but also ecological barriers. Is this useful or 'nice to know' information? There is a list of weeds in the Pacific that have become invasive. One should look at areas with similar geography and search for invasive plants in those locales. Should we not also study the plants that have been sent from the U.S. to other parts of the world?

What is the highest elevation that anyone in this room has found spotted knapweed – 7000 feet? - but it was found at 11000 feet in New Mexico. Are ecological gradients more important than physical limitations? Jodie Holt looks at these as research questions. You define the range of species by doing research, and not by using anecdotal information. On the other hand, people can anticipate where camelthorn may exist based on the extremes of where it currently exists. It gives ecological clues as to where to expect a plant. The Forest Service has massive amounts of land that have not been inventoried. I see value in having sideboards. It would help with current invaders.

What variables are transportable between systems and will predict distribution? Some environmental factors or some aspect of it not being able to get into a community because it has more physiological tolerance. For some species it may be primarily water that will be limiting whereas in others it would be some other ecological factor such as light. Microclimates

can also be a major contributor to distribution. An example: when there was no rain in Wyoming, but Russian thistle and kochia still grew along roadsides.

Is it useful to collect the information? A lot of information is published in Europe and elsewhere, but the ecological amplitude of a species in its native range may be more restricted due to native pests, competition from other plant species and the like. It is an idea that maybe should be put on the backburner. It may be something that CIPM, Missouri Botanical Gardens or the Smithsonian can take on.

**Pathways for Introduction**

**Introduction:**

There could be some simple solutions to invasive problems. Nelroy related a story about how the even well informed could unintentionally be responsible for spreading invasives from one area to another by transporting weed seeds in boots.

Invasive Species Advisory Council (ISAC) is investigating potential pathways for distribution of invasive species. The group brainstormed ideas on how invasive plants are spread over pathways and some solutions to assist in this report.

**Discussion**

**What are the most important pathways?**

Wind, e.g. Kikuyugrass spread by Santa Ana winds
Roadways
Gravel
To/From rest areas
Airlines
Transportation corridors, particularly railroads
ATV
Trails
Seed distribution/sales through catalogs and Internet sales
Intentional seed trade/horticulture
Ballast water exchange, may be impossible to retrofit
The medium is an often-overlooked pathway
    Aquarium trade, water, plants etc.
    Cattle transport – in the gut as well as on the coat
    Compost/manure
    Seed trade
    Pet trade – still a powerful lobby against restrictions

**Examples of solutions**:

US Mail: any seed coming into Hawaii is screened, including material coming in from the continental US. Packages must be marked as containing seed or plant materials
Hawaii has a one year quarantine for any grass coming in from continental US.
Displays in terminals to catch and inform travelers
    Sometimes is difficult to get permission for such displays
Idaho does restricts sale and importation of potato seeds and sets
APHIS is often more concerned with pests of plants rather than plants that are pests
Hawaii was able to increase funding for port inspections by $200,000 from Homeland Security
Hawaii has a list of animals that you can bring in
    Volunteering
The hobby trade is below the radar screen for inspection, and is largely immune from regulation and restrictions
Live corral is openly traded and distributed. It is not only the corral but the live organisms it contains, and there are no restrictions to importation and movement.
Why would not Departments of Transportation and Commerce on pressure on airlines that films are shown?

Prioritize surveys based on roadways and other pathways
Public education should be more than just cleaning boats but why you should clean them
Airlines are also another missed opportunity, why folks fill out inspection forms
ISAC invasive species of the month idea
Montana, Idaho. Use before and after pictures.
Some ideas
- Early detection linked to Pathways
- Include in tax statement a list of weeds that county thinks is important
- Target individuals that have a connection to weeds
- Weed free hay restrictions that are workable
- The simpler you can make it the better

Seeking to perfect system for prevention is better to take a more incremental approach to prevention??
E.G. Vermont banned growth and transportation across Vermont, need to make a gentler approach??
Programs of public outreach have been successful in some areas/states e.g. Florida,

Chairman: Rita Beard Chair-elect: Jody Holt

**PROJECT 6: BASIC SCIENCES**
Chairperson: Kassim Al-Khatib

*Topic 1: Herbicide rate and weed resistance case studies*
*Topic 2: Managing herbicide use rate to delay evolution of major gene and polygenic control of resistance*

Signed attendance at the Basic Sciences discussion session was 40 individuals. A mailing list is available. Dan Ball, Oregon State University; Donn Thill, University of Idaho; Kirk Howatt, North Dakota State University; and Bruce Maxwell, Montana State University initiated discussion with short presentations on various aspects of weed resistance to herbicides.

The Herbicide Resistant Plants committee presented a poster Tuesday morning titled 'Development of Weed Resistance as Affected by Frequency of Herbicide Application'. This poster was used as the introduction to selection pressure and resistance evolution. The model used for estimating resistance evolution predicted a substantial increase in time to resistant wild oat populations if the selection pressure, or herbicide, was applied every third year compared to every second year or every year. Wild oat resistance developed after 43 herbicide applications if the herbicide was only applied once in three years, while resistance developed after 15 applications in the every year or every other year scenarios.

Models can give good information on the potential for resistance evolution, but reliable models depend on basic science to provide parameter estimates such as initial gene frequency and mutation rates. These parameters have been estimated for some major gene resistance cases, ALS-resistance, but it is difficult to find virgin populations to investigate initial gene frequency. The group provided examples of surveys of remote weed populations that demonstrated resistance to ALS-inhibiting herbicides in the absence of extensive selection pressure, but even sampling in remote areas couldn't eliminate the possibility of previous herbicide exposure or gene movement. It also was noted that multiple genotypes give similar phenotype, as with ALS-resistant kochia. Genetic elasticity of the target enzyme presents more difficulty in predicting resistance evolution rates. An adequate model can be constructed after resistance has developed and is understood, but predictions are often based on inference.

Resistance expression that behaves similar to a polygenic trait is less understood than major gene resistance. Initial gene frequencies and mutation rates in polygenic systems are not known; therefore, predictions from resistance models are questionable. Investigation of traits believed to be polygenic is difficult because relationships among involved genes are intricate. It was noted that identification of polygenic resistance traits has been elusive. Polygenic control of some herbicide resistance cases has been proposed but not confirmed.

Indication of major gene or polygenic control of resistance was important for discussing the influence of herbicide rate on resistance evolution. While some participants believed that higher herbicide rates would cause quicker resistance evolution regardless of the genetic control, a majority of the group maintained that there was a difference between the systems. Resistance controlled by a major gene would be equally selected at high and low herbicide rates. This is because the

herbicides are often very effective at low use rates, providing selection pressure to drive resistance evolution. Also, point mutations for major gene resistance often confer resistance to very high herbicide rates. Resistance with polygenic type expression will be preferentially selected at low use rates. High herbicide rates will control individuals in the population with intermediate resistance expression and prevent progression to greater resistance response.

Greater selection pressure of polygenic resistance traits at low herbicide rate was confirmed by several examples from the audience. The examples typically involved weeds that were marginally controlled by glyphosate. Sublethal glyphosate rates eliminated the susceptible individuals, which left plants that expressed intermediate response. Over time the population shifted to a higher proportion of surviving plants. This is consistent with methods for generating insect resistance to insecticides. Entomologists promote insecticide resistance by exposing insect colonies to sublethal insecticide rates. The rate is gradually increased until the desired level of resistance in the population is reached. Major gene resistance shows up more rapidly and more frequently because it is selected for more often in our herbicide programs than polygenic resistance but the ease of evolutionary conversion of the two systems should be considered; single point mutations of dominant alleles are intuitively easier to establish than polygenic changes.

Donn Thill presented a prickly lettuce case study. Cropping practice on the fields in the study was continuous winter wheat or winter wheat – fallow. Starting in 1983, chlorsulfuron and metsulfuron were used one to two times per year at labeled rates each time. These herbicides were used in crop as well as in the fallow period and in a preplant burndown treatment with glyphosate. After 4 to 5 years of selection pressure, as much as 83% of the prickly lettuce population in each field was resistant to ALS-inhibitors.

The producer had to initiate new management practices to control the ALS-resistant prickly lettuce. Spring barley and mustard were incorporated into the rotation sequence with winter wheat. Herbicide programs still included infrequent use of shorter residual ALS-inhibitors but chlorsulfuron and metsulfuron were removed from the system and other modes of action were relied on for weed control. The fields were sampled for resistance in 1998, 10 years after the previous testing. The ALS-resistant population had been almost eliminated. A field with 83% resistance in 1988 had 7% resistance in 1998. This trend was found in all fields except one, which was next to a county road. It was believed that resistance remained high in this field because resistance was maintained in the road ditch by selection pressure from county herbicide application. Prickly lettuce population was reduced in almost all fields and resistance generally was absent where populations remained high.

Two others provided cases of suspected reversion to a susceptible weed population in the absence of herbicide selection pressure. This would imply there is a cost to resistance evolution and resistance is not favored in natural selection and evolution, which may be used to explain why initial frequencies of resistance genes are very small. Perhaps resistance evolution affects plant fitness in ways we are not measuring. Should Weed Science revise the methods for evaluating fitness?

Fitness is regarded as the ability of a plant to donate alleles to the next generation. General contention is that once resistance develops it will remain in the population unless significant fitness reduction has occurred with the mutation. Several biological characteristics of the ALS-resistant prickly lettuce were investigated to evaluate fitness. The only difference detected was germination of the resistant biotype at a slightly lower temperature than the susceptible biotype. This difference in germination may mean that the resistant biotype emerged in the field and was killed by preplant glyphosate treatment. If this was the case, reversion to susceptible lettuce plants was due to an alternative selection pressure that favored susceptibility rather than reduced fitness of the resistant biotype.

The prickle lettuce case study demonstrated the utility of a diversified system for managing weed resistance. But even in diversified systems where producers incorporate tillage, crop rotation, and multiple herbicide modes of action, herbicide-resistant weed biotypes have quickly developed. It was pointed out that producers have survived the development of several resistant weed biotypes; however, concern was expressed several times that no-till systems particularly are at risk to glyphosate resistance and may not survive if glyphosate resistance becomes prevalent. Seed banks, seed dormancy, seed rain, and mating system also were identified as areas where additional investigation could lead to refinement of current management practices but were not discussed.

The upcoming CAST symposium, 'Management of Pest Resistance: Strategies Using Crop Management, Biotechnology and Pesticides', will be held in Indianapolis, IN on April 10 and 11. Tracy Sterling was elected as chairperson-elect for 2004.

Project 6 Officers for 2004:

Chairperson: Kirk Howatt
North Dakota State University
Department of Plant Sciences
470-F Loftsgard Hall
Fargo, ND 58105-5051

Chairperson-elect: Tracy Sterling
New Mexico State University
Entomology, Plant Pathology, and Weed Science
MSC 3BE
Las Cruces, NM 88003

**WESTERN SOCIETY OF WEED SCIENCE**
EXECUTIVE COMMITTEE SUMMER BOARD MEETING
FRIDAY, AUGUST 16, 2002, PHEONIX, AZ

Attendees: Dan Ball, George Beck, Gil Cook, Wanda Graves, Nelroy Jackson, Rod Lym, Bill McCloskey, Steve Miller, Bob Parker, Jill Schroeder, Bob Stougaard, Kai Umeda.

Call to Order: President Jill Schroeder called the meeting to order at 8:00 a.m.

Jill Schroeder informed the group that Barb Mullin passed away on Aug 15th. It was moved by George Beck to dedicate the 2003 proceedings to Barb. Gil Cook seconded the motion. Motion passed unanimously.

**Minutes**. Bob Stougaard

Steve Miller moved to approve the minutes from the executive board meetings on March 11th and 14th 2002. Gil Cook seconded. Motion passed unanimously.

**Financial report:** Wanda Graves

Wanda indicated that the society did well financially at the Salt Lake annual meeting. We have investment losses of $44,713.63, but we have a positive balance of $273,866.59. We are financially sound and the finance committee has been very active. Nelroy Jackson moved to accept the report, Steve Miller seconded. Motion passed unanimously.

**Past president report**: Bob Parker

The WSWS Constitution and By-Laws is still to be revised to reflect the change in Standing Committees (giving the duties of the Resolutions Committee to the Past-President), reducing the number of standing committees from 18 to 17, and deleting references to this position in the Operating Guide. This project is on hold until the Ad Hoc committee, led by Vanelle Carrithers, has completed its task. The responsibilities of the Editorial Committee in the Operating Guide is still in the hands Don Morishita to address and provide recommendations to the board.

Rod Lym had more golf balls made with the WSWS insignia to give to future retirees. Notification of retirees has not occurred since the last meeting.

Steve Miller moved to accept the report, George Beck seconded. Motion passed unanimously.

**Program committee.** Gil Cook

Gil will go over in September to evaluate facilities in Hawaii.

General session: Tentative speakers will include a 15-minute presentation from Rob Hedberg to provide an annual update on his activities. Two individuals will also be solicited to discuss local weed management issues of Hawaii. Possible topics include invasive weed problems, and the national botanical gardens.

Bob Zimdahl has requested 30 minuets to speak on the evolution of weed science – ethical considerations. It was suggested that Zimdahl should work with a project or section chair to possibly speak at a discussion group.

Bill Cobb offered to organize a workshop on determining soil organic matter. Miller suggested that more details should be provided, and if approved, that this workshop proposal should be submitted for the following years meeting.

GPS/GIS applications/mapping for weed science was suggested as a discussion or workshop topic. This may also be included in a project session.

No symposia or workshops were approved because of the anticipated attendance and paper submissions for this meeting.

Due to the high attendance anticipated, oral papers and posters will be limited to only a single oral paper as first author and one poster as first author. However, authors can have unlimited participation on oral and poster presentations as secondary authors.

The number of easels and available space may limit the number of posters presented. It was concluded that all student posters should again be situated together.

**Action item:** *Gil Cook will ask Rob Hedberg to make a presentation in the general session and will remind him to make his plane reservations. Gil and Joan Campbell will work on the Call for Papers. Gil will inform Bill Cobb to resubmit his workshop proposal next year due to anticipated time constraints in the program and request that he provide a detailed proposal at that time. Gil will contact Bob Zimdahl and suggest he work with a Section chair or Project chair as a format to present his talk.*

**Research Section:** George Beck

Project chairs should be made aware not only of their responsibilities with regards to assembling the Research Progress Reports, but also their role in preparing and facilitating the various project discussions at our annual conference and the subsequent project reports. We also have the newly adopted electronic format for papers that Project Chairs must contend with. We need to determine any changes for the Project Chair responsibilities that are different than what appear in the WSWS Operating Guidelines, so these can be articulated carefully in the letters that will be sent this fall.

Electronics: Project chairs are to be in charge of acquiring and setting up visual aids and computer technicians. They are responsible for getting a laptop and LCD projector for their session. The version of PowerPoint needs to be similar for all sessions and needs to be put in Call for Papers.

***Action item:*** George Beck will draft a letter detailing project chairs responsibilities. This will be followed by e-mail in November to project chairs and chair elects. George, Gil, Phil, and Bill will work out projection details. Wanda needs write-ups for the Call for Papers, the Progress Report, newsletter items, and Call for Nominations of Outstanding Weed Scientist by August 31.

**Education and Regulatory**: Bill McCloskey

Bill will organize a session pertaining to the use of websites to deliver extension programming. The session will start with a survey of selected Web sites. Other topics would include:

A panel discussion of how the internet is being used at specific Universities; Copyright issues related to the use of information in the internet, particularly images; Access to the web by rural/farm clientele verse urban clientele; Design of effective web sites; Tracking web visitors and using that information to improve the web site; Peer review of information put on web sites; and Publication distribution – free verses cost recovery. Length of session would be 3 to 4 hours.

It was suggested that Bill set up equipment the night before and have some pages stored.

***Action items***; Bill needs to work with Gil and Phil Motooka to inquire about the accessibility and costs for live internet connection and travel expenses for ACIS webmaster (Jenny). This session doesn't need board approval for anything under $1000.00.

Steve Miller made motion to approve program (General session, Research and Education/Regulatory), George Beck seconded. Motion passed unanimously.

**Local arrangements**. Phil Motooka

1. We have held an initial meeting on Kauai and there was no shortage of volunteers to help host the WSWS. Representatives of the Division of Forestry and Wildlife, the Department of Agriculture, the Kokee Natural History Museum , industry, and the UH attended. Several off-island volunteers did not attend.

2. The itinerary for a pre-conference field trip on March 10th to see invasive plants at the Kokee State Park has been set. It will be guided by State foresters and staff of the Kokee Museum. The announcement will be sent to Wanda for inclusion with the conference announcement packet. The cost will be in the $35-40 per person range, mostly because we have to use smaller buses than in Kona in 1998. We charged $30 then.
3. We are in contact with the Sheraton. I will tag along with Gil Cook when he visits the Sheraton in September.

56TH Meeting
Western Society of Weed Science
March 11, 12 and 13, 2003

The Sheraton Kauai Resort-Poipu Beach
2440 Ho'onani Road
Koloa, Hawaii 96756

Phone: 808-742-1661
888-847-0208 (toll free)
Fax: 808-742-4055
Website: www.sheraton-kauai.com

Room Rates for WSWS group:

Run of the House rooms $160.00 single or double
PLUS $20.83 Resort Amenities Fee per room per day inclusive of tax

Resort Amenities Fee includes the following:

-Buffet breakfast for two
-Nightly one hour mai tai sunset punch with Hawaii entertainment
-Local, credit card and 800 access phone calls
-In room coffee maker, safe and mini refrigerators
-Shuttle service within a three (3) mile radius of the hotel
-Access to fitness center and tennis courts
-Four (4) Internet ports that are located in the lobby of the hotel-24 hours

Group rates shall apply three (3) days prior and after the main program, subject to availability.

Third Person rate waived for graduate students.

When making reservations please IDENTIFY WITH WSWS.

A ONE NIGHT DEPOSIT is require to hold reservations.

RESERVATION DEADLINE: February 5, 2003.

Nelroy Jackson suggested that it be emphasized in the reports and correspondence in new letter that we identify ourselves as being with WSWS.

WSWS 2003 Invasive Plants Tour
March 10, 2003
8 a.m. – 4 p.m.

Members and guests of the Western Society of Weed Science are cordially invited to participate in a field trip to see some of the many invasive plants that infest natural areas in the Kokee State Park on Kauai. You will be guided by the foresters of the Division of Forestry and Wildlife (DOFAW), Hawaii Department of Land and Natural Resources and the staff and volunteers of the Kokee Natural History Museum. Along the way, you will visit the ruins of the Russian Fort Elizabeth. While there you will also see an infestation of mesquite (Prosopis juliflora). We will stop at the Waimea Canyon Lookout for a panoramic view of the "Grand Canyon of the Pacific" and at the Kalalau Valley Lookout, where you will see the whole valley down to the sea, 4,000 ft below; or you may just be able to see the hand at the end of your out stretched arm. Though still a beautiful place, the Kokee State Park has been thrice cursed. The introduction of goats, cattle and deer wreaked havoc on the native vegetation. Then as early as 1929, the old Board of Agriculture and Forestry authorized reforestation with exotic trees (via aerial seed drops even). Finally occupants of cabins in the park planted ornamentals, many of which became invasive.

There will be two almost identical tours. Tour A will include, weather permitting or for those willing to brave our liquid sunshine, a guided 1.5 mile hike of Kaluapuhi Trail, a rather easy hike. The trail passes through three types of moist native forest and patches of non-native invasive species, where reclamation work is on-going. A picnic lunch (for both tours) will be at Kanaloahuluhulu.

Tour B will include a guided stroll through the DOFAW Kalalau Rim exclosure, fenced to keep out deer, goats and pigs, where native plants are being re-introduced. Tour B participants should have a long lunch and be able to stroll the 0.3 mile Kokee Nature Trail.

At 4,000 ft in March, it may be cool and wet so you may want a rain jacket; and the trails are unpaved. There will be a charge of $40.00 to cover transportation, lunch and refreshments (No pork will be served. Vegetarian upon request). Half price for children 12 and under. Because of the expense of currency exchanges we can accept only checks in US $. We are unable to accept charge cards. Personal checks, made out to "Philip Motooka" (Not to WSWS), will be accepted. March is a busy time for the tour companies so we have to make final commitments for the buses by February 1, 2003. Seats may be limited, so first-come, first-served. In the event that participation does not hit the break-even point, buses or the whole field trip will be cancelled and full refunds will be made. In the event that participants cancel after the deadline, refunds cannot be guaranteed. We regret the constraints but this is a manini operation. Profits, expected to be minimal if any, will be donated to the Kokee Natural History Museum.

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WSWS Pre-Conference Invasive Plants Tour Registration

Name(s): ----------

Address: ----------

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e-mail or fax: ---------- Vegetarian lunch? ----------(# of lunches).

_____Adults @$ 40.00? + _____Children 12 and under @ $ 20.00? = $_____

Choice of tour (A or B. Indicate second choice, if acceptable):1st _____ 2nd _____.

Mail completed form with check by February 1, 2003 to: Philip Motooka
UH CTAHR CES
79-7381 Mamalahoa Hwy
Kealakekua, HI 96750-7911

Board meeting dates were discussed. Options included a meeting on Monday March 10 or Sunday March 9. A meeting on Sunday would conflict with the Jointed Goatgrass meeting.

Bob Parker moved to accept tours, Dan Ball seconded. Motion passed unanimously.

Gil Cook moved to accept report, George Beck seconded. Motion passed unanimously.

**Member at large**: Nelroy Jackson

Notes of Teleconference of the WSWS Constitution and By-LawsRevision Ad Hoc Committee held on August 13, 2002

Present were Phil Banks, Vanelle Carrithers, Peter Dotray, Gus Foster, Nelroy Jackson and Jill Schroeder. Charlotte Eberlein was abs
After discussion, the following report for the August meeting of the Board was agreed to.

**Report of the Ad Hoc Committee for the revision of the Constitution and By-laws of the WSWS.**

The committee met twice by conference call and also worked on suggested revisions using e-mail. There are some 'minor' grammar and format changes. The committee report is in 4 parts.

Part A. Easy Items. The committee has reached consensus on several non-controversial items including: -

For the Constitution: -

1. Inclusion of British Columbia in Article I, section 1.
2. Add 'provincial' to Art. II, section 2, and 'provinces' to Article VIII, section 2.
3. Add 'and management' after "weed control" throughout the document.
4. Art. IV, section 6 – change 'may elect' to "shall appoint' a treasurer-Business Manager.

For the By-Laws: -

1. Article VI – delete Fellows and Honorary Members committee – current wording is in conflict with Article VII, section 9 of the constitution.
2. Article VII – sections 10, 11, 12, and 13 – the duties of these committees need to be enumerated.
3. Article VII, section 16 – change 'WSSA liaison' to 'Director of Science Policy'.

Part B. Significant Items where consensus was reached.

1. Nominations of qualified and willing candidates for President-elect should be made from university and non-university sectors in alternating years. (There must be a 'safety net')
2. A new membership category should be created for students.
3. Create a position of Chair, Constitution and By-Laws/Operating Procedures similar to the WSSA position. This should be a non-voting seat on the Board.
4. Revise the Local Arrangements Committee and Site Selection committee sections on duties to require appointment of a Local Arrangements Chairman when a new site is selected.
5. Revise the list of Standing committees and merge the 'Herbicide Resistant Plants' committee into the Education or other committee.
6. Appoint a student to a non-voting seat on the Board. (A procedure or mechanism for election of a student representative should be developed)
7. Chairpersons-Elect for the Research Section and Education and Regulatory Section should be non-voting members of the Board.

Part C. Significant Items where **feedback** from the Board and more Past Presidents is requested.

1. What is the definition of the Board vs. the Executive Committee? We believe that the terminology in the constitution and by-laws if 'executive committee' is really a board of directors. Not all members of the current executive committee may vote.
Question A. Do you want to change the terminology from Executive Committee to Board of Directors?
Question B. If yes, do you also want to have an Executive committee of elected officers only?

2. Should the WSSA representative be appointed by the President or elected by the members? The constitution states that the Rep. is appointed, but the by-laws state that the Rep. is elected. Either way, should the WSSA Rep. be a voting member of the Executive Committee or Board of Directors? When (time of year in relation to WSSA and WSWS board meetings) should the term of the WSSA Rep. be effective?

3. Should the CAST representative be (a) appointed, (b) elected, (c) have a vote, on the Executive committee or Board of Directors? When (time of year in relation to CAST and WSWS board meetings) should the term of the CAST Rep. be effective?

4. Should the secretary serve for a 1 or 2 year term? Should we have a 'secretary-Elect' or equivalent position?

Part D. Other Items.

1. Dissolution of the Resolutions committee and transfer of those duties to the Immediate Past President was approved at the March 2002 meeting and those wording changes need to be made.

2. The Legislative Committee made some changes to their modus operandi. These need to be found and incorporated in the revision.

3. Revise 'dissolution' section.

*Discussion:*

(THESE ARE ALL BOARD SUGESTIONS TO THE AD HOC COMMITTEE)

Part A.

Constitution. Steve Miller moved to approve constitutional changes, Bob Parker seconded. Motion passed unanimously.

By-laws: Change article VII, section 9 of constitution so that past president can serve on Fellows and Honorary members committee as indicated in by-laws article VI. Clarify that in article VII the function, not duties, of committees be enumerated.

Steve Miller moved to accept the committee continuing to clean up the by-laws, Bob Parker seconded. Motion passed unanimously.

Part B.

1. Nominations to alternate public and private. Motion by Bill McCloskey to change verbiage to state the *intent* is to alternate and it should be placed in the operating guide rather than the by-laws or constitution. Dan Ball seconded. Motion passed unanimously.

2. New membership category for students. It was discussed that students are technically active members if they pay dues.

Bob Parker moved that we don't have a separate membership category for students. Steve Miller seconded. Motion passed unanimously.

3. Create a chair of the constitution and by-laws and operating procedures. This would help with institutional memory. An appointed position, preferably a past president.

Steve Miller moved to accept, Gil cook seconded. Motion passed unanimously

4. Revise local arrangements and site selection committees. Bob Parker moved that site selection committee should provide for a willing local arrangements chair for each potential site. Gil Cook seconded. Motion passed unanimously

5. Revise list of standing committees. Gil Cook moved to approve the suggestion. George Beck seconded. Motion failed.

Bob Parker moved to revise the list of standing committees. George Beck seconded the motioned to get the Ad Hoc committee to solicit input from interested parties. Motion passed unanimously.

6. Appoint a student to a non-voting seat on the board. Steve Miller moved that the students select a member to serve on the board as a non-voting member. George Beck seconded the motion. Motion passed.

7. Chair-elects for research and education section as non-voting board members.

Steve Miller moved that it be mandatory for the chair elects to attend board meetings and to adjust constitution/operating guide. Gil Cook seconded. Motion passed unanimously.

Part C.

1. Item A. Bill McCloskey moved to accept changing the terminology from executive committee to board and to defer the decision regarding the executive committee. Gil Cook seconded. Motion passed unanimously.

2. Should WSSA rep be appointed or elected? Gil Cook moved that the WSSA representative be appointed by the president, with consent of the board, and be a voting member of the board. Bill McCloskey seconded. Motion passed unanimously.

3. Should CAST representative be appointed, elected, and be a voting member?

Steve Miller made motion to have CAST representative an appointed position in WSWS and having voting privileges on the board. Gil Cook seconded. Motion passed unanimously.

***Action item***: Steve Miller is to draft clarification of the WSSA representative's term activation and duration. Rod Lym is to draft clarification of the WSSA representative's term activation and duration.

4. Should secretary serve for one or two year term?
Bob Parker made a motion to have committee continue to look into other options. Steve Miller seconded. Motion passed unanimously.

***Action item***: Nelroy Jackson is to look into changing by-laws so that if president can't attend meeting, the past president would run the meeting. Currently states the president-elect does.

Nelroy Jackson made a general recommendation to cooperate with other related entities eg. Western crop science and EPPC's, for joint meetings and workshops.

Jill Schroeder is to draft a mission statement for the board.

**WSSA rep report**. Steve Miller

The annual meeting will be held in Jacksonville, FL, February 10-13. A schedule change will result in the meeting starting on Monday. Committee meetings will change accordingly.

The WSSA is to serve as coordinator of worker protection training for ARI (Ag Research Inst.). WSSA will get 15% of the grant dollars ($50,000) over next two years for supplying office space and phone service for Dr. Herrett. The EPA must approve before WSSA can proceed.

New editors: John Wilcutt for Weed Technology, Bob Blackshaw for Weed Science. Each journal has distinct mission statements. As of January 1, 2003, all manuscripts will be on-line submissions using Allen Trac Technology. This should speed up reviews, cut down on publication time, and allow authors to track manuscripts at any stage.

WSSA is pursuing an agreement with XID Services to market a CD on Expert Weed Identification Systems of the U.S. and Canada. WSSA provides market support, advertising and approximately 450 of 1,500 photos, but will get 50% of the profits.

Discussion ensued regarding how the CD could impact sales of Weeds of the West.

Gil Cook moved to approve the report, George Beck seconded. Motion passed unanimously.

**Awards Committee**: Paul Ogg

Report for Call for Nominations was handed out. The call for nominations addresses the criterion and the awards while the instructions for nomination addresses the requirements to fill out for the nominee. New awards include professional staff, weed manager, and outstanding weed scientist – early career.

***Action item***: Forward any questions/corrections to Paul Ogg regarding the Call for Nominations. Get names of nominees from Paul.

Gil Cook moved to accept report, Bill McCloskey seconded. Motion passed unanimously.

**Fellows and Honorary Members Committee:** Frank Young

The instructions for nominating the fellow and honorary members are displayed on the WSWS web site. The committee has changed due date to October 30 to receive nominations since few nominations have been received to date. The Committee asked for a clarification of the definition of Fellow. The board discussed the matter and asked the Ad Hoc committee to review whether the language needs to be changed in the constitution and by-laws.

***Action item:*** Bob Parker will communicate our discussion with Frank Young that the board needs to approve their nominations by December 1, 2002. Jill Schroeder will make a new appointment to the committee to replace Barb Mullin. Bob Parker will look up previous actions regarding changing submission dates.

Gil Cook made motion to accept report, George Beck seconded. Motion passed unanimously.

**Nominations Committee**. Steve Miller

The committee has arrived at a great slate of people.

Bob Parker moved to accept candidates, Nelroy Jackson seconded. Motion passed unanimously.

**Finance committee**. Roger Gast

1. The Finance Committee met at the annual conference in March and via telephone in May and July 2002 to review quarterly investment reports and WSWS financial statements. The treasurer's records and accounting books were audited at the March meeting. It is our opinion that both the Treasurer and Investment Adviser are operating according to the WSWS Investment Policy Guidelines and Objectives.

2. Pursuant to a March 2002 executive board recommendation to reallocate investment assets, $27,000 was moved from the mutual fund (MFA) account to purchase 1065 shares of *Bank of America* preferred investment grade bonds, yield 6.9%, callable 12-15-06. This brings the investment type balance in line with WSWS "Investment Policy Guidelines" (no more the 65% equities). As of June 30, 2002 the Merrill Lynch fixed income account had a total balance of **$86,516**, and the mutual funds Account had a balance of **$145,440**. The combined value of these two accounts was **$231,956**. This was a **$16,914** (-6.8%) quarterly loss on total investments.

3. As of June 30, 2002, the money market saving account (Newark) had a balance of **$57,378** and the checking account (Newark) **$4,732**.

4. Several committee recommendations to the executive board in March were approved:
   a) Re-balancing of the investment portfolio
   b) Raise the salary of the Treasurer/Business Manager to $12,000 per year
   c) Purchase of a new computer for Wanda Graves and including finance software
      - Computer has been purchased

**Recommendations:**

1. Consider options for increasing the contribution of WSWS for support of the Director of Science Policy position. The finance committee recommends an increase in annual contribution from $7300 to $14,000 based on study analysis of other contributing regional societies summarized below.

| Society | Membership (cur.) | Annual Contribution | $/member |
|---|---|---|---|
| NCWSS | 514 | $14,000 | 27 |
| SWSS | 475 | $14,000 | 29 |
| WSWS | 491 | $7,300 | 15 |
| NEWSS | 197 | $4,000 | 20 |

2. Consider a policy change that would assess a service fee for revolving accounts that recoups at least part of the costs associated with time and resource commitments from the WSWS treasurer. Recommended key points to include in the policy directive should include:
   a) Definition of what constitutes a "revolving account". The finance committee recommends: "*A revolving account is any account where the WSWS does not have control of the funds, but merely acts as a convenience banker for the entity*". In other words, if you would consider it theft for the WSWS officers and Executive Committee to spend the funds assigned to your account, then you probably don't consider the funds to belong to WSWS, and therefore, these funds should be considered belonging to a "revolving account". Current accounts meeting this definition are the Noxious Weed Short Course, Biocontrol Handbook, and Knapweed Symposium. The Weeds of the West would not meet this definition since funds do belong to WSWS.
   b) A 2% service fee charge on all incoming funds will be assessed to revolving accounts. This figure was derived from analysis of actual experience with the Noxious Weed Short Course taking into consideration the annual income and value of the treasurer's time spent.
   c) A book transfer from the revolving account to the WSWS general fund would occur on an annual basis (fiscal year 4/1-3/31) starting 4/1/03. The book transfer will occur at the end of the fiscal year and will be based on the total income over the yearly period.

3. The finance committee supports the effort to subsidize graduate student attendance at the WSWS conference in Hawaii March 2003.

*Discussion:*

The first four items of the report were approved.
Recommendations:

1. Increase society contribution to Director of Science Policy Position.
   Tabled.
2. Policy change for revolving accounts.
   Gil Cook moved to charge a fee for revolving accounts. Miller seconded. Motion failed.
   Nelroy Jackson moved to approach the organizers of the knapweed symposium to either donate the funds to WSWS general fund to serve as seed money for other well thought out symposia or workshops, or remove the money from our books. George Beck seconded. Motion passed unanimously.
3. Support students at $80.00/night. A total of $240.00 for 3 days. The student's advisor must ask for it.
   Bill McCloskey moved to support up to three graduate students per program at $240.00 for the Hawaii meeting, George Beck seconded. Motion passed.

***Action item***: Wanda Graves will ask a tax accountant what the definition of a revolving account should be. Nelroy Jackson will contact Linda Wilson regarding the disposition of the knapweed funds.

**Publications:** Tom Whitson
Weeds of the West will be reprinted. The number of copies will be 12,000.

Biocontrol of Weeds of the West: Book is being published by the Center for Invasive Plant Management through Oregon State University at no cost to WSWS. WSWS will receive royalties.

Questions include whether WSWS is interested in purchasing copies of the book to make available to members at a reduced cost (support of scholarship)
The group is still interested in publishing a field guide and would like to work with WSWS.

Nelroy Jackson moved to accept royalties, Steve Miller seconded. Motion passed unanimously.

***Action Item:*** Wanda will send Jill Schroeder a copy of the original contract for the Biocontrol book and Jill will contact Janet Clark or a representative of the Montana Department of Agriculture to see if we are released from the contract and don't need to repay the money. These assurances should be in writing.

**Noxious Weed Short Course**: Celestine Duncan

The Noxious Weed Short Course sponsored by the WSWS was held in Ft. Collins, CO during April 2002. Both sessions were filled (35 each) with employees of USFS, BLM, Fish and Wildlife Service, Dept. of Transportation, and County Weed District superintendents.

Instructors included: Dr. Rod Lym, Dr. Steve Dewey, Barbra Mullin, Dr. Scott Nissen, Dr. George Beck, Rita Beard, Jim Sebastian, Cindy Lair, and Celestine Duncan representing the Western Society of Weed Science. Ken Lair (BOR), Tom McClure (USFS), and Bill Chetum (USFS) also helped with the course. The committee greatly appreciates the support and assistance from all instructors.

Participant evaluations ranked the course as excellent to good in terms of content and delivery. Comments regarding the course were very favorable, and there is a high level of interest in continuing the training in the present format.

The 2003 course is tentatively scheduled to be held in Ft. Collins in April 2003, only one session is planned at this time. Current budget is $21711.11.

Bill McCloskey moved to accept the report, Gil Cook seconded. Motion passed unanimously.

**Editorial Committee**. Joan Campbell

Proceedings:

The 2002 proceedings has 145 pages. Omnipress (Madison, WI) printed 300 copies for $2550.00 ($8.50 per book) which included shipping to Wanda. Assuming $2.00 for postage, 127 books need to be sold at $20.00 to break even.

Several reports were not received for publication in the proceedings. All information must be submitted to the Proceedings editor within a month of the annual meeting.

Web site:

Sustaining members, officers, committee chairs and newsletter pages have been updated. The annual meeting page, including minutes, will be updated before the summer meeting.

The events and job announcements pages have been used throughout the year. Members are encouraged to increase utilization of this resource.

Guidelines for submission dates have been developed to allow the web master and web editor timely postings on the site. This includes requirements for posting photographs on site.

Research Progress Report:

Barb Mullin investigated the logistics associated with the development of a CD format and electronic submission for the WSWS Research progress Report. It is difficult to to get information on the actual costs associated with conversion from printed to CD formats and Barb recommended that the Board defer conversion for one year to allow us to get better information.

Steve Miller moved to table development of a CD and electronic submission report for one year. Bob Parker seconded. Motion passed unanimously.

***Action item:*** Jill will identify a replacement for Barb Mullin as Editor of the research Report. All proceedings materials must be into Joan by April 1st.

Gil Cook moved to accept the report, Nelroy Jackson seconded. Motion passed unanimously.

**Graduate student activities.** Steve Dewey

Lisa Boggs requested an e-mail list of graduate students.

**Action item:** Wanda will send e-mail address of grad students to Lisa Boggs.

Gil Cook moved to accept the report, Steve Miller seconded. Motion passed unanimously.

**CAST Report.** Rod Lym

1. The Membership Referral program that WSWS decided to participate in last March resulted in five new members (to date) and an income of $125 to WSWS. Steve Halloran, CAST Membership Director, indicated that this program attracted 1% of the WSWS membership as new members of CAST. He suggested that that a second effort will result in additional referrals (typically, consumers of any product or service require several exposures to what is being offered....consumers do not often respond to first-time solicitations). If packaged with a regular mailing to membership, WSWS's cost should be minimal (as long as the additional piece does not "bump" up the postage rate). Steve sent a "flyer" developed and mailed by the Tri-Societies as an example of a different format.

Rod Lym proposed that WSWS continue to participate in the CAST new member program by sending out the announcement in the newsletter along with a request to join by a board member that is a member of CAST.

2. The general response to the USB report (Comparative Environmental Impacts of Biotechnology-derived and Traditional Soybean, Corn, and Cotton Crops) has been very positive, even downright grateful (by the State Department). Congressional staff reactions were enthusiastic from House and Senate Agriculture Committee staff (and this includes staff from the personal offices of the Members of these Committees). Unfortunately, there was a low level of interest from the media.

3. CAST is beginning work on hosting a one day workshop on pest resistance management in conjunction with a big IPM meeting being organized mainly by USDA and EPA next April in Indianapolis. Since it will be an add-on to the big IPM meeting, costs will be minimal and the target audience will already be assembling, so CAST hopes for a good turnout.

4. CAST is starting to implement a three-year grant that the Kellogg Foundation has funded, on leadership development. CAST will be sending out information to the CAST societies and sustainable Ag organizations in the coming month (or sooner), following up on the pilot workshop held in May 2001. Focus will be on organizational leadership development, and this will be an opportunity for WSWS if the Society is interested.

5. A new project is the CAST essay contest for 6th, 7th and 8th grade students. CAST has raised about $108,000 so far to support it, and is excited about the level of interest among CAST "networking" partners. There will soon be information on the CAST website, and once it is up, CAST will send out information to other organizations to send out through their own outreach channels.

6. CAST has initiated a Trade Development Agency-sponsored China biotech dialogue. Currently the project is awaiting TDA to approve an amended budget. Once approved, CAST will begin to schedule trips for scientists with expertise in biotech regulation to go to China, and for Chinese regulators and others to come to the U.S. for educational dialogues.

7. The American Agricultural Economics Association (AAEA) has rejoined CAST as a society member. AAEA's mission is "to enhance the skills, knowledge and professional contribution of those economists who help society to solve problems related to agriculture, food, resources, and economic development." CAST now has a core membership of 37 societies.

8. The Fall 2002 CAST board of Directors meeting will be held September 12 - 14 in Phoenix, AZ a the Hilton Phoenix Airport Hotel. CAST members are welcome to attend as observers. I will begin my term as the Chair-elect for the Plant Protection Working Group.

9. Upcoming reports of special interest to WSWS members include:
   - Agriculture's Response to the Climate Change Challenge
   - Documenting Benefits from Ag Research
   - Integrated Pest Management

Gil Cook moved to accept the report. Bill McCloskey seconded. Motion passed unanimously.

**Action item:** Lym will include an announcement to join CAST with the newsletter. Jill will submit a personal invitation to join CAST to the newsletter. Rod Lym and Steve Miller will put a proposal together pertaining to reimbursement to attend CAST and WSSA meetings.

**Site Selection**: Jesse Richardson

The committee is considering three sites (Portland, Reno, Albuquerque) for 2006.

Bob Parker moved to accept report, Gil Cook seconded. Motion passed unanimously.

The relative merits of future contracting were discussed. An advantage to future contracting is to secure low hotel rates in advance and being able to budget accordingly. A disadvantage is that the WSWS membership is growing, which makes it difficult to know the number and size of rooms required.

The issue of Helms-Brisco was raised. Do we have a long-term contract with them?

***Action item:*** Gil Cook needs a copy of the contract for the 2003 meeting site and a checklist from the site selection committee for hotel requirements. Jill will ask Jesse to contact Keith Duncan to determine the status of our contract with Helms-Brisco, to redevelop a checklist for hotel requirements, to investigate alternatives to Helm-Brisco (e.g. Allen marketing) and to wait to secure sites for 2006 until these issues are resolved.

**Necrology.** Dennis Tonks

Troy Price can't serve any longer and we need to find a replacement. Dennis Tonks will serve as chair for second year. No report.

**Herbicide resistant plants:** Randy Anderson

The Herbicide Resistant Plants Committee is planning a discussion session (cooperatively with Kassim Al-Khatib) to be held during the Project #6: Basic Sciences session at the 2003 WSWS meeting in Hawaii. The topic of the discussion is how frequency of herbicide use affects the appearance of resistant wild oats and jointed goatgrass. The Committee also will present a poster at the 2003 meeting that summarizes model predictions on herbicide resistance with these two species, thus introducing our ideas for the following discussion session with Project #6.

For the 2004 meeting, we are tentatively planning a similar program that focuses on pollen flow and management strategies to minimize gene flow in field situations.

The Committee is emphasizing activities for annual WSWS meetings rather than summer meetings, as we felt that our activities would be more effective in reaching a larger audience.

We do not have any requests for the WSWS executive committee to consider at this time.

Parker moved to accept report, Gil seconded.

**Student Educational Enhancement:** Ted Warfield

The following arrangements were made for student and sponsor to participate in the Student enhancement experience during the summer of 2002: Johnathon Holman from MSU to Marathon Ag & Environmental Consulting, Las Cruses, NM; Tom Ireland from UI to Dow Agro Science, Tampa, FL; Brad Hanson from UI to BASF, Longmont, CO; Katherin Schirmacher from KSU to Syngenta, Yakima, WA; Doug Soup from KSU to BASF, Potlatch, ID.

Plans are to place 2003 announcements on the WSWS web site and newsletter, also to the same Universities as in 2002.

As far as I can determine Shay Suderland has been transferred so a new co-chair will need to be appointed.

**Action item**: Nelroy will contact the committee to find out if their plans for soliciting students for 2003 experiences. Jill will appoint another chair to the committee.

**Sustaining Membership**: Steve Eskelsen

No report.

***Action item:*** Suggest the chair solicit NGO's as potential members in a third membership category.

**Legislative Committee**: Roy Reichenbach

At the WSWS meeting in Salt Lake City, UT in March 2002 the Legislative Committee updated their operating guides.

The Chair of the Legislative Committee also serves on the WSSA Legislative Committee and the WSSA Washington, DC Liaison Committee. I receive many notes and correspondence for the Director of Science Policy for WSSA, Dr. Rob Hedberg and pass along relevant information and requests for information to the Legislative Committee and the WSWS executive board. In most instances, comments and information is requested to be directed to the requesting agency or to Dr. Hedberg, to develop a WSSA response. On a few occasions, I have requested that comments or information be sent to me for compilation and distribution to Dr. Hedberg.

The following is a listing of the comments and information requested and other information provided to the Legislative Committee and the Executive Board.

Provided the Legislative Committee and the Executive Board with Rob Hedberg's report for the 4th quarter and the1st quarter; endocrine disrupting substances and male fish.

Information and request for comments on proposed EPA spray drift rules; requests for comments on molinate documents regarding human health, environmental fate and ecological effects risk assessments; requests for comments for Blazer Herbicide; comment period announced for atrazine special review - EPA; request for comments to go to WSSA for a proposed consent decree with EPA that would allow the US Fish and Wildlife Service and National Marine Fisheries Service to require EPA to evaluate for additional risks to aquatic life for the use of approved aquatic pesticide; request for information to go to Rob Hedberg, WSSA, for CARAT Committee Transition Work Group to Meet June 20, 2002; request for comments from the CEQ on ways to Improve the Environmental Impact Assessment Process and other aspects of Implementation of the National Environmental Policy Act - The Council on Environmental Quality.

Provided information to the Legislative Committee and the Executive Board about the EPA response to the Talent Irrigation decision by the 9th Circuit court of Appeals; California's attempt to ban the use of clopyralid in lawns; information about the costs of setting up a monitoring program for NPDES permits in California after the Talent decision; grant funding opportunities for on the ground weed programs; RFP solicitation from the Aquatic Ecosystem Restoration Foundation to develop economic models for restoration; several articles about possible effects of atrazine and frog deformities or other causes; WSSA's endorsement of the nomination of Dr. Victor Lechtenberg to serve for another three-year term on the National Agricultural Research, Extension, Education and Economics Advisory Board representing the Land-Grant Colleges and Universities; proposed editorial about frog deformities for the WSSA web site; proposed ban on pesticides use in Quebec; information that Randall Stocker and Nelroy Jackson are President and Vice-president of the National Invasive Species Advisory Committee, respectively. Information was provided about re-authorization of the National Invasive Species Act (NISA); Steve Dewey's report to the Agriculture committee about Bio-security through WSSA participation in CoFARM; HR 64, "Strengthening Science at the Environmental Protection Agency Act," to promote the use of sound science in EPA decision making; the CoFARM annual report; information to obtain a summary of the Farm Bill.

Both, the Craig bill S198 "Harmful Nonnative Weed Control Act of 2001" and the Hefley bill HR1462, of the same name, were sent for markup and are in committee. S198 has had field hearings in Idaho within the last few weeks. The Moran bill and the Rayhall bill have seen some activity but are not moving through the congress.

As additional material becomes available, it will be forwarded to the committee.

Gil Cook moved to accept report, seconded Nelroy Jackson. Motion passed unanimously.

**Placement Committee:** Curt Thompson

No activity.

***Action item:*** George Beck will contact Curt and request that the committee prepare placement service materials for the November newsletter and update the information on the WSWS web site.

**Poster Committee:** Brenda Waters

No report.

***Action item***: Gil will contact Brenda and request that the poster committee make sure that easels are shipped to Hawaii for the meeting and determine if WSWS has enough easels once the number of poster submissions are known.

**Student Paper Judging:** Kassim Al-Khatib

No report.

**Action item**: Gil will contact Kassim to request that the committee prepare the student contest information for inclusion in the fall mailing and to coordinate the competition within the program.

**Public Relations**: Kai Umeda

Continuing education hours were requested and/or not granted by 12 states and sing-in/sign-out sheets were submitted to individual state regulatory agencies. No Certified Crop Advisor CEU's were granted due to the laborious accreditation requirements. However, the Society for Range Management did grant CEU's to members attending the WSWS meeting. Phil Banks and Kai Umeda were the offical photographers for the 2002 meeting. Photographs and press releases were sent to several entities. A press release will be issued following the September newsletter to announce the 2003 meeting in Kauai, Hawaii.

***Action items:*** Stougaard send Kai addresses for ASA newsletter, Gil send address for Capitol Press.

Gil moved to accept, Bill second, Motion passed unanimously.

**Education Committee**: Bill McCloskey

Distance learning: Sterling.

A cooperative project among several weed scientists in the western United Sates and the University of Nebraska-Lincoln (led by Dr. Deana Namuth) has created a variety of education modules which target extension and academic audiences throughout the west. The lessons are in various stages of development and many will be translated into Spanish. The modules offer educators a supportive medium to present topics related to herbicide mode of action, weed ecology and herbicide resistance topics as well as others. Each lesson has an animation cartooning the process being explained as well as a quiz questions and glossaries and is peer-reviewed. The WSWS has agreed to host this site and is providing funding to support its move from UNL. The WSWS web master, Jeff Griffith, is moving the WSWS site to a new server and has been in contact with the computer experts at UNL. Jeff feels that there should be no problem with moving the site (http://croptechnology.unl) to the WSWS web site. Funding opportunities are being actively pursued to initiate additional lessons.

Gil Cook moved to accept report, seconded by Bill McCloskey. Motion passed unanimously.

Old Buisness

Kids Journey: Roy Reichenbach requested addition financial support.

Gil Cook moved to have board ask Roy to document impact of this program by interviewing/surveying teachers. Bob Parker seconded. Motion passed unanimously.

**Action Item**: Jill Schroeder will contact Roy to request the survey information.

Retirees' gift – Golf balls: See above.

Graduate Student assistance to Hawaii meeting: See above.

**New business:**

There has been a formal request for British Columbia to become a member of WSWS. Bob Parker moved to accept, Bill McCloskey seconded. Motion passed unanimously. The action will need a vote by the membership at the March meeting.

***Action item***: Stougaard is to draft a document for the breakfast meeting regarding membership voting on the issue.

Date for 2003 board meeting: Gil Cook moved to have meeting early on Sunday, seconded by Nelroy Jackson. Motion passed unanimously.

Nelroy indicated that the WSWS may want to co-sponsor joint invasive weeds meeting with WSSA and Ecological Soc. of Amer. in November 2003.

Bob Parker motioned to adjourn the meeting, Gil Cook seconded. Motion passed unanimously.

**WESTERN SOCIETY OF WEED SCIENCE**
**BOARD BUSINESS MEETING**
**March 9, 2003, Sheraton Kauai Resort, Kauai, Hawaii**

Attendees: Monty Anderson, George Beck, Lisa Boggs, Gil Cook, Pete Forster, Wanda Graves, Nelroy Jackson, Kassim Al-Khatib, Bill McCloskey, Steve Miller, Bob Parker, Jill Schroeder, Phil Stahlman, Bob Stougaard, Curtis Thompson, Tom Whitson, Frank Young,

**Call to order:** President Jill Schroeder called the meeting to order at 8:10 a.m.

**Approval of Agenda:** Steve Miller moved to approve the agenda, Gil Cook seconded, motion passed unanimously.

**Minutes:** - Bob Stougaard: Steve Miller moved to approve the minutes of the 2002 WSWS Summer Executive Board Meeting, Nelroy Jackson seconded, motion passed unanimously.

Summer e-mail report: Stougaard discussed the exchange of e-mail correspondences that occurred between regular board meetings. Nelroy Jackson proposed that the summer e-mail correspondence be entered into these board minutes, seconded by Steve Miller, motion passed unanimously.

Summer e-mail correspondences are as follows:

The Board edited and approved the minutes from the closing board meeting at Salt Lake as well as the minutes from the summer board meeting.

The Board edited and approved the changes put forth from the Ad Hoc Committee for constitutional and by-laws changes.

Approval was made for Nelroy Jackson to become the Western Society of Weed Science's WSSA representative.

Several correspondences were issued pertaining to the IRS audit of the Western Society of Weed Science.

Several correspondences were exchanged to evaluate and summarize the communication flow among the board, committee chairs, and committee members.

The board approved the nominations for Fellows and Honorary members.

New individuals were assigned to the responsibilities previously held by Barb Mullin.

Jill Schroeder drafted a letter in support of the California biocontrol and weed eradication programs.

**Action item**: Stougaard is to revise the operating guide for secretary to include the recording of board e-mail correspondence.

**Financial Report** - Wanda Graves:

| | |
|---|---|
| **CAPITAL** | |
| 2001-2002 Balance Brought Forward | $334,615.65 |
| Current Income or (Loss) | (108,525.43) |
| | **$226,090.24** |
| **DISTRIBUTION OF CAPITAL** | |
| Merrill Lynch Funds | $211,111.57 |
| Money Market Savings (Newark) | 9,373.44 |
| Checking (Newark) | 5,605.21 |
| | **$226,090.22** |

**Revolving Account Balances Included In $226,090.22: Weeds of West $29,321.00**
**Noxious Short Course 27,169.00**

**WSWS FINANCIAL STATEMENT APRIL 1, 2002 THROUGH FEBRUARY 28, 2003**

**INCOME**

| | |
|---|---|
| Registration & Membership Dues | $ 18,680.00 |
| 2002 Proceedings | 5,049.45 |
| 2002 Research Progress Reports | 2,852.75 |
| Noxious Weed Short Course | 10,700.00 |
| Weeds of the West Book | 65,178.51 |
| CAST Referral Program | 225.00 |
| 2003 Sustaining Membership Dues | 4,400.00 |
| Bank Account Interest Earned | 389.79 |
| ML Investments Gains or (Losses) | (49,254.42) |
| Contribution – Annual Conference Refreshment Breaks | 3,000.00 |
| **Current Income or (Loss)** | **$ 61,221.08** |

**EXPENSES**

| | |
|---|---|
| Office Supplies & Equipment | $ 2,411.80 |
| Telephone, Internet | 1,631.09 |
| Postage, Mailing Permits, Box Rental | 1,968.99 |
| Business Record Storage | 627.00 |
| WSSA Director of Policy (2003) | 7,300.00 |
| CAST Membership Dues (2003) | 556.00 |
| Noxious Weed Short Course | 14,473.12 |
| Weeds of the West Book | 119,047.10 |
| Knapweed Symposium Proceeding Printing | 301.95 |
| Tax Account | 225.00 |
| Franchise Tax Board Filing Fee | 10.00 |
| Secretary of State Semi-Annual Filing Fee | 20.00 |
| Printing | |
| Newsletters | 1,181.22 |
| Stationary, Printed Envelopes | 352.89 |
| Proceedings | 2,555.00 |
| Programs | 1199.30 |
| WSWS Logo Golf Balls – Member Retirees | 230.04 |
| Annual Conference Guest Speaker | 1,422.22 |
| Refund – Registration Fee | 75.00 |
| Student Award Plaques | 384.41 |
| Member Recognition Award Plaques | 259.75 |
| Proceedings Editor Expenses | 715.00 |
| Business Manager Salary | 11,000.00 |
| Executive Board & Committee Meetings | 1,549.63 |
| Barbra Mullin Memorial Fund | 250.00 |
| **Total Expenses** | **$ 169,746.51** |

ML accounts continue to lose money (see report). The costs associated with this 2003 meeting should be more expensive than the 1998 Hawaii meeting as there are a lot of incidental costs: microphones, mail, mail handling etc. Preregistration is down, 313 – includes 47 spouses and 47 students.

Bob Parker moved to accept the financial report, Steve Miller seconded, motion passed unanimously.

**Report on tax audit**: Wanda discussed the tax audit that occurred on December 10th pertaining to the 1999 – 2000 tax period. The overall issue was whether we as a society were operating within our tax-exempt status. The main issues dealt with the society's financial contribution to the WSSA congressional science fellow, expenses incurred for Weeds of the West, and Wanda's status and compensation as a self-employed consultant. Regarding the Weeds of the West book, there had been

a final payment for a previous printing and a down payment for the next printing. Regarding the Congressional fellow, we increased the amount we paid but didn't receive an invoice until later. The IRS determined that Wanda was not self-employed but was being treated as an employee of WSWS. This was largely based on the fact that the WSWS paid for some of Wanda's office equipment, and that her duties and job responsibilities were detailed in the Operating Guidelines. After consultation with our tax accountant and reviewing the information they have sent us, we have agreed that Wanda's status should be changed to "employee" and are in the process of taking care of that change and will comply with their findings. We received paper work from the IRS to change Wanda's status. We will pay a tax deficiency of only 25% of what was assessed. Wanda will draft two checks totaling $274.95; 218.94 is for FICA, medicare, and withholding tax, and an additional $56.00 is for unemployment tax. Wanda will need to file taxes quarterly. Jill Schroeder will continue to over see this issue to its conclusion.

Steve Miller moved to agree to the terms the IRS put forward, pay the tax deficiency and sign the IRS letter acknowledging that Wanda (Business manager/treasurer) is an employee of WSWS. George Beck seconded, the motion passed unanimously.

Nelroy Jackson moved that the WSWS re-file for federal tax-exempt status (501C) as requested by the IRS because of our 1990 incorporation in the State of California. Steve Miller seconded the motion, the motion passed unanimously.

From July 1, 2003 forward, Wanda will be treated as an employee of the WSWS. The taxes for the business manager will increase slightly.

**Immediate Past President's Report** - Bob Parker: Several people retired since the last meeting or will be retiring this coming year. There may be others that I may not know about. The response I got back from the e-mail and Newsletter Announcement was not overwhelming. Those that have retired were Don Colbert, Paul Ogg, Tom Whitson and Ron Brenchley and Bob Norris. Those retiring this year are Dave Cudney, Clyde Elmore, and Bob Mullen. According to the minutes from the 2002 meeting, Dave Cudney, Clyde Elmore, Bob Norris and Tom Whitson were to be recognized last year. However, according to Don Morishita, he thought only Tom and Clyde were recognized. There were others that were laid off with the downsizing going on in the industry. I am not sure if they found employment that will allow them to continue membership in WSWS.

George Beck made a motion to accept the report, Steve Miller seconded, motion passed unanimously.

**Member-at-Large Report** - Nelroy Jackson: One of our members requested that the Board take a look at the way candidates for President-Elect are rotated. This led to President Schroeder's appointment of an ad hoc committee to revise the constitution and by-laws. I served as the main scribe for that committee. Vanelle Carrithers will give a full report on the work of the committee. Other activities consisted of doing many small jobs, including serving as a listening post.
Other activities:

**National Invasive Weeds Awareness Week IV: Summary**

More than 100 people, representing 28 states, registered and participated in several interactive sessions of NIWAW IV during the week of February 24-28 in Washington, D.C. Representation covered most of the states west of the Mississippi River, southeastern states, and Washington included local, state, federal government, academic, NGO's, industry personnel, private and public landowners and managers.

The opening session offered a breadth of topics ranging from weed-free hay standards, electronic mapping techniques, status of some specific projects, and an update on NISC and ISAC highlighting progress on the crosscut budget. The new WSSA poster was displayed during the week at the U.S. Botanic Garden along with 18 other exhibits from a variety of agencies and organizations. An excellent reception at the Smithsonian Castle featured the presentation of awards to significant contributors who have advanced the awareness of invasive plants, with Randall Stocker as the Emcee. Many high-level managers attended the reception from NISC departments and agencies.

Briefing sessions at USDA and the Department of Interior featured three Undersecretaries, a deputy undersecretary, and the administrators of CSREES, ARS, APHIS, FWS, BLM, BOR, NPS, USGS, and BIA and the deputy administrator of NRCS. The FICMNEW meeting was highlighted by discussions of the proposed early detection and rapid response network, invasive plant management position, and update on Japanese stiltgrass.

Most importantly, participants from the several states had numerous visits with their Senators and members of the House of Representatives. The final tally is not complete but the majority of the Hill visits were to key members on agriculture, resources, and environment committees. Arizona for the first time was represented by a delegation of five representing the Southwest Vegetation Management Association, University of Arizona Cooperative Extension and Arizona State University. California had a delegation of four that made visits to key congressional offices. Intermountain Noxious Weed Advisory Council (INWAC) and North American Weed Management Association (NAWMA) representatives had 17 meetings with various NGO's and agencies to present and discuss their position on several critical issues and concerns

NIWAW-IV was highly successful and most comments by the participants were positive and favorable with constructive critiques to improve future NIWAW. Financially, the NIWAW-IV is reported to be in the black with support from federal and private funds to offset the expenses of the breakfast meeting, evening reception, and other organizational expenses.

Perhaps the most important take-away is that feedback from the administrators is that they were impressed by the large turnout during the meetings, showing the interest of stakeholders in the invasive weed issue. Kai Umeda, Nelroy Jackson and Rob Hedberg.

**NISC and ISAC Highlights**

- The initial crosscut budget increase for FY04 was approved. Three areas are covered – Prevention, EDRR and Control & Management.
- A much fuller effort on the crosscut budget will be undertaken for fiscal 05.
- The idea of publicity with an 'Invasive Species of the Month' was supported strongly.
- The idea of a Rapid Response Fund with multi-year funding was kept a live.
- Leadership and Coordination will be given more emphasis.
- Department of Homeland Security and APHIS – the move of port inspectors was effective March 1. However, an MOA between DHS and USDA was signed to have USDA retain control over regulations, policies and procedures
- Economic assessments given some play.
- Completion of a comprehensive look (drawings) at pathways as a first step.
- FICMNEW has completed their draft of an EDRR plan. NISC is working on an all taxa EDRR plan.
- Rep. Ehlers has introduced HR 266 to codify NISC and ISAC. Presumably legislative updates will be given elsewhere.

**IPINAMS: Invasive Plants in Natural and Managed Systems: Linking Science and Management.**

The conference and workshop is scheduled for November 3-7, 2003 at the Wyndham Bonaventure Hotel in Fort Lauderdale, Florida. We have raised the expected attendance form 300-500 people to 500-800 people. The draft program outline is given below.

**The Plenary Sessions are structured around the following themes: -**

Tuesday: Theme: Prevention, Early Detection and Rapid Response
Wednesday: Theme: Control, Management and Restoration
Thursday: Theme: Policy, Science and Management
Friday: Theme: Synthesis/International

**The following Symposia are planned:**

1. Predicting invasiveness and preventing entry
2. Ecological Resistance and Community Invasibility: Theory, Practice and Restoration
3. Ecological impacts of invasive plants on native ecosystems: Assessment, patterns, and implications
4. The role of genetics and rapid evolution in the spread, impact and control of damaging weeds
5. Biological Weed Control
6. (Strategies for) Vegetation Management for Invasive Plants
7. Global Change and Invasive Plants

8. Modeling Biological Invasions
9. People and Propagule Pressure.
10. Application of Weed Science Principles to Management of Invasive Plant Species
11. Economic impacts of invasive plants: approaches to getting real numbers
12. Impacts Invasive Plant Management on Recovery of Endangered Species

**The following Workshops are planned:**

1. Pathways of Invasion [– how to develop a pathways analysis, scientific approach to pathways, weed-free forage program, discussion of corrective action, phytosanitary issues]
2. Weed List Criteria
3. Early Detection, Rapid Assessment and Rapid Response
4. Fire and Invasives – How to use fire to control invasive plants: current knowledge and future directions
5. Decision Tools - Priority Setting with Limited Resources (management and $)
6. Harmonization of Regulations and Lessening Jurisdictional Conflict
7. Management as Research: Examples of success and failure
8. Detection, Mapping and Assessment of Invasive Exotic Plants [include NAWMA mapping standards]
9. Invasive Plant Management in Different Habitats – Case Studies – model examples of success.
10. NEPA Guidance – Council on Environmental Quality – CEQ's NEPA task force results, recommendations and revisions
11. Restoration: Managing for or towards what?
12. Impacts of invasive plants on soils and implications for restoration

**Roundtable discussions are planned for these topics:**

1. Public Outreach and Education
2. What do we expect the situation to be 20 years from now?
3. "Options for Containment and Eradication vs. Sustainable Control through Biological and Integrated Methods."
4. State Regulatory tools

An optional Database Workshop is planned for Monday.
WSWS is a co-sponsor of the conference. The Co-Chairs are Nelroy Jackson and Carla D'Antonio.

Other: Nelroy is working with Rob Hedberg to work with the NRCS to develop a basic IPM course and specific IPM courses for individual ecosystems.

**Action item:** Nelroy will advertise the Invasive Plants in Natural and Managed Systems (IPINAMS) meeting in the WSWS newsletter.

George Beck moved to accept all of Nelroy's reports, Gil Cook seconded, motion passed unanimously.

**Program Committee-** Gil Cook: Gil reported that on-line paper submissions were duplicated and that a notification procedure is needed to alert the authors that their papers have been accepted. The hotel contact changed in November. The lack of meeting space is causing some logistical problems. There are 87 posters and 107 papers slated for the 2003 meeting. Gus Foster did an outstanding job finding sponsors for the refreshment and food breaks.

**Research Section Report** - George Beck: The six Project Chairs are responsible for collecting and initially editing the research progress reports submitted by members for publication by the Society. Project Chairs also are responsible for planning, organizing, and implementing the discussion sessions of their various projects. A letter was sent to each Project Chair and Chair-elect in early October outlining their responsibilities. Most progress reports were submitted to the Research Chair on time for compilation of reports and preparation of indices and all discussion topics were submitted on time. Some progress reports were submitted directly to the new Research Progress Reports Editor, Joan Campbell, and this procedure worked well. However, the editor had to make substantial changes to many reports and in the future, Project Chairs must spend more time editing reports to be certain they conform to the correct format. Joan Campbell would like to change the

submission procedure so reports are submitted directly from Project Chairs to the editor to compile the reports into a final document and finish preparing the indices. This will require Board approval and change to the WSWS Operating Guidelines.

The WSWS adopted a new format for oral presentations in 2002 using laptop computers, LCD projectors, PowerPoint. The Board agreed to have Project Chairs provide this equipment each year for the Society meetings and changes to the Operating Guidelines were submitted to reflect this altered responsibility for the Project Chairs.

Project Chairs and Chair-elects did an outstanding job of creating interesting discussion topics for their respective projects. Discussion topics were as follows:

Project 1 Weeds of Range and Forests; Project Chair Tim Prather, University of Idaho
"What should a national invasive plant detection network look like?"

Project 2 Weeds of Horticultural Crops; Project Chair Tom Lanini, University of California-Davis; Chair-elect Tim Miller, Washington State University
"Current and future use of precision weed management in horticultural crops"

Project 3 Weeds of Agronomic Crops; Project Chair Don Morishita, University of Idaho; Chair-elect Jeff Herrmann, Monsanto
"Weed science research equipment, tools, and methods – innovations among public and private researchers"

Project 4 Teaching and Technology Transfer; Project Chair Mack Thompson, University of Idaho; Chair-elect Jed Colquhoun, Oregon State University
"Effective and efficient use of digital photography: choosing a camera, uses, file management, and camera to publication"

Project 5 Wetlands and Wildlands; Project Chair Nelroy Jackson, Monsanto; Chair-elect Rita Beard, US Forest Service
"What is the ecological amplitude of invasive weedy species?"
"Identifying the most important pathways for introduction of a new invasive species into the west"

Project 6 Basic Sciences; Project Chair Kassim Al-Khatib, Kansas State University; Chair-elect Kirk Howatt, North Dakota State University
"Herbicide rate and weed resistance case studies"
"Managing herbicide use rate to delay evolution of major gene and polygenic control of resistance"

Discussion: Project chairs are now responsible for LCD projectors. Do we need backup computer(s)? It was recommended that the Progress reports be sent directly from the author to progress report editor, by-passing the chairs and research section chair. (See Editorial Committee Report).

**Education and Regulatory Section Report**- Bill McCloskey: Consultation with the outgoing and past chairpersons of the Extension and Regulatory Section established that the use of the web for the delivery of educational materials to agricultural producers and other land managers had not been a recent topic of the section's discussion session at the annual WSWS meeting. Thus, in consultation with Jennifer Jones, the Arizona Crop Information Site webmaster, a discussion session revolving around issues relevant to presenting traditional Cooperative Extension education materials to farmers, pest control advisors and other members of Extension's traditional audience was planned. A title was selected ("Reaching Your Extension Audience and Getting Your Information Presented Using the World Wide Web") and a proposal was submitted to the Executive Board at their summer meeting. The board granted a budget of $1,000 for the discussion session.

The discussion session will consist of a short presentation by Bill McCloskey giving an overview of Cooperative Extension type information available on web sites of Western Land Grant Universities and the topics that will be presented by subsequent speakers/discussion leaders. Speakers/topics are:

Jenny Jones – Arizona Crop Information Site (ACIS) webmaster
Introduction to ACIS - presenting Cooperative Extension education materials via the web

Web site considerations (before you begin)
What am I trying to accomplish?
Who is my audience?
Content, layout, and construction and maintenance support
Advertise (Build it and they may or may not come)

Susan Kelly – Education Program Coordinator, Center for Invasive Plant Management, MSU

Development and delivery of short courses (1 credit hour courses) via the web for field practitioners: a method of delivering in-depth educational content to traditional Extension clientele and other types of land managers. Susan will share her experiences and knowledge gained from organizing and presenting such a course. Bill McCloskey will join the discussion following Susan's presentation to provide perspective and experiences gained from providing such a course in a traditional classroom setting.

Kristen Anderson – University of Hawaii Library

Presentation and discussion of the current status of copyright issues related to presenting information, images, video and other types of content on the web. The perspective of content providers and users of the information will be covered followed by a question and answer/discussion session.

**Additional budget request:** My original budget of $1,000 has been consumed by flying Jenny Jones to Hawaii and providing her with two nights of lodging at the Sheraton Kauai Resort-Poipu Beach. I am requesting an increase in the budget of $312 to pay for an additional night at the Sheraton for Jenny and to pay for Kris Anderson's roundtrip flight from Honolulu to Lihue on Thursday March 13th ($132) so that she can participate in the discussion session. When I estimated my original budget, I did not anticipate the high cost of airfare to and lodging in Hawaii. As an additional note I will be paying for additional lodging for Jenny and for the non-lodging per diem expenses of Jenny and Kris using other grant funds.

Bob Parker moved to allow up to $312 in additional expenses. George Beck seconded. Motion passed with one dissenting vote.

Nelroy Jackson moved to accept all 3 program reports, George Beck seconded, motion passed unanimously.

**Constitution and By-Laws (ad hoc)** – Vanelle Carrithers (Nelroy Jackson).

**CONSTITUTION**
**(With revisions and additions as adopted by the membership on March 16, 2000)**

ARTICLE I - NAME

Section 1. The name of this organization shall be the "Western Society of Weed Science," hereinafter called the "Society". The Society area shall include Alaska, Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, Texas, Utah, Washington, Wyoming, Alberta, British Columbia and Saskatchewan.

ARTICLE II - OBJECTIVES

The objectives of the Society shall be:

Section 1. To foster cooperation among state, federal, provincial, and private agencies in matters of weed science in the Society area.

Section 2. To support the Weed Science Society of America and foster state and regional organizations of persons and agencies interested in weed control and management.

Section 3. To aid and support commercial, private, and public agencies in the prevention, identification and solution of weed problems.

Section 4. To foster and encourage education and research in weed science.

Section 5. To support legislation governing weed control and management programs and weed research and education programs.

Section 6. To assist in the development of uniform weed control and management and eradication legislation and weed seed quarantine legislation and regulations.

ARTICLE III - MEMBERSHIP

Section 1. Membership shall be open to anyone interested in the objectives of the Society. Three types of membership are provided: (a) active, (b) honorary, and (c) sustaining.

Section 2. Active members are individuals who are interested in weeds or their control and management, and who have paid their annual dues to the treasurer. Active members may attend all Society meetings, vote on Society matters, hold office, and receive official notices of all meetings.

Section 3. Honorary members are ~~members~~ selected individuals whose activities have been largely from outside the Western Society of Weed Science who have significantly contributed to the field of weed science, and who are elected by two-thirds majority of the ~~Executive Committee~~Board of Directors. Honorary members shall receive all publications and announcements of the Society but will not be eligible to vote or hold office.

Section 4. Sustaining members are public or private individuals or organizations interested in the objectives of the Society, who wish to participate in the activities of the Society and who have remitted their annual sustaining membership dues.

ARTICLE IV- OFFICERS AND BOARD OF DIRECTORS ~~EXECUTIVE COMMITTEE~~

Section 1. The officers of the Society shall be:

(1) President
(2) President-elect who serves as Program Chairperson
(3) Secretary

Section 2. The Board of Directors ~~Executive Committee~~ shall be composed of:

(1) President
(2) President-elect
(3) Secretary
(4) Immediate Past-President
(5) Representative to WSSA
(6) Chairperson of the Research Section
(7) Chairperson of the Education and Regulatory Section
(8) ~~One~~ Mmember ~~chosen~~ at-L large ~~by the President with the consent of the Executive Committee~~

Non voting Board members
(9) Chairperson-Elect of the Research Section ~~(non-voting)~~
(10) Chairperson-Elect of the Education and Regulatory Section ~~(non-voting)~~
(11) Representative to CAST ~~(non-voting)~~
(12) Treasurer/Business Manager ~~(non-voting)~~
(13) ~~The~~Representative for Constitution and Operating Procedures ~~Person (non-voting)~~

Section 3. The President, President-elect, and Secretary shall begin their duties at the close of the regular business meeting at which they are installed and shall remain in office until the close of the next regular Society business meeting at the end of their respective terms. Other members of the ~~Executive Committee~~Board of Directors shall b~~e~~gin their term at the close of the meeting at which they are installed, except the Representatives to WSSA and CAST whose term is described in ARTICLE IV, Section 5 & 7 of the Constitution.

Section 4. The Chairperson of the Research Section and Chairperson of the Education and Regulatory Section shall serve a one-year term beginning at the close of the business meeting at which they become chairpersons.

Section 5. The President, with the consent of the Board of Directors, shall appoint a Society Representative to the Weed Science Society of America who shall serve a three ~~years~~ term beginning at the Weed Science Society of America Business meeting in the year following ~~his~~ appointment, ~~by the President with advice and consent of the Executive Committee.~~

Section 6. The ~~Executive Committee~~Board of Directors shall appoint ~~may elect~~ a Treasurer-Business manager to serve as they may direct.

Section 7. The ~~Executive Committee~~ President, with the consent of the Board of Directors, shall appoint ~~may select~~ a Society Representative to the Council for Agricultural Science and Technology (CAST) to serve as they direct. The Representative to CAST shall serve three (3) years, beginning after the CAST fall ~~winter~~ meeting ~~at which the election is announced~~.

Section 8. The Chairperson-elect of the Research Section and Chairperson-elect of the Education and Regulatory Section shall serve a one-year, non-voting, term beginning at the close of the business meeting at which they become chairpersons-elect.

Section 9. The President, with the consent of the Board of Directors shall appoint a person to serve as a representative of Constitution and Operating Procedures ~~person~~ to a term of five years. This person shall be parliamentarian on behalf of the President and shall serve as a non-voting member of the Board of Directors provided that (s)he is not concurrently serving as a duly elected member of that body.

ARTICLE V - SOCIETY SECTIONS

Section 1. In promoting a full exchange of ideas and information on weed science and to facilitate programming of meetings, there shall be two general sections as follows:

(1) The Research Section

(2) The Education and Regulatory Section

Section 2. These two sections may have sectional programs, project meetings and informal discussions of research reports and other pertinent information. Such meetings shall be at the regular meeting at a time designated by the Program Committee.

Section 3. The Chairperson of each of these sections shall be a member of the Society ~~Executive Committee~~Board of Directors and shall be elected as stated in Article VI, Section 3.

ARTICLE VI - ELECTION OF OFFICERS

Section 1. The Nominating Committee shall be appointed by the President, with the advice and consent of the ~~Executive Committee~~Board of Directors. They shall present their nominations for each office to be filled to the ~~Executive Committee~~Board of Directors for approval before presenting the nominees to the membership for election by ballot. No member's name shall be placed on the ballot without the member's consent. All candidates for office shall be selected from the Society membership and shall be elected by the majority of the members voting. In case of a tie vote, the winner shall be determined by flip of a coin in the presence of both nominees or their representatives at a meeting of the ~~Executive Committee~~Board of Directors.

Section 2. The terms of office shall be as follows: The officer moving through the office of President-elect, President, and Immediate Past-President shall be a member of the ~~Executive Committee~~Board of Directors for a three-year term; the Secretary shall serve a two~~one~~-year term ~~but shall be eligible for renomination as a secretary or as any other officer~~.

Section 3. The Chairperson-elect of ~~each of the two~~the Research and the Education and Regulatory sections shall be elected by the Society and serve a one-year term. Following this, they shall succeed as Chairperson of their section for an additional one-year term. The chairperson-elect shall serve as Chairperson if the Chairperson is unable to serve his/her term.

Section 4. If an elected officer cannot serve the full term, the vacancy shall be filled for the interim by appointment by the President with the advice and consent of the ~~Executive Committee~~Board of Directors, unless otherwise provided for in this constitution. The President-elect shall serve as President if the President becomes unable to serve. This service shall not constitute his/her term as President. In case both the President and President-elect are unable to serve, the most immediate Past-President who is willing to serve shall serve as interim President until new officers are elected by the members.

ARTICLE VIII - STANDING COMMITTEES

Section 1. There shall be seventeen ~~eighteen~~ Standing committees: Program, Finance, Publications, ~~Resolutions,~~ Local Arrangements, Nomination, Public Relations, Placement, Nominations of Fellows and Honorary Members, Site Selection, Awards, Poster, Student Paper Judging, Necrology, ~~Publications,~~ Sustaining Membership, Legislative, Herbicide Resistant Plants, and Student Educational Enhancement appointed by the President with the advice and consent of the ~~Executive Committee~~Board of Directors.

Section 2. The Program Committee shall consist of the President-elect as Chairperson, the two Section Chairpersons, and such other members appointed by the Program Committee Chairperson as required to give all phases of weed science adequate representation.

Section 3. The Finance Committee shall consist of a Chairperson and two members. Term of office of the committee shall be three years, established to expire alternately so that at least two members continue over each year. The member serving his/her second year of the term shall serve as Chairperson.

Section 4. ~~The Resolutions Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.~~ The Publications Committee shall consist of the President-elect (Chairperson), Proceedings editor, Research Reports Editor, Newsletter editor, and Website editor.

Section 5. The Local Arrangements Committee shall consist of a Chairperson and others as needed.

Section 6. The Nominating Committee shall consist of Chairperson, Immediate Past-President, and two rotating members. Terms of this committee, excluding the Immediate Ppast-President, shall be as in Section 3 above.

Section 7. The Public Relations Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 8. The Placement Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 9. The Committee for Nominations of Fellows and Honorary Members shall consist of three fellows of the Society ~~WSWS appointed by the President with advice and consent of the Executive Committee~~ and the Immediate Past President. Terms of office of this committee shall be as in Section 3 above.

Section 10. The Site Selection Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 11. The Awards Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 12. The Poster Committee shall consist of Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 13. The Student Paper Judging Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 14. The Necrology Committee shall consist of Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 15. The Sustaining Membership Committee shall consist of a chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 16. The Legislative Committee shall consist of a chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above. ~~Terms of office to this committee shall be: Chair appointed to a two year term and an additional year a past-chair, and two other members appointed to two year terms. Terms of the committee members shall rotate in alternate years.~~ Members shall be eligible for re-appointment to serve a second 3-year term.

Section 17. The Herbicide Resistant Plants Committee shall consist of a chairperson and five additional members. Terms of office of this committee shall be: Chair appointed to a three year term and five other members

appointed to three year terms, established to expire alternately so that at least four members continue over each year.

Section 18: The Student Educational Enhancement Committee shall consist of three members from private industry and two members from academic institutions and/or government agencies who shall serve for three years. Members from industry should reside in different geographic regions at the time of their appointment. Relocation to another region already represented on the committee shall not prevent the relocated member from completing his/her term. A member serving his/her second year shall serve as chairperson. Terms of the committee members shall rotate in alternate years.

ARTICLE VIII - DUES

Section 1. The amount of dues and the method of collecting such dues shall be determined by the ~~Executive Committee~~Board of Directors.

Section 2. In the event of the dissolution of the Western Society of Weed Science, the physical assets shall be sold and after payment of all debts, money possessed by the Society shall be given prorated on a membership basis without let or hindrance to agricultural education institutes in the states and provinces listed in Article I, Section 1, by the ~~Executive Committee~~Board of Directors holding office at the time of dissolution.

ARTICLE IX - MEETINGS

Section 1. Meetings shall be held at such time and places as may be deter-mined by the President in consultation with the ~~Executive Committee~~Board of Directors.

ARTICLE X - BY-LAWS

Section 1. The Society may adopt By-Laws.

ARTICLE XI - AMENDMENTS

Section 1. The Constitution and By-Laws may be amended by majority vote of the members present at any regular meeting.

**WSWS BY-LAWS**

ARTICLE 1 - DUTIES OF OFFICERS

Section 1. The President shall be the Chief Eexecutive Oofficer of the Society. ~~He/she~~(S)He shall act as Chairperson of the ~~Executive Committee~~Board of Directors, carry out the spirit of the Constitution and the decisions of the ~~Executive Committee~~Board of Directors, appoint designated officers and committees, and perform other usual duties of that office. ~~He/she~~(S)he may confer if, in his/her opinion, a member of the Society has demonstrated distinguished service, the Presidential Award of Merit. Presentation of this award must have majority approval of the ~~Executive Committee~~Board of Directors.

Section 2. The President-elect shall perform the duties of President if ~~he/she~~(s)he cannot serve; serve as Chairperson of Program Committee; develop program outlines of the Society meetings; assign responsibilities to Program Committee; issue calls for papers; advise ~~Executive Committee~~Board of Directors of program status one month before the meeting; and present a copy of the program to the Business Manager for publication.

Section 3. The Secretary shall prepare minutes of Society and ~~Executive Committee~~Board of Directors meetings, prepare and maintain an up-to-date list of officers including ~~Executive Committee~~Board of Directors, all standing committees and special committees, and perform other duties when designated by the President.

ARTICLE II - DUTIES OF TREASURER-BUSINESS MANAGER

Section 1. The Treasurer-Business Manager will receive, manage and disperse monies of the Society in accordance with prescribed policies and instructions of the ~~Executive Committee~~Board of Directors, maintain financial records and records of property, prepare records for annual audit and meeting with designated auditors, maintain supplies of Proceedings and Research Progress Report, receive and fill orders for above publications and collect payment for same, maintain standing orders and mailing lists for distribution of publications, and arrange for, and consummate publications for the Society. The Business Manager may be financially compensated for services rendered as decided by majority vote of the ~~Executive Committee~~Board of Directors.

ARTICLE III - DUTIES OF WSSA (WEED SCIENCE SOCIETY OF AMERICA) REPRESENTATIVE

Section 1. The WSSA Representative shall serve on the ~~Executive Committee~~Board of Directors of WSSA and shall act as liaison between the Society and WSSA. ~~He/she~~(S)he will keep WSSA informed of all activities and actions of the Society and will, in turn, keep the Society informed of all activities and actions of WSSA.

ARTICLE IV - DUTIES OF MEMBER-AT-LARGE

Section 1. The Member-at-Large shall maintain liaison with the President and other officers of the Society and shall bring to the attention of the ~~Executive Committee~~Board of Directors the various concerns of the members of the Society. The Member-at-Large shall perform other duties delegated by the President and the ~~Executive Committee~~Board of Directors.

ARTICLE V - DUTIES OF CAST REPRESENTATIVE

Section 1. The CAST Representative shall represent the Society, present ideas and proposals from the Society to CAST, and recommend persons from the Society for participation in CAST activities.

ARTICLE VI - DUTIES OF IMMEDIATE PAST-PRESIDENT

Section 1. The Immediate Past-President shall serve on the ~~Executive Committee~~Board of Directors, ~~and~~ on the Nominations committee, and on the committee for Nominations of Fellows and Honorary Members. ~~Nominations of Fellows and Honorary Members~~, (S)He ~~and~~ shall maintain close liaison with the President in an advisory capacity. (S)He shall also serve as the liaison and advisor for members desiring that a resolution be put before the society at the annual meeting. (S)He will assist in the writing of new resolutions and getting them to the Board of Directors and members of the society.

ARTICLE VII - DUTIES OF STANDING COMMITTEES

Section 1. The Program Committee shall develop the program for the meetings of the Society. The President-elect, who is Chairperson, shall delegate duties to members as ~~he/she~~(s)he deems advisable (see duties of President-elect).

Section 2. The Finance Committee shall analyze the financial conditions of the Society and recommend, if needed, immediate and long-range plans for sound growth of the society, recommend budget policies, recommend policies regarding registration fees and prices of publications, audit the financial accounts at least annually, and make a report to the Society.

Section 3. ~~The Resolutions Committee shall develop resolutions and recommendations regarding the general field of weed science within the Society area and put into writing important recommendations that the Society would promote and encourage; they shall report to the annual meeting.~~ The Publications Committee shall

be responsible for all publications of the ~~Society including~~Society including the Proceedings, Research Progress Reports, Newsletter and Website.

Section 4. The Local Arrangements Committee shall make arrangements for the conduct of an efficient Society meeting. They shall work in concert with the Program Chairperson in designating meeting rooms for each section, and arranging for an ~~Executive Committee~~Board of Director's meeting room, Placement Committee headquarters, and space and tables for registration. The Committee shall be responsible for providing or arranging for typewriters and personnel for registration, and ~~projectors, screens, microphones,~~ appropriate audio visual and other equipment as designated by the Program Chairperson.

Section 5. The Nominations Committee shall nominate candidates for the officers of President-elect, Secretary, Chairperson-elect of the Research Section, Chairperson-elect of the Education and Regulatory Section when necessary, ~~and WSSA Representative when necessary~~. Such candidates shall be contacted and cleared as set forth in ARTICLE VI of the Constitution. The intent is to alternate candidates for President-elect from the private and public sectors.

Section 6. The Public Relations Committee shall take every feasible opportunity to inform the scientific community and the general public of the activities and benefits of the Society and of weed science in general. Any statement, which may be construed as reflecting policy of the Society, should be approved by the President before release.

Section 7. The Placement Committee shall provide at each annual meeting of the Society a registration service to make information available to potential employees and employers in cooperation with the Weed Science Society of America.

Section 8. The Committee for Nominations of Fellows and Honorary Members shall prepare nominations for these awards under the provisions of ARTICLE III, Section 3 of the Constitution, and ARTICLE X, Sections 1 and 2 of the By-Laws. They shall prepare biographical data for publications in the Proceedings and shall work with the Public Relations Committee in preparation of news releases concerning the award recipients.

Section 9. The Site Selection Committee shall make all arrangements in all matters pertaining to the reservation of facilities for future meetings. They shall select the city and hotel and, after receiving approval from the ~~Executive Committee~~Board of Directors, they shall finalize business agreements between the Society and hotel management and transfer the records of these agreements to the Local Arrangements Committee for the site at the earliest possible date.

Section 10. The Awards Committee shall solicit nominations and review applications for any awards that have been approved by the Society. The committee shall make recommendations of qualified candidates to the Board of Directors for action. ~~The Awards Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 2 above.~~

Section 11. The Poster Committee shall oversee all aspects of the Poster session for the annual meeting. The Chairperson will work closely with the Program Chairperson and the Local Arrangements Chairperson in doing this. ~~The Poster Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 2 above.~~

Section 12. The Student Paper Judging Committee shall oversee all aspects of the Student Paper Contest at the annual meeting. It shall arrange for judges, determine guidelines for judging, and do the final scoring to determine contest winners. The Chairperson shall work closely with the Program Chairperson in scheduling the papers. ~~The Student Paper Judging Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 2 above.~~

Section 13. When any Society member or individual within the weed science profession has passed away during the year, t~~T~~he Necrology Committee shall obtain a biography or obituary of the deceased individual(s) and

make a report at the business meeting each year. A written report should be included in the Proceedings. ~~shall consist of a Chairperson and two additional members. Terms of office will be as in Section 2 above.~~

Section 14. The Sustaining Membership Committee shall solicit for the Society the membership of public and private organizations interested in weeds or their control and management, help maintain liaison between these organizations and the Society, and provide an annual updated listing of Sustaining Members to the Program Committee Chairperson for publication in the Annual Meeting Program and to the Proceedings Editor for publications in the Proceedings. Paid Sustaining Members will receive one copy each of the Progress Report and annual meeting Proceedings, and free booth space for an educational exhibit. ~~After three consecutive years of Sustaining Membership, the Society annually will provide a plaque to the Sustaining Member as long as membership is continuous.~~

~~Section 15. The Publications Committee shall be responsible for all publications the Society publishes including the Research Progress Report and Proceedings.~~

~~Section 16~~ Section 15. The Legislative Committee shall be responsible for keeping the ~~Executive Committee~~Board of Directors informed on legislative issues of interest to Society members and ~~about~~ the activities of ~~the~~ WSSA's Director of Science Policy ~~WSSA liaison~~ in Washington, DC, and with organizing ~~the~~ Ssociety membership on legislative issues.

Section 167. The Herbicide Resistant Plants Committee shall be responsible for keeping the ~~Executive Committee~~Board of Directors informed about issues concerning herbicide resistant plants and organizing educational materials and workshops to address critical aspects of herbicide resistance.

Section 178. The Student Educational Enhancement Committee shall be responsible for soliciting applicants and matching applicants with industry hosts based on the applicant's geographic preference and goals.

ARTICLE VIII - DUTIES OF THE SECTION CHAIRPERSONS

Section 1. The Chairperson of the Research Section shall organize sectional and project meetings of those engaged in research in the Society to exchange information and ideas and for improvement of research in weed science. (S)He ~~He/she~~ shall solicit and assemble papers for the Research Progress Report from research workers for publication by the Society each year. The Chairperson may delegate to the Chairperson-elect part of his/her duties as may be wise.

Section 2. The Chairperson of the Education and Regulatory Section shall organize sectional meetings of those engaged in this phase of weed science in the Society for exchange of information and improvement of the work. ~~He/she~~(S)he shall solicit program reports of education and regulatory work in weed science for publication in the Society Proceedings. The Chairperson may delegate part of these duties to the Chairperson-elect.

Section 3. The Chairperson-elect of ~~each of~~ these Research and Education & Regulatory Sections are members of the ~~may attend~~ Executive ~~Committee~~Board of Directors ~~meetings~~ but may ~~cannot~~ vote.

ARTICLE IX – REPRESENTATIVE FOR CONSTITUTION AND OPERATING PROCEDURES ~~PERSON~~

Section 1. The Constitution and Operating Procedures Person shall review the Constitution, By-laws and Operating Guide of the society, and make recommendations for improvement to the Board of Directors. (S)He shall receive copies of correspondence of the officers and committee chairs which relate to the Constitution and Operating Procedures.

ARTICLE IX - PUBLICATIONS

Section 1. The Proceedings of the Annual Meeting and The Research Progress Report shall be published annually. Proceedings will consist of reports and papers given at the meeting, reports of the Standing Committees

and special committees, minutes of the business meeting, minutes from all Board of Directors' meetings, and reports from the Research and the Education and Regulatory Sections. Research Progress Reports shall be available at the annual meeting. Other publications may be authorized from time to time by the ~~Executive Committee~~Board of Directors. Two editors, selected by the ~~Executive Committee~~Board of Directors, will compile an index and supervise the printing of the Research Progress Report and the Proceedings. Minutes of Board of Directors' meetings ~~should~~will be available on the Society website.

ARTICLE XI - FELLOWS AND HONORARY MEMBERS

Section 1. Fellows of the Society are members who have given meritorious service in Weed Science, and who are elected by two-thirds majority of the ~~Executive Committee~~Board of Directors. Not more than two Fellows shall be selected each year. A cumulative list of Fellows shall be published each year in the Program and in the Proceedings.

Section 2. Honorary Members shall be selected as set forth in ARTICLE III, Section 3 of the Constitution. A cumulative list of Honorary Members shall be published each year in the Program and in the Proceedings.

Section 3. All Fellows, upon retirement, and Honorary Members shall receive publications of the Society and complimentary registration and luncheon privileges at all Society meetings which they attend. Persons selected as Honorary Members prior to 1974 shall be listed annually in the Program and in the Proceedings under the heading, Fellows (formerly Honorary Members).

ARTICLE XII - RULES OF ORDER

Section 1. Business at all regular meetings of the Society shall be conducted according to Robert's Rules of Order.

ARTICLE XIII - QUORUM

Section 1. All members of the Society in good standing who are present at any regular meeting shall constitute a quorum.

ARTICLE XIIIV - AUTHORIZATION

Section 1. The adoption of this Constitution and By-Laws shall render null and void all previous rules and regulations of this Society.

~~NEJ October~~ December, 2002

**CONSTITUTION (Clean Version)**

ARTICLE I - NAME

Section 1. The name of this organization shall be the "Western Society of Weed Science," hereinafter called the "Society". The Society area shall include Alaska, Arizona, California, Colorado, Hawaii, Idaho, Kansas, Montana, Nebraska, Nevada, New Mexico, North Dakota, Oklahoma, Oregon, Texas, Utah, Washington, Wyoming, Alberta, British Columbia and Saskatchewan.

ARTICLE II - OBJECTIVES

The objectives of the Society shall be:

Section 1. To foster cooperation among state, federal, provincial, and private agencies in matters of weed science in the Society area.

Section 2. To support the Weed Science Society of America and foster state and regional organizations of persons and agencies interested in weed control *and management.*

Section 3. To aid and support commercial, private, and public agencies in the prevention, identification and solution of weed problems.

Section 4. To foster and encourage education and research in weed science.

Section 5. To support legislation governing weed control and management programs and weed research and education programs.

Section 6. To assist in the development of uniform weed control and management and eradication legislation and weed seed quarantine legislation and regulations.

ARTICLE III - MEMBERSHIP

Section 1. Membership shall be open to anyone interested in the objectives of the Society. Three types of membership are provided: (a) active, (b) honorary, and (c) sustaining.

Section 2. Active members are individuals who are interested in weeds or their control and management, and who have paid their annual dues to the treasurer. Active members may attend all Society meetings, vote on Society matters, hold office, and receive official notices of all meetings.

Section 3. Honorary members are selected individuals whose activities have been largely from outside the Western Society of Weed Science who have significantly contributed to the field of weed science, and who are elected by two-thirds majority of the Board of Directors. Honorary members shall receive all publications and announcements of the Society but will not be eligible to vote or hold office.

Section 4. Sustaining members are public or private individuals or organizations interested in the objectives of the Society, who wish to participate in the activities of the Society and who have remitted their annual sustaining membership dues.

ARTICLE IV- OFFICERS AND BOARD OF DIRECTORS

Section 1. The officers of the Society shall be:

(1) President
(2) President-elect who serves as Program Chairperson
(3) Secretary

Section 2. The Board of Directors shall be composed of:

(1) President
(2) President-elect
(3) Secretary
(4) Immediate Past-President
(5) Representative to WSSA
(6) Chairperson of the Research Section
(7) Chairperson of the Education and Regulatory Section
(8) Member-at-Large

Non-voting Board members

(9) Chairperson-Elect of the Research Section
(10) Chairperson-Elect of the Education and Regulatory Section
(11) Representative to CAST
(12) Treasurer/Business Manager
(13) Representative for Constitution and Operating Procedures

Section 3. The President, President-elect, and Secretary shall begin their duties at the close of the regular business meeting at which they are installed and shall remain in office until the close of the next regular Society business meeting at the end of their respective terms. Other members of the Board of Directors shall begin their term at the close of the meeting at which they are installed, except the Representatives to WSSA and CAST whose term is described in ARTICLE IV, Section 5 & 7 of the Constitution.

Section 4. The Chairperson of the Research Section and Chairperson of the Education and Regulatory Section shall serve a one-year term beginning at the close of the business meeting at which they become chairpersons.

Section 5. The President, with the consent of the Board of Directors, shall appoint a Society Representative to the Weed Science Society of America who shall serve a three-year term beginning at the Weed Science Society of America Business meeting in the year following appointment.

Section 6. The Board of Directors shall appoint a Treasurer-Business manager to serve as they may direct.

Section 7. The President, with the consent of the Board of Directors, shall appoint a Society Representative to the Council for Agricultural Science and Technology (CAST) to serve as they direct. The Representative to CAST shall serve three (3) years, beginning after the CAST fall meeting.

Section 8. The Chairperson-elect of the Research Section and Chairperson-elect of the Education and Regulatory Section shall serve a one-year, non-voting, term beginning at the close of the business meeting at which they become chairpersons-elect.

Section 9. The President, with the consent of the Board of Directors shall appoint a person to serve as a representative of Constitution and Operating Procedures to a term of five years. This person shall be parliamentarian on behalf of the President and shall serve as a non-voting member of the Board of Directors provided that (s)he is not concurrently serving as a duly elected member of that body.

ARTICLE V - SOCIETY SECTIONS

Section 1. In promoting a full exchange of ideas and information on weed science and to facilitate programming of meetings, there shall be two general sections as follows:

(1) The Research Section
(2) The Education and Regulatory Section

Section 2. These two sections may have sectional programs, project meetings and informal discussions of research reports and other pertinent information. Such meetings shall be at the regular meeting at a time designated by the Program Committee.

Section 3. The Chairperson of each of these sections shall be a member of the Society Board of Directors and shall be elected as stated in Article VI, Section 3.

ARTICLE VI - ELECTION OF OFFICERS

Section 1. The Nominating Committee shall be appointed by the President, with the advice and consent of the Board of Directors. They shall present their nominations for each office to be filled to the Board of Directors for approval before presenting the nominees to the membership for election by ballot. No member's name shall be placed on the ballot without the member's consent. All candidates for office shall be selected from the Society membership and shall be elected by the majority of the members voting. In case of a tie vote, the winner shall be determined by flip of a coin in the presence of both nominees or their representatives at a meeting of the Board of Directors.

Section 2. The terms of office shall be as follows: The officer moving through the office of President-elect, President, and Immediate Past-President shall be a member of the Board of Directors for a three-year term; the Secretary shall serve a two-year term.

Section 3. The Chairperson-elect of the Research and the Education and Regulatory sections shall be elected by the Society and serve a one-year term. Following this, they shall succeed as Chairperson of their section for an additional one-year term. The chairperson-elect shall serve as Chairperson if the Chairperson is unable to serve his/her term.

Section 4. If an elected officer cannot serve the full term, the vacancy shall be filled for the interim by appointment by the President with the advice and consent of the Board of Directors, unless otherwise provided for in this constitution. The President-elect shall serve as President if the President becomes unable to serve. This service shall not constitute his/her term as President. In case both the President and President-elect are unable to serve, the most immediate Past-President who is willing to serve shall serve as interim President until new officers are elected by the members.

ARTICLE VII - STANDING COMMITTEES

Section 1. There shall be seventeen Standing committees: Program, Finance, Publications, Local Arrangements, Nomination, Public Relations, Placement, Nominations of Fellows and Honorary Members, Site Selection, Awards, Poster, Student Paper Judging, Necrology, Sustaining Membership, Legislative, Herbicide Resistant Plants, and Student Educational Enhancement appointed by the President with the advice and consent of the Board of Directors.

Section 2. The Program Committee shall consist of the President-elect as Chairperson, the two Section Chairpersons, and such other members appointed by the Program Committee Chairperson as required to give all phases of weed science adequate representation.

Section 3. The Finance Committee shall consist of a Chairperson and two members. Term of office of the committee shall be three years, established to expire alternately so that at least two members continue over each year. The member serving his/her second year of the term shall serve as Chairperson.

Section 4. The Publications Committee shall consist of the President-elect (Chairperson), Proceedings editor, Research Reports Editor, Newsletter editor, and Website editor.

Section 5. The Local Arrangements Committee shall consist of a Chairperson and others as needed.

Section 6. The Nominating Committee shall consist of Chairperson, Immediate Past-President, and two rotating members. Terms of this committee, excluding the Immediate Past-President, shall be as in Section 3 above.

Section 7. The Public Relations Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 8. The Placement Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 9. The Committee for Nominations of Fellows and Honorary Members shall consist of three fellows of the Society and the Immediate Past President. Terms of office of this committee shall be as in Section 3 above.

Section 10. The Site Selection Committee shall consist of a Chairperson and two additional members. Terms of this committee shall be as in Section 3 above.

Section 11. The Awards Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 12. The Poster Committee shall consist of Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 13. The Student Paper Judging Committee shall consist of a Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 14. The Necrology Committee shall consist of Chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 15. The Sustaining Membership Committee shall consist of a chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above.

Section 16. The Legislative Committee shall consist of a chairperson and two additional members. Terms of office of this committee shall be as in Section 3 above. Members shall be eligible for re-appointment to serve a second 3-year term.

Section 17. The Herbicide Resistant Plants Committee shall consist of a chairperson and five additional members. Terms of office of this committee shall be: Chair appointed to a three year term and five other members appointed to three year terms, established to expire alternately so that at least four members continue over each year.

Section 18: The Student Educational Enhancement Committee shall consist of three members from private industry and two members from academic institutions and/or government agencies who shall serve for three years. Members from industry should reside in different geographic regions at the time of their appointment. Relocation to another region already represented on the committee shall not prevent the relocated member from completing his/her term. A member serving his/her second year shall serve as chairperson. Terms of the committee members shall rotate in alternate years.

ARTICLE VIII - DUES

Section 1. The amount of dues and the method of collecting such dues shall be determined by the Board of Directors.

Section 2. In the event of the dissolution of the Western Society of Weed Science, the physical assets shall be sold and after payment of all debts, money possessed by the Society shall be given prorated on a membership

basis without let or hindrance to agricultural education institutes in the states and provinces listed in Article I, Section 1, by the Board of Directors holding office at the time of dissolution

ARTICLE IX - MEETINGS

Section 1. Meetings shall be held at such time and places as may be determined by the President in consultation with the Board of Directors.

ARTICLE X - BY-LAWS

Section 1. The Society may adopt By-Laws.

ARTICLE XI - AMENDMENTS

Section 1. The Constitution and By-Laws may be amended by majority vote of the members present at any regular meeting.

**WSWS BY-LAWS**

ARTICLE 1 - DUTIES OF OFFICERS

Section 1. The President shall be the Chief Executive Officer of the Society. (S)He shall act as Chairperson of the Board of Directors, carry out the spirit of the Constitution and the decisions of the Board of Directors, appoint designated officers and committees, and perform other usual duties of that office. (S)he may confer if, in his/her opinion, a member of the Society has demonstrated distinguished service, the Presidential Award of Merit. Presentation of this award must have majority approval of the Board of Directors.

Section 2. The President-elect shall perform the duties of President if (s)he cannot serve; serve as Chairperson of Program Committee; develop program outlines of the Society meetings; assign responsibilities to Program Committee; issue calls for papers; advise Board of Directors of program status one month before the meeting; and present a copy of the program to the Business Manager for publication.

Section 3. The Secretary shall prepare minutes of Society and Board of Directors meetings, prepare and maintain an up-to-date list of officers including Board of Directors, all standing committees and special committees, and perform other duties when designated by the President.

ARTICLE II - DUTIES OF TREASURER-BUSINESS MANAGER

Section 1. The Treasurer-Business Manager will receive, manage and disperse monies of the Society in accordance with prescribed policies and instructions of the Board of Directors, maintain financial records and records of property, prepare records for annual audit and meeting with designated auditors, maintain supplies of Proceedings and Research Progress Report, receive and fill orders for above publications and collect payment for same, maintain standing orders and mailing lists for distribution of publications, and arrange for, and consummate publications for the Society. The Business Manager may be financially compensated for services rendered as decided by majority vote of the Board of Directors.

ARTICLE III - DUTIES OF WSSA (WEED SCIENCE SOCIETY OF AMERICA) REPRESENTATIVE

Section 1. The WSSA Representative shall serve on the Board of Directors of WSSA and shall act as liaison between the Society and WSSA. (S)he will keep WSSA informed of all activities and actions of the Society and will, in turn, keep the Society informed of all activities and actions of WSSA.

ARTICLE IV - DUTIES OF MEMBER-AT-LARGE

Section 1. The Member-at-Large shall maintain liaison with the President and other officers of the Society and shall bring to the attention of the Board of Directors the various concerns of the members of the Society. The Member-at-Large shall perform other duties delegated by the President and the Board of Directors.

ARTICLE V - DUTIES OF CAST REPRESENTATIVE

Section 1. The CAST Representative shall represent the Society, present ideas and proposals from the Society to CAST, and recommend persons from the Society for participation in CAST activities.

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Section 1. The Immediate Past-President shall serve on the Board of Directors, on the Nominations committee, and on the committee for Nominations of Fellows and Honorary Members. , (S)He shall maintain close liaison with the President in an advisory capacity. (S)He shall also serve as the liaison and advisor for members desiring that a resolution be put before the society at the annual meeting. (S)He will assist in the writing of new resolutions and getting them to the Board of Directors and members of the society.

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Section 1. The Program Committee shall develop the program for the meetings of the Society. The President-elect, who is Chairperson, shall delegate duties to members as (s)he deems advisable (see duties of President-elect).

Section 2. The Finance Committee shall analyze the financial conditions of the Society and recommend, if needed, immediate and long-range plans for sound growth of the society, recommend budget policies, recommend policies regarding registration fees and prices of publications, audit the financial accounts at least annually, and make a report to the Society.

Section 3. The Publications Committee shall be responsible for all publications of the Society including the Proceedings, Research Progress Reports, Newsletter and Website.

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and 2 of the By-Laws. They shall prepare biographical data for publications in the Proceedings and shall work with the Public Relations Committee in preparation of news releases concerning the award recipients.

Section 9. The Site Selection Committee shall make all arrangements in all matters pertaining to the reservation of facilities for future meetings. They shall select the city and hotel and, after receiving approval from the Board of Directors, they shall finalize business agreements between the Society and hotel management and transfer the records of these agreements to the Local Arrangements Committee for the site at the earliest possible date.

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publication in the Society Proceedings. The Chairperson may delegate part of these duties to the Chairperson-elect.

Section 3. The Chairperson-elect of the Research and Education & Regulatory Sections are members of the Board of Directors but may not vote.

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Section 1. The Constitution and Operating Procedures Person shall review the Constitution, By-laws and Operating Guide of the society, and make recommendations for improvement to the Board of Directors. (S)He shall receive copies of correspondence of the officers and committee chairs which relate to the Constitution and Operating Procedures.

ARTICLE X - PUBLICATIONS

Section 1. The Proceedings of the Annual Meeting and The Research Progress Report shall be published annually. Proceedings will consist of reports and papers given at the meeting, reports of the Standing Committees and special committees, minutes of the business meeting, minutes from all Board of Directors' meetings, and reports from the Research and the Education and Regulatory Sections. Research Progress Reports shall be available at the annual meeting. Other publications may be authorized from time to time by the Board of Directors. Two editors, selected by the Board of Directors, will compile an index and supervise the printing of the Research Progress Report and the Proceedings. Minutes of Board of Directors' meetings will be available on the Society website.

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Section 1. Fellows of the Society are members who have given meritorious service in Weed Science, and who are elected by two-thirds majority of the Board of Directors. Not more than two Fellows shall be selected each year. A cumulative list of Fellows shall be published each year in the Program and in the Proceedings.

Section 2. Honorary Members shall be selected as set forth in ARTICLE III, Section 3 of the Constitution. A cumulative list of Honorary Members shall be published each year in the Program and in the Proceedings.

Section 3. All Fellows, upon retirement, and Honorary Members shall receive publications of the Society and complimentary registration and luncheon privileges at all Society meetings which they attend. Persons selected as Honorary Members prior to 1974 shall be listed annually in the Program and in the Proceedings under the heading, Fellows (formerly Honorary Members).

ARTICLE XII - RULES OF ORDER

Section 1. Business at all regular meetings of the Society shall be conducted according to Robert's Rules of Order.

ARTICLE XIII - QUORUM

Section 1. All members of the Society in good standing who are present at any regular meeting shall constitute a quorum.

ARTICLE XIV - AUTHORIZATION

Section 1. The adoption of this Constitution and By-Laws shall render null and void all previous rules and regulations of this Society.

December, 2002

Discussion: The definition of fellow hasn't been changed. Vanelle will give a report at the business meeting and a revised constitution will be handed out at the registration desk.

Nelroy Jackson moved to accept the report, Gil Cook seconded, the motion passed unanimously.

**Local Arrangements** - Phil Motooka:

1. The Local Arrangements Committee now consists of 17 members. The State of Hawaii has another round of budget cuts and that may prevent a couple of people from attending. Those members are from forestry: Alvin Kiyono, Galen Kawakami, Craig Koga, and Stafford Soto. From the Department of Agriculture: Larry Nakahara, Nilton Matayoshi, Kyle Onuma, and Craig Kaneshige. From the Koke'e Museum of Natural History: Katie Cassel. From industry: Reggie Hasegawa and Joey Silva, United Horticultral Supply; and Allen Teshima, DuPont. From the University of Hawaii: Lincoln Ching, Mike DuPonte, Glen Fukumoto, John Powley, and Roy Nishimoto.
2. We have arranged for about 5 power point units to be brought to the conference.
3. The pre-conference invasive weed tour is set for Monday March 10 with 68 participants as of 02/07/03. The State foresters and Katie Cassel of the Kokee Natural History Museum and her volunteers have developed an educational and fun tour.
4. Arrangements have been made to have the sustaining members sign made on Kauai.
5. Two guest speakers are set: Ken Teramoto, Head of the Biocontrol Section at the Hawaii Department of Agriculture, and Philip Thomas of the Hawaii Ecosystem at Risk (HEAR) project.
6. The Sheraton seems set. The awards luncheon will be at the Poipu Ballroom if we have a large crowd. They want to shift it to their restaurant, not open for lunch, if we have 200 participants or so. This will eliminate the need to re-set the ballroom from conference to meal to conference again. If at the restaurant, the seating will be in rows. A podium will be set up.
7. My friends and colleagues at the University of Hawaii, the Department of Agriculture, the Division of Forestry and Wildlife the Koke'e Natural History Museum, and industry have been unstinting in their support of this conference. And the guidance from the WSWS, especially Jill Schroeder, Wanda Graves and Gil Cook is greatly appreciated as is the support of several other members on the mainland.

**NOTE:** Power point presentation may negate the need for practice rooms in the future.
Nelroy Jackson moved to accept the report, George Beck seconded, motion passed unanimously.

**WSSA Representative**- Nelroy Jackson: I attended both the pre-conference and post-conference WSSA board of directors meetings, since Steve Miller had a university engagement during the pre-conference meeting.

WSSA membership continues to decline at the rate of about 100 per year (to 1865 in 2002), institutional subscriptions to the journals declined by 35. Sustaining memberships declined due to the consolidation in the chemical industry, but financial contributions stayed about the same. WSSA calendars were published late, at a cost of $4,200. If a 2004 calendar is to be published, then it must be ready by October 2003. The society is in good financial condition, even though income from investments declined. The herbicide handbook continues to sell very well.

Attendance at the meeting was less than expected (553), including the number of room nights predicted. The Invasive Plant Workshop in Jacksonville was cancelled because of lack of pre-registrants. A graduate student organization was formed.

Based on what happened to WSWS, the board decided to change the status of Rob Hedberg, Director of Science Policy, from that of a contractor to that of an employee.

An Invasive Plant Workshop is planned for the Kansas City meeting, with the primary function to provide training for Mid-Western people, especially CCA's and members of NAWMA, the North American Weed management Association. Collie Graddick, President of NAWMA addressed the Board. This should also help with room pick-up. Roger Becker will be the workshop planner.

The next board meeting is scheduled for July 25/27 at the Westin hotel in Kansas City

Discussion: Nelroy indicated that the relation between national and regional societies seems at cross-purposes at times. Steve Miller felt that we needed to keep our identity while working together. WSSA seems to want to control everything.

George Beck moved to accept the report, seconded by Bob Parker, motion passed unanimously.

**Committee Reports** (Board Contact)

**CAST Representative** - Rod Lym: The fall meeting of the CAST Board of Directors was held in September in Phoenix, AZ and was one of the more productive meetings as several new publications and workshops were approved. Also, WSWS had one of the largest increases in membership to CAST from the membership-partnership program. Remember $25 will be returned to WSWS for each new member who joins CAST from our Society. Another benefit of CAST membership.

1. CAST is starting a new series of Fact Sheet publications designed to enhance federal research funding. These one page (front and back) publications will give examples of success stories coming from research. The fact sheets will present data on economic savings, health benefits, development of new technologies with likely application in agriculture and/or solving a problem which impacts farmers, industry, or consumers.

This is a very good opportunity for members of the Western Society of Weed Science to tell the people in Washington DC how much their work has meant to the farmers and land managers in the region. Traditionally Agriculturalists in general, and Weed Scientists in particular have been a humble group and not willing to "brag" about the good work they have done. In order to compete with other science disciplines for federal funding, we must learn to tell our story.

Please send me a few short sentences telling of a success story. WSWS will be allowed to submit two from our Society. Don't delay, send today! Rod.Lym@ndsu.nodak.edu

Items of special interest to WSWS members from the Fall CAST Board of Directors meeting.

2. CAST will be sponsoring a Resistance Management Workshop in conjunction with the national IPM meeting in Indianapolis on 10 and 11 April 2003. This workshop differs from previous resistance management meetings because it will involve not just weed scientists, but scientists from other disciplines such as entomology, plant pathology, and microbiology who have been dealing with resistance much longer than weed scientists. We should be able to learn how to deal with resistance from their work as both successes and failures will be emphasized. I have attached a draft agenda.

3. The CAST Board approved an issue paper that will explore the effect of multiple exposures to pesticides alone and in combination. The working title is "Total Maximum Daily Load (TMDL) Development and Effects on Agriculture".

4. CAST is building a new interactive website and should be much more user friendly. You can access CAST reports, see the latest CAST news, and even pay your dues from the new site.

5. The CAST spring board meeting will be held 20 to 22 March in Washington D.C. Please let me know of any issues you would like me to address at the meeting. As your WSWS rep., I am currently the Chair of the Plant Protection Work Group and the Vice-Chair of the National Concerns Committee. I appreciate the opportunity to represent WSWS on CAST.

Other: CAST will be sponsoring another shared leadership workshop to be held June 19-22 in Cold Spring, NY. The application deadline is March 31, 2003. The cost is $800 to send 3 people to the workshop. Jill Schroeder will address this issue on the Thursday breakfast meeting.

Nelroy Jackson moved to accept the report, Bill McCloskey seconded, motion passed unanimously.

**ACTION ITEMS**: Fact sheet success stories in the west should be provided to Rod before the summer CAST meeting. Only a few lines from CRIS reports are needed initially. Clarify with Rod when his term is over.

**Awards Committee**- Paul Ogg (Jill Schroeder): The awards committee received two nominations for the "Outstanding Weed Scientist – Public Sector" and unanimously selected Dr. Frank Young as the individual to receive this award for this

year. Dr. Young has made considerable contributions in the WSWS and has been very instrumental in developing the benefits and implementing conservation farming systems in the Pacific Northwest. Frank is most deserving of this award.

Mr. Bill Brewster was selected by the awards committee to receive the "Professional Staff" award for 2003. Bill Brewster has made significant impact on the Pacific Northwest agriculture. His strong work ethic, attention to detail and his professional commitment to the weed science discipline are unprecedented and sets a strong example for his peers and graduate students. Bill is most deserving of this award.

There were no nominations for the other awards – Outstanding Weed Scientist, Early career (public or private) or the Weed Manager Award. The society needs to find ways to increase award nominations.

Steve Miller moved to accept the report, Gil Cook seconded, the motion passed unanimously.

**Nominations Committee**- Steve Miller (Jill Schroeder): We received 123 ballots by February 1 and an additional 7 ballots after this period. I did not include the 7 ballots in the final count. However, if these ballots would have been received by the February deadline they would have changed the election results for one office. The committee had a strong list of candidates for each office and would like to encourage those not elected to allow their names to be placed on the ballot again sometime in the future. The winners were Phil Stahlman, president-elect; Pete Forster, secretary; Drew Lyon, research chair-elect; and Charlie Hicks, education and regulatory chair-elect.

Bob Parker moved to accept the report, Gil Cook seconded, the motion passed unanimously.

**Site Selection Committee**- Jesse Richardson (Jill Schroeder): For the annual meeting, we have reviewed sleeping room and menu prices, meeting capacity, and accessibility for hotels in Albuquerque, Portland, Reno, Lake Tahoe and Seattle. After selecting a number that appears to meet our standards, we have initiated discussions with several properties. We found that most hotels will reduce their room price (sometimes substantially) when asked to go back and "sharpen their pencils." We also found that some hotels will set aside a certain number of rooms with further discounted prices for government employees, and apply those rooms to our room count. We have identified four, rather than three, locations for the executive board to consider.

1. Albuquerque Hilton is offering us $103/room, single/double. You might remember that when we stayed there last (1966), it was a tight fit. They also want us to put our graduate students next door at the Fairfield Inn. Menu prices for our society luncheon and business breakfast would be similar or cheaper than what we have seen in recent years. This was a well-attended location for the WSWS. 26,000 sq ft of meeting facilities. 1/50 comp rooms.

2. Reno Hilton is offering us $114/room, single/double. They are also willing to provide a block of discounted rooms for government employees, but they haven't specified the price. This is a large hotel with 2,000 sleeping rooms and 200,000 sq ft of meeting space. 1/50 comp rooms.

3. Columbia River Doubletree (Portland) is offering us $99/room, single/double. This property was Red Lion the last time we met there. We have had a difficult time getting a portfolio from them. This was a well-attended location for the WSWS in 1977. 1/50 comp rooms.

4. John Ascuaga's Nugget (Sparks/Reno) is offering us $89/room, single/double. They are also offering 100 rooms for government employees at $55/room. At present they also have a $3 energy surcharge/room/night... we don't know if it will be in effect in 2006. Menu prices would be similar or cheaper than what we have seen in recent years. This is a large hotel with 1600 sleeping rooms and 110,000 sq ft of meeting space. 1/40 comp rooms.

Steve Miller moved we tentatively accept the Reno area provided we have a local arrangements person on hand, Bill McCloskey seconded, motion passed unanimously.

Helms Brisco is still an uncomfortable situation, but should stay with them for the time being.

**ACTION ITEM:** Jesse will continue to develop a checklist for what the meeting requirements are in order to hand down the information from committee chair to committee chair in succeeding years.

Gil Cook moved to accept the report, Bob Parker seconded, motion passed unanimously.

**Fellows and Honorary Members Committee**- Frank Young (Bob Parker): The committee independently reviewed nominations of submitted candidates for consideration as Fellows and Honorary Member of WSWS. The committee evaluated three nominations (two carry-overs) for the Fellows award and one solicited (no carry-over) nomination for Honorary Member. The committee discussed and evaluated the qualifications of the awards and the nominees by email and telephone.

The committee unanimously selected and recommend to the WSWS Executive Committee the following award recipients for 2003:

| | |
|---|---|
| Fellow: | Carol Mallory-Smith<br>Vanelle Carrithers |
| Honorary Member: | Roy Nishimoto |

I believe plaques are to be purchased by the Society and presented to the award winners at the Hawaii meeting. Also, I want to pose a question— "Does the Society pay for the expenses of the Honorary Member to attend the meeting and be recognized by the Society?" If selected, Dr. Nishimoto already resides in Hawaii where he is a faculty member at the University of Hawaii.

Discussion: Frank Young indicated that it is hard to get nominations and that the definition of fellow is a problem.

**ACTION ITEM**: This committee will investigate what a fellow is and what is the award for, solicit input from membership, and bring the suggested revisions to the board. When approved, it would be incorporated into the operating guidelines.

Bob Parker moved that all awards deadlines be changed to December 1 so all coincide with each other. Steve Miller seconded, motion passed unanimously. Operating guidelines will need to be changed.

Gil Cook moved to accept the report, George Beck seconded, the motion passed unanimously.

**Sustaining Membership Committee**- Steve Eskelsen (Bob Parker):

1. Seventeen sustaining members as of March 2, 2003 contributed $4,800 in member dues for the year 2003, as follows:

Agriliance L.L.C., AGSCO, Inc., Arvesta Corporation, BASF Corporation, Bayer CropScience, Bellspray Inc. dba R&D Sprayers, Dow AgroSciences, Dupont Crop Protection, Electronic Data Solutions, Marathon Agricultural & Environmental Consulting, Inc., Monsanto Company, PBI-Gordon Corporation, Syngenta Crop Protection, United Agri Products, Inc., Valent USA Corporation

2. All 2002 sustaining members and prospective sustaining member were personally contacted by phone to determine their interest in becoming sustainable members. Those that showed interest were sent letters via email (with attached invoice). The slow economy and the location of the 2003 annual meeting were the most common reasons businesses and public agencies gave as to why they could not become sustainable members.

Discussion: We need a mechanism to identify potential new sustaining members e.g. NGO's. Vanelle had suggested to secure industry financial support for the annual meeting by December.

George Beck moved to accept the report, Gil Cook seconded, the motion passed unanimously

**Finance Committee**- Roger Gast (Bob Stougaard):

The Finance Committee met several times by teleconference over the last year and most recently on February 7, 2003 to discuss proposals and review quarterly investment reports and WSWS financial statements.

As of December 31, 2002 the Merrill Lynch fixed income account had a total balance of **92,563**, and the mutual funds account had a balance of **$122,611**,for a combined value of **$215,174**. This represents an **$8k (+3.9%)** quarterly gain but a **$34k (-13.5%)** annual loss on total investments. A re-balancing of investments in 2Q02, along with declining equity values in 2002, resulted in a 57% investment value distribution in equities at year end, which is in line with WSWS "Investment Policy Guidelines" (no more the 65% equities).

As of December 31, 2002, the money market saving account (Newark) had a balance of **$46,685** and the checking account (Newark) **$15,074**.

The financial statement that was provided by the business manager on January 28th for the fiscal 3rd quarter appears to be in order.

**Recommendations:**

1) Consider item from last report concerning an increase in support of Director of Science Policy position (item tabled at July EBM, see recommendation below). We believe WSWS should begin to move toward the $14,000 support level this year, although given recent WSWS investment results and long-term membership projections, the board may wish to accomplish this objective through a series of increases over a 2- to 3-year period, with reevaluation of the objective each year.

   Previous Recommendation: *Consider options for increasing the contribution of WSWS for support of the Director of Science Policy position. The finance committee recommends an increase in annual contribution from $7300 to $14,000 based on study analysis of other contributing regional societies summarized below*

| Society | Membership (cur.) | Annual Contribution | $/member |
|---|---|---|---|
| NCWSS | 514 | $14,000 | 27 |
| SWSS | 475 | $14,000 | 29 |
| WSWS | 491 | $7,300 | 15 |
| NEWSS | 197 | $4,000 | 20 |

2) Consider a modest increase in conference registration fees for all categories to offset rising costs.

3) Consider a study of alternative investment approaches with the goal of maintaining current balanced risk/reward exposure while reducing costs. The "Vanguard Wellington Fund" is an example of a balanced mutual fund that has a very low expense ratio (0.36%), a low risk profile relative to other equity funds, and it has out-performed the current investment vehicle over the last several years.

Discussion of Recommendations:

1) Increase contribution to Director of Science Policy. Bill McCloskey moved to acknowledge the committees recommendation and that the WSWS be prepared to increase our contribution when WSSA asks for more support. Seconded by George Beck, motion passed unanimously.

2) Registration Fees: Nelroy Jackson moved to ask the finance committee to work with Wanda to make a specific recommendation in terms of how much we need to increase registration and membership fees. Seconded by Bill McCloskey, motion passed unanimously.

3) Alternative investment funds. It was agreed to ask the committee for more information and specifics in order to make a decision. Nelroy Jackson moved to accept the motion, George Beck seconded, motion passed unanimously.

**Necrology Committee**- Dennis Tonks (Bob Stougaard): The committee received notification of two deaths this past year, Barbra Mullin and Jim McHenry. (Full text is located at the back of Proceedings.)

Discussion: Don Burgoyne recently passed-on but no information is available at his time. Dennis expressed the notion that the membership should respond one way or another to e-mail solicitations. A request for necrology items should be placed in the newsletter. Dennis was to rotate off this year, but will remain because one committee member no longer participates in the WSWS.

**ACTION ITEM:** Gil Cook needs to appoint one more person to the committee.

George Beck moved to accept the report, Gil Cook seconded, motion passed unanimously.

**Herbicide Resistant Plants Committee-** Randy Anderson (Nelroy Jackson): At the 2003 annual meeting, our committee will be presenting a poster summarizing impact of herbicide use frequency on development of resistant weeds. We also will be leading discussion on this topic in Project #4: Basic Sciences, cooperating with Kassim Al-Khatib.

For 2004, we are exploring how to integrate ecologically-based management strategies with current guidelines for resistance management (*Herbicide Resistance Action Committee*). Research has quantified weed demographics as affected by diverse crop rotations and competitive crop canopies; initially, we plan to evaluate model simulations with jointed goatgrass and imazamox. One idea is to examine gene transfer by pollen flow between winter wheat and jointed goatgrass; we wonder if barrier strips of other crops could be designed that minimize pollen flow among neighboring wheat fields. We plan to present our findings during the Project #6 workshop in 2004.

The Committee is planning activities at annual WSWS meetings to inform WSWS members on recent findings in weed population management.

We do not have any requests for the WSWS executive committee to consider at this time.

If we can integrate weed ecology with HRAC guidelines for resistance management, we may write a 1- to 2-page fact sheet for the WSWS Web page. This would enable scientists to include this information in handouts for producer field days or other technology transfer activities.

The committee may stop holding the annual summer committee meeting and instead conduct its business at the annual meeting.

Gil Cook moved to accept the report, Bill McCloskey seconded, motion passed unanimously.

**Student Educational Enhancement Committee-** Ted Warfield & Steve Fennimore (Nelroy Jackson): Announcements were sent out with the WSWS Newsletter because of a problem on the web site. Letters of request were sent to 84 University research and extension faculty. Five students applied to the SEE Program in 2003: 2 students from Washington State University, 1 from Kansas State University, 1 from New Mexico State University, and 1 from Colorado State University. The following arrangements have or are being finalized: David Belles from CSU to UC Riverside and or UC Davis; Tom Witzgall from WSU to UC Riverside and or UC Davis; Jeanne Falk from KSU to probably Monte Anderson and Dean Christy Bayer Yakima, WA; Amber Vallotton from NMSU to Michael Ralphs USDA Logan, UT; Laylah Scarnecchia from WSU to Steve Watkins Syngenta Yuma, AZ (this will be done in January because of the cropping season in that area). A meeting of the committee, the participants and or major professors, and probable sponsors will be held on Monday prior to the WSWS meeting.

Discussion: Fewer industry reps are now available to participate and workloads have increased, making this venture more difficult. Industry reps can't afford to take a week off. Individual reps could share the burden across more than one company within a region. Also, the workload could be spread out to academia, state and federal agencies, in which case, funding the student could then be a problem. Universities may need to hire the student for one/two weeks for liability concerns.

George Beck moved to have committee evaluate the overall program, financing, and breadth of opportunities, Bill McCloskey seconded, motion passed unanimously.

**ACTION ITEM**: Have committee evaluate overall program, financing, and breadth of opportunities. The committee is to also draft a booklet/white paper discussing the objectives and benefits of the program.

**Legislative Committee**- Roy Reichenbach (Steve Miller): At the WSWS meeting in Salt Lake City, UT in March 2002 the Legislative Committee updated their operating guides.

The Chair of the Legislative Committee also serves on the WSSA Legislative Committee and the WSSA Washington, DC Liaison Committee. I receive many notes and correspondence for the Director of Science Policy for WSSA, Dr. Rob Hedberg and pass along relevant information and requests for information to the Legislative Committee and the WSWS executive board. In most instances, comments and information is requested to be directed to the requesting agency or to Dr. Hedberg, to develop a WSSA response. On a few occasions, I have requested that comments or information be sent to me for compilation and distribution to Dr. Hedberg.

The following is a listing of the comments and information requested and other information provided to the Legislative Committee and the Executive Board.

Provided the Legislative Committee and the Executive Board with Rob Hedberg's report for the 4th quarter and the1st quarter; endocrine disrupting substances and male fish.

Information and request for comments on proposed EPA spray drift rules; requests for comments on molinate documents regarding human health, environmental fate and ecological effects risk assessments; requests for comments for Blazer Herbicide; comment period announced for atrazine special review - EPA; request for comments to go to WSSA for a proposed consent decree with EPA that would allow the US Fish and Wildlife Service and National Marine Fisheries Service to require EPA to evaluate for additional risks to aquatic life for the use of approved aquatic pesticide; request for information to go to Rob Hedberg, WSSA, for CARAT Committee Transition Work Group to Meet June 20, 2002; request for comments from the CEQ on ways to Improve the Environmental Impact Assessment Process and other aspects of Implementation of the National Environmental Policy Act - The Council on Environmental Quality.

Provided information to the Legislative Committee and the Executive Board about the EPA response to the Talent Irrigation decision by the 9th Circuit court of Appeals; California's attempt to ban the use of clopyralid in lawns; information about the costs of setting up a monitoring program for NPDES permits in California after the Talent decision; grant funding opportunities for on the ground weed programs; RFP solicitation from the Aquatic Ecosystem Restoration Foundation to develop economic models for restoration; several articles about possible effects of atrazine and frog deformities or other causes; WSSA's endorsement of the nomination of Dr. Victor Lechtenberg to serve for another three-year term on the National Agricultural Research, Extension, Education and Economics Advisory Board representing the Land-Grant Colleges and Universities; proposed editorial about frog deformities for the WSSA web site; proposed ban on pesticides use in Quebec; information that Randall Stocker and Nelroy Jackson are President and Vice-president of the National Invasive Species Advisory Committee, respectively; updates of rob Hedberg's activities as of January 1, 2003 were forwarded to the Committee and executive board; GOA report on a greater focus needed to manage incasive species; EPA's T&E protection program; House subcommittee to review invasive species.

Information was provided about re-authorization of the National Invasive Species Act (NISA); Steve Dewey's report to the Agriculture committee about Bio-security through WSSA participation in CoFARM; HR 64, "Strengthening Science at the Environmental Protection Agency Act," to promote the use of sound science in EPA decision making; the CoFARM annual report; information to obtain a summary of the Farm Bill.

Both, the Craig bill S198 "Harmful Nonnative Weed Control Act of 2001" and the Hefley bill HR1462, of the same name, were not passed by the congress in 2002, but were reintroduced into the 2003 congress as Senate bill 144 (Senator Larry Craig of Idaho) on January 13 and H.R. 119 (Representative Joel Hefley of Colorado) on January 14, 2003 . The Moran bill HR 3260 and the Rayhall bill HR 3558 did not pass the congress. Representative Ehlers has introduced a bill, HR 266, to make the National Invasive Species Council an entity by statute instead of Executive Order.

According to the Operating Guide, I will become the Past Chair for two years, and the Vice Chair, Jeffrey Koscelny, is scheduled to become Chair for two years. Celestine Duncan will be going off the committee and I would suggest that Dawn Rafferty become a member of the committee as she has expressed an interest in serving.

**ACTION ITEM:** Gil Cook needs to appoint another member to this committee.

Nelroy Jackson moved to accept the report, George Beck seconded, motion passed unanimously.

**Publications Committee-**
Weeds of the West-Tom Whitson (Steve Miller): The current inventory is 15,600 copies. The University of Wyoming has recently purchased 2000 copies leaving us 13,600 copies. The financial breakdown of the account is as follows: 13,600 copies @ $13.00 each = $176,800.00. 2000 copies recently purchased by the University of Wyoming @ $13.00=$26,000.00. Balance currently in the Weeds of the West account=$29,321.09. Total profits including future inventory profits=$232,121.09. The only outstanding balance due from the account is the $80.00/night x 3 nights for student rooms at the 2003 annual meeting of WSWS. We have now printed 132,0000 copies of the Weeds of the West Book.

Discussion: The future market potential for the book was raised. We will continue to track sales and adjust production if need be.

Biocontrol of Weeds of the West: WSWS was released from the original contract. The center for invasive weeds will cover the costs of publication and the WSWS will get the profits.

Nelroy Jackson moved to accept the report, George Beck seconded, motion past unanimously.

**Placement Committee-** Curtis Thompson (George Beck): There are four positions available and three resumes submitted. Electronic media is now preferred. This was the first year we put the placement session books at the registration desk. The committee could also offer students the opportunity to serve as an outside review of resumes. The committee plans a survey of graduate students and recently hired faculty as to their utilization of the placement service.

**ACTION ITEM**: The committee is to solicit feedback from the membership regarding the acceptance of having the position books at the registration desk.

Gil Cook moved to accept the report, George Beck seconded, motion passed unanimously.

**Editorial Committee** - (George Beck)

*Newsletter Report* - Don Morishita: The Newsletter was published four times since last year's meeting in Salt Lake City, UT. Each issue had five to seven pages that included a president's report, calendar of events, news from around the west, and position announcements. We have contacted at least one individual from every member state and province as well as federal and state agencies to contribute information to the newsletter. Chemical company representatives from the major basic manufacturers also have been contacted prior to each newsletter to contribute information regarding their company. Response to these requests has continued to increase since the first time this was done last year.

We are recommending 1) a self-imposed limit of six pages for the newsletter and 2) to include with each issue obituaries of deceased members, when appropriate. Any suggestions by the Board are greatly appreciated. Don Morishita will continue as the editor.

**ACTION ITEM**: The board agreed to try to limit the newsletter to 6 pages and that the newsletter editor should work with necrology committee and report obituaries.

*Research Progress Report*- Traci Rauch and Joan Campbell: We printed 325 copies of the Research Progress Report. 130 copies were sent to the meeting site and the remainder to Wanda Graves. The total cost was $2983.00.

Project 1 - 13 reports
Project 2 - 15 reports
Project 3 - 77 reports
Project 4 – 1 report
Project 5 - 9 reports
Project 6 – 3 reports

No trade names were included in the index this year since the appropriate information was not on the index outline. Joan Campbell and Traci Rauch will continue as co-editors.

Recommended Action Items:

Change operating guidelines as follows:
1. Prepare call for Progress Reports with Research Project Chair. Send call to Business Manager to be sent out in September mailing.
2. Authors send reports directly to Progress Report editors. Progress Report Editors will edit reports and prepare indices.

Steve Miller moved that the editors index herbicides by common name and trade names and that no trade names be used in the report/body of text. George Beck seconded, motion failed.

Bill McCloskey moved to have as required fields an index of common and trade names, seconded by Steve Miller, motion passed.

George Beck moved to accept the committee's recommendations, Gil Cook seconded, motion passed unanimously.

Discussion: A CD version of the Research Report would need search capabilities, which greatly adds to cost. The WSWS wouldn't print enough CD's to recover the costs.

**ACTION ITEMS**: 1. Index herbicides by common name and trade name. 2. Prepare call for progress reports with research project chair. Send call to business manager to be sent out in September. 3. Authors of progress reports are to send reports directly to editors.

*Proceedings Report* - Joan Campbell: Abstracts, indices, and table of contents have been downloaded from the online submission. Project reports, Awards and Fellows reports, minutes, general session manuscripts, financial report, and sustaining members list need to be sent to the Proceedings Editor the first week in April. Omnipress will again print the Proceedings. Cost of printing will be similar to last year but cost is dependent upon page length. The Proceedings will be somewhat larger than last year since the number of papers is larger.

*Web Site Report* – Joan Campbell: We are hiring a new web designer and web host. We have not been billed for the last two years. Three bids have been returned; $1700, $10,000 plus hosting fee, and $28,000. The new site will also host a mode of action of herbicides course.

Discussion: The costs associated with a new web designer may impact how much the WSWS raises dues in the future. Three bids are in so far. Intelsys is the cheapest and very good. The costs are a $1700 one time fee plus $25.00 per month. Mode of action module may not need the $5000 initially asked for.

Nelroy Jackson moved to accept Intelsys as web master, Steve Miller seconded, motion passed unanimously.

**ACTION ITEM**: Joan is to ask Scott Nissen if he still needs the $5000 he initially estimated he would need. Joan will make arrangements to hire Intelsys, and Wanda will pay Intelsys once she receives the invoice.

Nelroy Jackson moved to accept editorial committee report, George Beck seconded, motion passed unanimously.

**Poster Committee**- Brenda Waters (Gil Cook): Marv Butler gave the report. There will be 44 posters displayed on Tuesday and 43 on Wednesday, for a total of 87. This compares to 66 in 2002, 50 in 2000, 51 in 1999, and 56 in 1998. Scott Nissen is shipping 51 the easels and 45 signs to the Sheraton. The easels and signs will be shipped back to Scott Nissen for storage until the 2004 meeting in Colorado Springs. Shipping costs to and from Hawaii will cost approximately $1,110. The local arrangements committee will purchase the foam boards for the poster displays and bring them to the hotel. Jed Colquhoun will assume the chair of the poster committee for 2004. A new committee member needs to be identified to replace Marvin Butler.

Steve Miller moved to accept the report, Gil Cook seconded, the motion passed unanimously.

**ACTION ITEM**: Gil Cook needs to identify a new committee member to the poster committee.

**Student Paper Judging Committee**- Kassim Al-Khatib (Gil Cook): There are 26 graduate student papers and 18 graduate student posters entered in the contests at the 2003 WSWS meeting. There are two sections in each of the paper and poster contest. There are 20 judges line up for the contest with five judges per section. First and second place winners for each section of the poster contest will be selected whereas first, second and third place winners will be selected for each section of the paper contest.

RECOMMENDATION FOR BOARD ACTION:

Since the submission process for the WSWS has gone to web based, the instruction of copies of student paper abstracts to be sent to the student paper chair has been dropped from the call for papers. We have obtained copies of the abstract from the proceeding editor in third week of February. The student paper judging committee would like the WSWS board to consider adding a provision to the operating guide indicating how the chair of this committee should obtain student abstract in the future.

I have been informed by Marty Williams that he is going to resign from the vice chair of this committee because he accepted a new position with USDA/ARS in Illinois. The committee would request that the board sign a new vice chair for this position. If no vice chair identified for next year, I will be glad to serve as a second year chair until a person is identified.

BUDGET NEEDS

Contest needs for 1st and 2nd place in each poster section and 1st, 2nd, and 3rd are $800 ($100 for 1st place, $75 for the 2nd, and $50 for 3rd place in each section).

Discussion: The Chair needs copies of submitted abstracts. Students need to know how they are going to be evaluated; several students sent in a title but not an abstract. Acknowledge receipt of title and abstract submission and send evaluation form to student after receiving title submission. Needs student address too in order to send them the evaluation form. A new committee member (vice chair) is needed. Kassim is willing to serve as Chair for one more year.

Bill McCloskey moved to accept the report, Nelroy Jackson seconded, the motion passed unanimously.

**Public Relations Committee**- Kai Umeda (Bill McCloskey): A press release dated February 19, 2002 announced the 56th Annual Meeting of the WSWS and distributed by e-mail to: WSSA Newsletter, American Society for Horticultural Science, American Society of Agronomy, Farm Press, Meister Publishing, Yuma Daily Sun, Columbia Publishing/Carrot Country, Potato Country/Onion World, and Farm Progress Publishing.
Continuing education hour requests for various state licensing requirements for attendees were submitted. Certified Crop Advisor (CCA) certification was applied for this year and CEU's for subjects were granted. The committee requested from the local arrangements chair that a CEU sign-in area be located near the registration desk. Phil Banks and Kai will photograph officers and award recipients.

Nelroy Jackson suggested to explore additional organizations for advertising of the annual meeting.

Nelroy Jackson moved to accept the report, Gil Cook seconded, the motion passed unanimously.

**Education Committee-** (Bill McCloskey):

*Herbicide mode of action modules*- Scott Nissen: **Overview:** This project started with a grant from the American Distance Education Consortium for the purpose of developing Internet based lessons and animations dealing with how herbicides work and ultimately why understanding herbicide mode of action is a critical part of herbicide resistant weed management. Several universities are working together on this project and these include the following: University of Nebraska-Lincoln (PI), Colorado State University, New Mexico State University, and Oregon State University. A second grant was submitted to ADEC in 2002, but was not funded. The objective of the current project is to complete 10 lessons dealing with herbicide absorption, translocation and metabolism, mode of action, resistance management and basic weed ecology. These will be stand-alone lessons with animations that illustrate major concepts. The goal is to provide lessons and animations that can be

used for under graduate and graduate classroom teaching and extension outreach programs. For the more formal learning situations online quizzes are available to evaluate student progress.

**Current Status:** The ten lessons are in various stages of completion, with a goal of completing all lessons (text and animation) by May 2003. The proposal submitted to the WSWS Board of Directors at the 2001 summer meeting involve having the WSWS provide $5,000 to support the hosting and maintenance of these lessons as a mirrored site to the UNL Crop Technology website. UNL's distance education specialists would assist in setting up the mirrored site for WSWS and allow WSWS to have access to other related online lessons that are closely related to Weed Science. The WSWS website would have a suite of lessons that would attract visitors, increase WSWS visibility, and meet our constitutional mandate as an educational organization. Due to issues related the societies current web-hosting arrangement no progress has been made in establishing the mirrored WSWS site.

**Recommendation for Future Action:** It is my firm conviction that this is an excellent opportunity for the WSWS at minimal cost. I recommend that WSWS honor the commitment made to this project at the 2001 meeting. Joan Campbell and I have spoken several times about plans to find a new web-hosting arrangement and once that process is completed, establishing the mirrored site will be relatively easy. UNL made significant improvements in their website that will assist in making the transfer to the WSWS site. The funds allocated are needed to cover the cost of transferring the database and providing for more bandwidth.

**ACTION ITEM**: Scott Nissen should reevaluate and clarify what the costs will be in light of our new web manager.

*Noxious weed shortcourse* - Celestine Duncan: The Noxious Weed Short Course sponsored by the WSWS will held at the Sylvan Dale Guest Ranch in Loveland, CO, April 14 through 17, 2003. We are only offering one session this year because of conflicts with instructor schedules. Currently the course is filled (38 people) with 15 people on a wait list. Participants include USFS, BLM, Fish and Wildlife Service, Dept. of Transportation, and County Weed District superintendents. Instructors include: Dr. Rod Lym, Dr. Joe DiTomaso, Dr. Steve Dewey, Dr. Scott Nissen, Dr. George Beck, Rita Beard, Jim Sebastian, Cindy Lair, and Celestine Duncan representing the Western Society of Weed Science. Tom McClure (USFS) will help with the course. Current weed short course budget is: $24,328.98 with additional revenue that needs to be paid for advance registration.

George Beck moved to accept both reports, Gil Cook seconded, the motion passed unanimously.

**Student Night Out (ad hoc Committee)** – Steve Dewey (Lisa Boggs): At the WSWS Board Meeting held on March 14, 2002, it was decided to initiate a WSWS-coordinated "Student Night Out" at the 2003 annual meetings in Hawaii. On this evening interested WSWS members could volunteer to take 1 to 4 graduate students out for a relaxed evening of dinner and conversation. The primary purpose of this evening would be to help students learn more about WSWS and its members, and to help them feel more a part of the society. It also could provide a unique opportunity for WSWS leaders to better understand the perspectives and needs of our students

In May, President Schroeder appointed an ad hoc committee consisting of myself, Lisa Boggs, Jeff Tichota, and Ruth Hufbauer to further develop and implement the idea. Lisa placed information about the program in two issues of the newsletter to encourage the participation of WSWS members. At least 30 students have registered for the annual meeting, and it is anticipated that most of them will sign up for the program. As of March 7 we have 5 hosts committed to take out of total of 9 students.

A sign-up sheet will be placed at the registration desk to match up interested students and hosts. The plan is to allow individual hosts and students to choose between Tuesday and Wednesday evenings. The objective is not to provide an eating/entertainment extravaganza for the students; but rather a relaxed informal small-group dining experience and casual conversation. We estimate that a host and 4 students can have that kind of experience for $100 or less.

If after this year's experiment it is decided to continue the Student Night Out, this committee may recommend that WSWS consider partially or fully subsidizing the event in future years. It is anticipated that the total cost to WSWS normally would not exceed $1500. If, for example, the Society provided a subsidy of $20 per student for up to 50 students, it would cost $1000.

Bill McCloskey moved to accept the report, Bob Parker seconded, the motion passed unanimously.

**Old Business**

Kid's Journey to Understanding Weeds: Request will be coming at summer meeting

Request for reimbursement of CAST representative – Rod Lym: I am requesting that WSWS reimburse travel expenses that the Society's CAST representative incurs while traveling to the semi-annual meetings. In the past, I and previous CAST reps have paid for these expenses from gift and grant money given to our projects. However, as the number of chemical companies has declined so have these "discretionary funds".

While funds have decreased, travel costs continue to increase. For example, travel costs to the March 2003 spring meeting of CAST in Washington D.C. will be approximately $965. The fall meeting is usually less expensive because we do not meet in Washington D.C., a very expensive meeting location, but still averages around $750. CAST will reimburse a Society representative up to $546 per year. Thus, the annual expense to my project to represent WSWS at CAST is approximately, $1150 per year ($965 + $750 minus the $546 from CAST). I am not asking to be reimbursed for the costs to the summer board meeting as I feel that is an obligation to the Society as the CAST rep and of course I would be coming to the annual WSWS meeting regardless.
Bill McCloskey moved to accept request for reimbursement for CAST above that which CAST reimburses for, George Beck seconded, motion past unanimously.

Request for reimbursement of WSSA representative travel – Steve Miller: We are requesting that WSWS reimburse travel expenses for the Society's
Representative to the summer meeting of WSSA. In the past, the WSSA,
usually an academic, has paid for these expenses from gift money given to projects. However, as the number of chemical companies has declined in recent years, so have these "discretionary funds". Travel costs continue to increase.

The WSSA representative is requesting reimbursement to only the WSSA summer board meeting, up to $1000.00.

Stougaard moved to reimburse WSSA representative to attend WSSA summer meeting, Beck seconded, the motion passed unanimously

**New Business**

WSWS Business Breakfast sponsorship: BASF agreed to sponsor this years breakfast and wants the option of first refusal for future meetings.

Bob Parker moved to allow BASF right of first refusal to sponsor the breakfast meeting, Nelroy Jackson seconded, the motion passed unanimously.

Nelroy Jackson moved to adjourn the meeting at 5:30 p.m.

**WESTERN SOCIETY OF WEED SCIENCE**
**56Th BUSINESS MEETING**
March 13, 2003, Sheraton Kauai Resort, Kauai, Hawaii

**Call to Order:** President Jill Schroeder called the 56th business meeting to order at 7:00 a.m.

**Approval of Agenda:** A motion was made to approve the agenda, the motion passed unanimously.

**Minutes:** A motion was made to approve the business meeting minutes from last years meeting at Salt Lake City as published in the 2002 Proceedings. The motion passed unanimously.

**Financial Report**- Wanda Graves: The WSWS finances are in good order. There is $226,000 in our bank account and we are operating within our guidelines. Wanda discussed IRS audit. Essentially we are operating correctly as a nonprofit organization.

**Immediate Past Presidents Report** – Bob Parker: Those individuals that have retired this year were Don Colbert, Paul Ogg, Tom Whitson and Ron Brenchley, Gaylon Goddard, and Bob Norris. Those planning on retiring in the coming year are Dave Cudney, Larry Jefferies, Clyde Elmore and Bob Mullen. These individuals were recognized at Monday's WSWS Members Welcome and Retires Reception.

**Member at Large Report**- Nelroy Jackson: Nelroy briefly discussed the Ad hoc committee to review constitution and by-laws (discussed later by Vanelle Carrithers)

**Program Committee** - Gil Cook: Gil asked the audience if they felt this years meeting was worthwhile. All agreed that this meeting was successful.

**Research Section Report** - George Beck: George discussed the six projects within society. He mentioned that Progress reports will now be sent directly to the Progress Report Editors. This was the second year of utilizing the power point format, and the project chairs are responsible for providing LCD projectors.

**Education and Regulatory Report** - Bill McCloskey: Bill promoted the discussion section on web-based meetings and information dissemination methods to be held that morning.

**Local Arrangements Committee Report** - Phil Motooka: Phil acknowledged the help of all the committee members. Phil reported that 86 individuals attended the invasive plants tour. Expenses were reduced and several people refused reimbursements. The excess funds will be given to Hawaiian Museum of Natural History.

**WSSA Representative Report** - Nelroy Jackson: Nelroy attended both board meetings. WSSA membership and subscriptions continue to decline. They look to the WSWS for direction because our membership is growing. Nonetheless, the society is in good financial condition. The WSSA changed the status of the Director of Scientific Policy to be an employee based on our IRS audit results with Wanda Graves. The 2004 meeting will be held in Kansas City.

**CAST Report-**Rod Lym: Rod discussed that new, one page fact sheets discussing our success stories within weed science were going to be developed. Rod requested the WSWS membership to provided brief descriptions of activities. CAST plans a resistant management workshop at the National IPM meeting. Rod asked for more members to join CAST. The CAST spring board meeting is next week.

COMMITTEE REPORTS

**Awards Committee Report-**Paul Ogg: The Outstanding Weed Scientist - Public Sector Award went to Frank Young and Bill Brewster received the award for "Professional Staff" award for 2003.

**Nominations Committee Report**- Steve Miller: 500 mailings were sent out, but only a meager 123 ballots were returned. Steve was somewhat perturbed by the low voter turnout, admonished the audience, and kindly requested that they become more actively involved in the affairs of the Society. The winners were Phil Stahlman, president-elect; Pete Forster, secretary; Drew Lyon, research chair-elect; and Charlie Hicks, education and regulatory chair-elect.

**Fellow and Honorary Members Report**– Bob Parker for Frank Young: Carol Mallory-Smith and Vanelle Carrithers were elected Fellows of the WSWS. Roy Nishimoto was elected as the 2003 Honorary Member. Bob mentioned that the nomination packets due date has been changed to December 1. Bob reiterated Steve Millers request for the membership to become more actively involved and to submit more nominations.

**Sustaining Membership Committee Report** – Steve Eskelsen: Steve reported that $4800 had been acquired this year and then listed the contributing members.

**Finance Committee Report** - Drew Lyon: Drew indicated that while the stock funds were losing money, that the Societies investment strategy was working according to the prescribed guidelines. The committee met with Wanda Graves, reviewed her records, and deemed that they were in order.

**Site Selection Committee Report** - Jesse Richardson: Jesse indicated that the 2006 meeting location will be in Reno, NV provided that a local arrangements person can be identified. Jesse also mentioned that he continues to develop a comprehensive checklist for the Operating Guide in order to better work with hotels.

**Necrology Committee Report** - Dennis Tonks: Three members passed away this year, Don Burgoyne, Barb Mullin, and Jim McHenry. Barb Mullin and Jim McHenry's obituaries were read. (Text is located at end of Proceedings.)

**Herbicide Resistance Committee Report** - Phil Banks for Randy Anderson: The committee had a poster presented in this years meeting, and may put together one page fact sheets discussing various aspects of resistance.

**Student Enhancement Committee Report** - Steve Fennimore for Ted Warfield: Five students have applied so far and the committee is in the process of setting up the arrangements. A smaller industry base, time, liability and expenses are all issues which may restrict the functioning of this activity in the future. The committee will try online discussions to come up with recommendations.

**Legislative Committee Report** - Jeff Koscelny for Roy Reichenbach: The committee is working with Rob Hedberg on several issues. Rob Hedberg then discussed that he is working with other organizations on several issues. Rob mentioned that he received funds to bring in Kai Umeda in on sabbatical. There is a great deal of interest in invasive weeds. Rob continues to work on regulatory issues, invasive plants, and is trying to initiate the development of a federal description for weed scientists.

**Publication Committee Report** - Tom Whitson: Tom reported that 12,000 additional copies were printed this year. This is the 10th time it's been published. A portion of the funds will be used funds to subsidize graduate students at this meeting. Tom mentioned that Biological Control of Weeds of the West is paid for by the CIWM but that the WSWS gets the profits.

**Placement Committee Report** - Curtis Thompson: Curtis indicated that there is a low utilization of these services and that the continued presence of this service may be in jeopardy. He requested more students to submit resumes. The committee placed the books near registration desk this year, and the committee is waiting for feedback from society regarding this change. He mentioned that the committee could serve as an outside reviewer of resumes. He also suggested that more undergraduates become involved in the WSWS. The committee will survey students and new faculty as to whether they used the services of this committee.

**Editorial Committee Report** - Joan Campbell: The Newsletter was published four times this year. Contact Don Morishita with information to be included. The Research Progress Report will be indexed herbicides by trade names and common names in the future and the reports will now be sent directly to the editors. Joan requested that reports from the discussion sessions, awards, and committee reports be sent to her shortly after the meeting so that this information can be included in the Proceedings. Joan also mentioned that the committee is attempting to locate a new web designer.

**Poster Committee Report** - Jed Colquhoun: There were a record number of 88 posters vs 60 from last year. This necessitated that the posters be presented in two different sessions.

**Public Relations Committee Report** - Kai Umeda: Kai reported that CE units from several states were available. CCA credits were also obtained.

**Education Committee Report** -

Scott Nissen: The completion of the herbicide mode of action modules were under a deadline due to grant funding running out. The transfer to the WSWS web site has been held up.

Bill McCloskey for Celestine Duncan: The short course is still well received and will be held in Colorado this year. FS, BLM, and other agencies are the primary audience.

**Student Paper Judging Committee Report** - Kassim Al-Khatib: There were 18 posters and 26 papers presented in the student contest. Kassim acknowledged all students and the judges who participated. The winners from the 2003 student paper/poster contest were:

Poster session 1

1. Amber Vallotton, NMSU. African rue seedling response to herbicides applied under drought stress.
2. Erick Dvorak, NDSU. Investigation of the mucilaginous coating on lanceleaf sage seed.

Poster session 2

1. Doug Shoup, KSU. Control of protox-resistant common waterhemp in corn and soybean.
2. Mark Lubbers, KSU. Fluroxypyr efficacy as affected by relative humidity and soil moisture.

Paper session 1

1. Lynn Fandrich, OSU. Germination response of winter and spring jointed goatgrass (Aegilops cylindrical) cohorts.
2. Travis Osmond, USU. Effects of herbicides, burning, and reseeding of desirable forages for medusahead control.
3. Doug Shoup, KSU. Mechanism of common waterhemp resistance to protoporphyrinogen oxidase (Protox)-inhibiting herbicides.

Paper session 2

1. Mark Lubbers, KSU. Kochia control and grain sorghum response to fluroxypyr-based treatments.
2. Laurie Janzen, NDSU. Biological control of purple loosestrife (*Lythrum salicaria*) with *Galerucella* spp.
3. Andrew Kniss, NE. Glyphosate-tolerant sugarbeet: Weed control, economics, and environmental impacts.

**Student Night Out Committee Report** - Steve Dewey: A total of 31 students signed up and 20 hosts volunteered. Steve acknowledged the guests and hosts who participated.

**Old Business**: None

**New Business:**

Proposed change to the constitution to accept the province of British Columbia as a new member: Dan Ball moved to accept the motion, Bill McCloskey seconded, the motion passed unanimously.

Changes to constitution and by-laws - Vanelle Carrithers: Vanelle discussed the minor and major changes to take place. Vanelle moved to accept the changes, Nelroy Jackson seconded, the motion passed with one dissenting vote.

Jill Schroeder appointed Steve Miller as the first Constitution and by-laws representative on the Board of Directors.

Jill Schroeder passed the gavel to Gil Cook as the next president of WSWS.

Gil's first duty was to give Jill a plaque recognizing her efforts. Gil then acknowledged Wanda Graves and Joan Campbell for their efforts. Gil announced that Rod Lym would continue as the WSWS CAST representative. Gil then acknowledged Industries support for all of the meeting functions.

Gil adjourned the meeting at 8:35 a.m.

Respectively submitted,
Bob Stougaard

**WESTERN SOCIETY OF WEED SCIENCE**
**BOARD OF DIRECTORS MEETING**
**March 13, 2003, Sheraton Kauai Resort, Kauai, Hawaii**

Attendees: Gil Cook, Lisa Boggs, Dan Ball, Bob Stougaard, Steve Miller, Jesse Richardson, Phil Motooka, Phil Stahlman, Jill Schroeder, Drew Lyon, Phil Munger, George Beck, Rob Hedberg, Nelroy Jackson, Charlie Hicks, Scott Nissen, Rod Lym, Steve Dewey, Wanda Graves, Bill McCloskey, Monte Anderson and Pete Forster.

Call to order: President Gil Cook called the meeting to order at 11:50 a.m.

New business:

**Summer Executive Board Meeting:**
Set date and location for Summer Executive Board Meeting: Aug 1-2, 2003 at the Red Lion Inn, in Colorado Springs.
Suggested that meeting start at noon on the 1st and end at noon on the 2nd if possible.
It was suggested that we keep this meeting brief and not make committee reports that don't require any action by the board This will also allow for more time for the program and broader issues facing the WSWS.
**Action Item**: Scott Nissen will make arrangements with the Red Lion for sleeping accommodations and meeting rooms.

Review of 56th Annual Meeting:
(Comments from the board)
Registered 348 – (down about 50 from previous 2 years)
Staff did an excellent job and addressed any problems in a timely manner.
Cost was an issue for some and caused some not to be able to attend.
Quality of the papers presented was excellent.
Question raised about students winning poster and paper contests (should it be restricted to one or the other?). (**Action Item:** Recommendation to be made by Student Judging Committee)
Poster session room needs to be bigger in order to accommodate an increase in the number of posters.
Concern about the time gap on Wed that was needed for the lunch set-up.
More time needs to be allotted for some of the discussions.
Would it be better to change set-up so the speaker has control of the computer during the presentations?
Allow only student papers during the student paper sessions. (**Action Item**: To be addressed by Student Paper Committee).
Limit the number of meetings in Hawaii (does not allow some groups to attend).
Student night out was a success.
There were a few communication issues with the hotel but all were resolved.

**Operation Guides**: need to be reviewed and revised as needed.
**Action Item**: Committee Chairs need to review and revise the guides. Steve Miller and Jill Schroeder will assist in the process.

**Finance Committee** (Phil Munger): brought up potential issue related to dealing with having an employee (job description, merit increases, insurance, retirement benefits…). These are things that will need to be evaluated over the next year and addressed if necessary. Jill Schroeder stated that we do not want there to be any negative financial impact on Wanda due to these changes.
Nelroy Jackson moved that the society pay the employer's portion of the FICA and any other additional expenses and treat them as a pay increase, Jill Schroeder seconded. Motion passed unanimously.

**Site Selection Committee** (Jesse Richardson): Local arrangements committee members have been identified for the 2006 meeting to be held in Reno. (Tim Tripp and Tom Lanini)
Jill Schroeder moved to choose John Ascuaga's Nugget for the location for the 2006 annual meeting, seconded by Phil Stahlman. Motion passed unanimously.

**IRS Audit**: Jill Schroeder will continue to work with Wanda to see that all issues associated with the IRS audit are addressed.

**Program Committee**: Phil Stahlman asked that any program suggestions be passed on to the Program Committee Chair.

**Student Night Out (ad hoc Committee)**: Steve Dewey expressed thanks for the support of the Graduate Student Night Out.

**Board Member Responsibilities:**
**Action Item**: Gil Cook will clarify board member responsibilities and send a list to each board member.
Bill McCloskey suggested that responsibilities be posted, by position, on the website. Suggested having a link set up, so when you click on a committee, the responsibilities and description pop up.

**Finance Committee** (Phil Munger): Our investment counsellor suggested we become more conservative in how we have the WSWS funds invested.
**Action Item**: The board needs to have a specific recommendation from the finance committee to act. No action will be taken until there is a recommendation from the committee.

Nelroy Jackson moved that the meeting be adjourned at 1:00 p.m., seconded by Dan Ball.

**WESTERN SOCIETY OF WEED SCIENCE**
**FINANCIAL STATEMENT**
**APRIL 1, 2002 THROUGH MARCH 31, 2003**

**CAPITAL**

| | |
|---|---|
| 2001-2002 Balance Brought Forward | $334,615.65 |
| Current Income or (Loss) | (137,323.54) |
| | **$197,292.11** |

**DISTRIBUTION OF CAPITAL**

| | |
|---|---|
| Merrill Lynch Funds | $186,111.57 |
| Money Market Savings (Newark) | 3,769.75 |
| Checking (Newark) | 7,410.79 |
| | **$197,292.11** |

**WSWS Financial Statement – 4/1/02 – 3/31/03**

**INCOME**

| | |
|---|---|
| Registration & Membership Dues | $ 22,335.00 |
| 2002 Proceedings | 5,409.45 |
| 2002 Research Progress Reports | 3,092.75 |
| Noxious Weed Short Course | 13,500.00 |
| Weeds of the West Book | 65,178.51 |
| CAST Referral Program | 225.00 |
| 2003 Sustaining Membership Dues | 4,400.00 |
| Bank Account Interest Earned | 389.79 |
| ML Investments Gains or (Losses) | (49,254.42) |
| Contribution – Annual Conference Refreshement Breaks | 3,000.00 |
| **Current Income or (Loss)** | **$ 68,276.08** |

| **EXPENSES** | |
|---|---|
| Office Supplies & Equipment | $ 3,072.49 |
| Telephone, Internet | 1,738.93 |
| Postage, Mailing Permits, Box Rental | 3,037.21 |
| Business Record Storage | 684.00 |
| WSSA Director of Policy (2003) | 7,300.00 |
| CAST Membership Dues (2003) | 556.00 |
| Noxious Weed Short Course | 23,214.48 |
| Weeds of the West Book | 119,047.10 |
| Knapweed Symposium Proceeding Printing | 301.95 |
| Website | 1,125.00 |
| Tax Accountant | 225.00 |
| Franchise Tax Board Filing Fee | 10.00 |
| Secretary of State Semi-Annual Filing Fee | 20.00 |
| Federal Taxes | 274.94 |
| Printing | |
| Newsletters | 1,181.22 |
| Stationary, Printed Envelopes, Signs | 442.70 |
| Proceedings | 2,555.00 |
| Research Progress Reports | 2,983.00 |
| *Programs* | 1199.30 |
| WSWS Logo Golf Balls – Member Retirees | 230.04 |
| Annual Conference Guest Speakers | 1,820.40 |
| Refund – Registration Fee | 190.00 |
| Student Awards, Plaques, Room Subsidy | 7,424.41 |
| Member Recognition Award Plaques | 259.75 |
| Proceedings & RPR Editor Expenses | 1,113.18 |
| Business Manager Salary | 12,000.00 |
| Executive Board & Committee Meetings | 2,883.07 |
| Annual Conference Refreshment Breaks | 2,863.44 |
| Audio Visual Rental | $1,697.44 |
| Barbra Mullin Memorial Fund | 250.00 |
| Annual Awards Luncheon | 5,899.57 |
| **Total Expenses** | **$205,599.62** |

**2003 HONORARY MEMBER AWARD**
**Dr. Roy Nishimoto**

Dr. Roy Nishimoto is currently Professor of Horticulture in the newly organized Department of Plant and Environmental Protection Sciences, College of Tropical Agriculture and Human Resources, University of Hawaii at Manoa. Roy received his B.S. and M.S. degrees form Oregon State University and his Ph.D. degree form Purdue University, all in the weed science major. Immediately upon completion of his Ph.D. program in 1970 he joined the University of Hawaii where he has since taught weed science and done research and extension in horticulture and weed science.

Roy has conducted applied research in tropical crops and orchards (and is considered an international expert on these crops), and on turf weeds. For much of his career, Roy was the only weed scientist on the faculty and thus was called upon to solve weed problems in all crops, orchards, and turf; in research and extension. He has won several major competitive grants and a number of awards for achievement. He has published extensively, and his papers are frequently cited. He has guided 13 MS students and 7 Ph.D. Students.

Dr. Nishimoto has also been active on the international scene. He has been active in the Asian-Pacific Weed Science Society, serving as an officer for several of the crucial early years for that organization, and has conducted several short courses in Indonesia, the Philippines, Singapore, and the Pacific. He is also a member of the International Weed Science Society. Domestically he is a member of the American Society for Horticultural Science (Fellow) and the Weed Science Society of America where he currently serves on the International Committee.

At the University of Hawaii, Roy was a long time chairman of the Department of Horticulture and at various times acting Extension Director, acting Associate Dean, and acting Dean. In time of need the college always turned to Roy. The college is sadder for the fact that Roy has consistently refused permanent posting in college administration preferring active scholarly duties instead.

Roy is an outstanding teacher, scientist, administrator, Extension educator, and above all, person. He has spent his professional career helping and serving students, growers, and organizations in Hawaii and the entire Asian-Pacific region. He has received numerous awards, citations, and invitations for his work. He continues to look for new ways to serve the people of Hawaii.


Dr. Roy Nishimoto

## 2003 FELLOW AWARD
### Vanelle Carrithers

Vanelle Carrithers is an eighteen-year employee of Dow Agro Sciences. She received her B.S. degree in Plant Protection from the University of Idaho and her M.S. degree in Entomology from Washington State University.

Vanelle is a Technical Service and Development Specialist and Development Biologist with Dow. In this capacity she has conducted research across a wide geography, from Hawaii to the Pacific Northwest and through the High Plain states. Demonstrating field research expertise with herbicides, tree growth regulators and insecticides she has attained a high level of technical and business knowledge in diverse markets including industrial vegetation management, forestry, range and pasture, noxious/invasive weeds, cereals, potatoes, and tree fruits. Even though these responsibilities place a high demand on her time and energy, Vanelle has unselfishly leveraged this experience and expertise to achieve significant accomplishments in numerous professional societies including the WSWS.

Vanelle has been a member of WSWS since 1985. She is a member of 11 professional societies as well as serving on the Board of Directors of the Center for Invasive Plant Management and as a part of the Washington State Commission on Purple Loosestrife. She belongs to two honor societies and has served on various committees and as a part of the leadership team for several societies. She is always willing to take leadership responsibilities when asked and is always very thorough at the tasks that she volunteers for.

For the WSWS, Vanelle has served as Chair of the Regulatory Committee and Member At Large. She has been Project Chair for both Project 5, Weeds of Aquatic, Industrial and Non-Crop Areas, and Project 6, Undesirable Woody Plants. These sessions, especially the discussion groups, were praised by other members as one of the most valuable and insightful held during that year's annual meeting. Vanelle's commitment to the WSWS is illustrated by the committee work she has chaired and the success these projects have enjoyed. Vanelle co-chaired the 1996 Weed Management on Natural Resource/Wildland Areas Symposium which was held in Albuquerque, NM. The symposium was held in conjunction with the Western Weed Coordinating Committee (WWCC) which includes many federal and state land managers. In 1997 Vanelle was asked to lead the Legislative Committee from an Ad Hoc to a Standing Committee. Vanelle sought the input of both present and previous members, then proceeded to quickly accomplish the task, including the revision statements needed for the Constitution and Bylaws. Once finished, she served as the first Chair of this Committee.

In addition to her commitment to serving the Society, Vanelle has presented 10 papers during the annual meeting, and has given numerous presentations at other state and regional weed science meetings. She is actively involved in the California, Idaho, Oregon, and Washington State weed organizations and holds offices in several.
Vanelle always takes a personal interest in University students and serves as a good example of how professionals should interact with other professionals. She has gone out of her way to meet and visit with students and is a model for professionalism, dedication, and work ethic for them.

## 2003 FELLOW AWARD
### Carol Mallory-Smith

Carol Mallory-Smith is currently an Associate Professor at Oregon State University. She received both her B.S. degree (Plant Protection) and her Ph.D. (Plant Science) from the University of Idaho.

Dr. Mallory-Smith has been actively involved in the WSWS for more than a decade. She has served as Chair of the Research Section, Project 3- Weeds of Agronomic Crops, and the Herbicide Resistance Plants Committee (she was one of the original members of this committee). On several occasions, Carol has organized sessions and symposia on current topics associated with herbicide resistant weeds and crops for the annual meeting of the WSWS. She has authored or co-authored many WSWS research progress reports and abstracts. She and her graduate students regularly present papers at the WSWS meetings. Additionally, Carol is active in the Weed Science Society of America and the International Weed Science Society. She has served, or currently serves, on the Board of these two organizations. She was on the Organizing Committee for the 2000 International Weed Science Society meeting in South America.

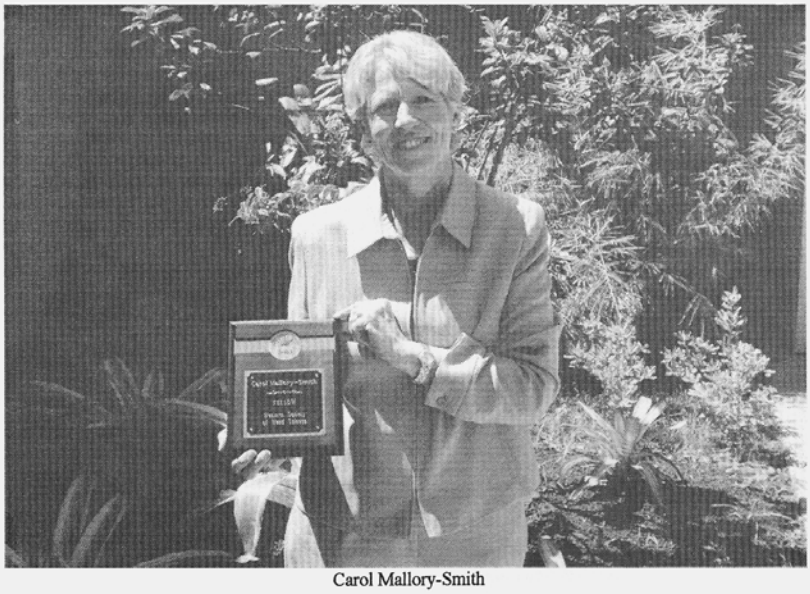
Carol's research program is recognized both nationally and internationally for its contributions to our knowledge base in the areas of herbicide resistance and gene flow from transgenic crops to weeds. Her collaborative work with Dr. Bob Zemetra

(University of Idaho) on the introgression between jointed goatgrass and wheat is particularly noteworthy. Carol's expertise in herbicide resistance has been utilized internationally. She was one of five scientists invited to speak to Brazilian biologists and agricultural professionals at the University of Sao Paulo in Jaboticabal, Brazil in 1996. She also was one of five weed scientists, and the only one from the US, invited to participate in a United Nations FAO sponsored technical committee on herbicide resistant crops in developing countries in Rome, Italy, in 1998. In 1999, Agriculture Western Australia invited her to lecture and consult for 6 weeks on her jointed goatgrass-wheat introgression work.

Regionally, Carol is known for the major contributions she has made to developing weed management systems for cereals, row crops, and grass seed production in Oregon. She has served as major professor for 8 graduate students who have completed their M.S. or Ph.D. degrees and 6 students who are working on their degrees. Carol has authored or co-authored 24 refereed journal articles, 5 book chapters, and 10 Extension and popular press publications. She was chosen as the George R. Hyslop Professor, an endowed professorship, in 1997.

In addition to her research competency, Carol is a very effective teacher. Her philosophy is to provide students with a unique learning experience in each class she teaches and to let students know that there are professors at OSU that value them. She has taught an upper level undergraduate Weed Science course and also teaches the graduate level Herbicide Science course. She has team taught the Orientation/Introduction to Crop and Soil Science course and Case Studies in Cropping Systems. She also has developed and taught numerous weed management short courses throughout Oregon and the Pacific Northwest. Her teaching excellence was recognized in 1997 when she received the Outstanding Teacher Award for the Department of Crop and Soil Science. She was named to the College of Agricultural Sciences Registry of Distinguished Teachers in 1999.

Vanelle Carithers



Carol Mallory-Smith

## FRANK L. YOUNG
## WSWS OUTSTANDING WEED SCIENTIST

Dr. Frank Young is recognized as the Outstanding Weed Scientist in the Western Society of Weed Science. Dr. Young joined the Agricultural Research Service (ARS) in 1981 and has served as Research Agronomist/Weed Scientist in Pullman, WA since that time. Frank is recognized nationally for his research on the biology, ecology, and management of Russian thistle, and for his research program and continued scientific contributions to our knowledge on jointed goatgrass. His jointed goatgrass program is one of the most comprehensive in the nation.

Since 1984, Dr. Young has spear headed long term integrated pest management cropping projects to manage weeds and other pests, reduced soil erosion, and maintain farm profitability in the Palouse Region of the Pacific Northwest. These projects have demonstrated in the dryland PNW that conservation farming practices not only saved soil, water and other natural resources but also were more profitable than conventional farming practices. Frank demonstrated outstanding leadership skills in managing this project that involved 144 - 0.5 acre plots, 14 scientists from eight different disciplines and years of research.

Dr. Young has been very active in the WSWS and the weed science profession, locally and nationally. He is a tireless advocate for weed science and his contributions have been significant. His research and implementation of conservation farming systems which have been more profitable, less risky, and reduce erosion compared to conventional systems has become the norm in the PNW. Frank has embraced new technologies and ideas to ensure that weed science has input in areas that will influence the future of agriculture.

It is with great pleasure to recognize Dr. Frank L. Young, who is extremely deserving to receive the Outstanding Weed Scientist Award from the Western Society of Weed Science.

## BILL BREWSTER
## WSWS PROFESSIONAL STAFF AWARD

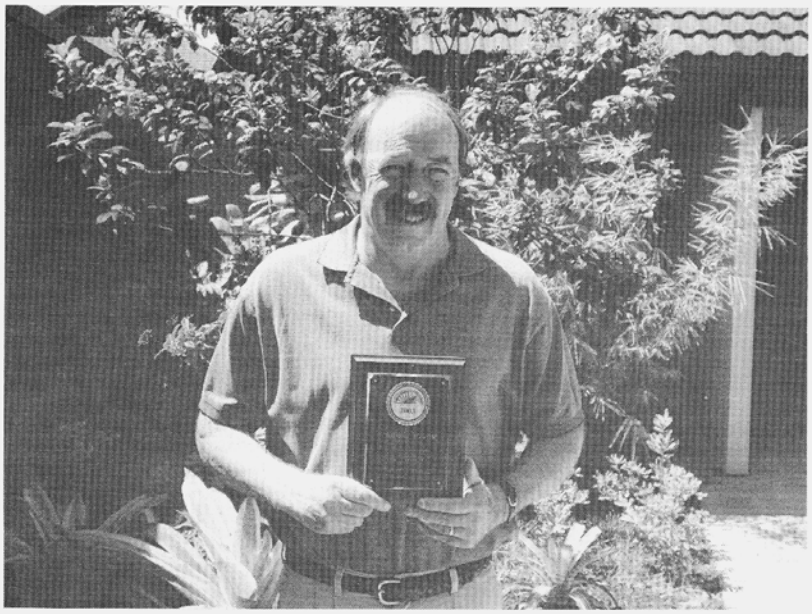
Bill Brewster is recognized to receive the Professional Staff Award in the Western Society of Weed Science. Bill has been the mainstay of the field research program at Oregon State University since 1975. Each year he commonly conducts over 100 field research trials in wheat, grass seed, peppermint and legumes, primarily.

Bill is one of the best field researchers and needs no guidance in conducting sound scientific research trials. His commitment and work ethics are unprecedented and sets a strong example for peers and graduate students. Bill's attention to detail in his research and observations is remarkable.

Bill has been committed to helping growers solve weed problems in Oregon agriculture for years. He organizes and leads field research tours on a regular basis, presents results at grower and commodity meetings, publishes research results in professional proceedings, progress reports, extension publications, and others. He interacts personally with growers, field consultants and fellow researchers. Bill's opinion and research results are held in the highest esteem by his peers and clientele.

Bill has made significant contributions in the WSWS and other organizations. He has presented papers and posters at the annual meeting and authored nearly 150 papers in the WSWS Research Progress Report. Bill was secretary, vice-president and president of the Oregon Society of Weed Science. He has given invited presentations locally, regionally and nationally.

It is with great pleasure to recognize Bill Brewster, who is extremely deserving to receive the Professional Staff Award from the Western Society of Weed Science.



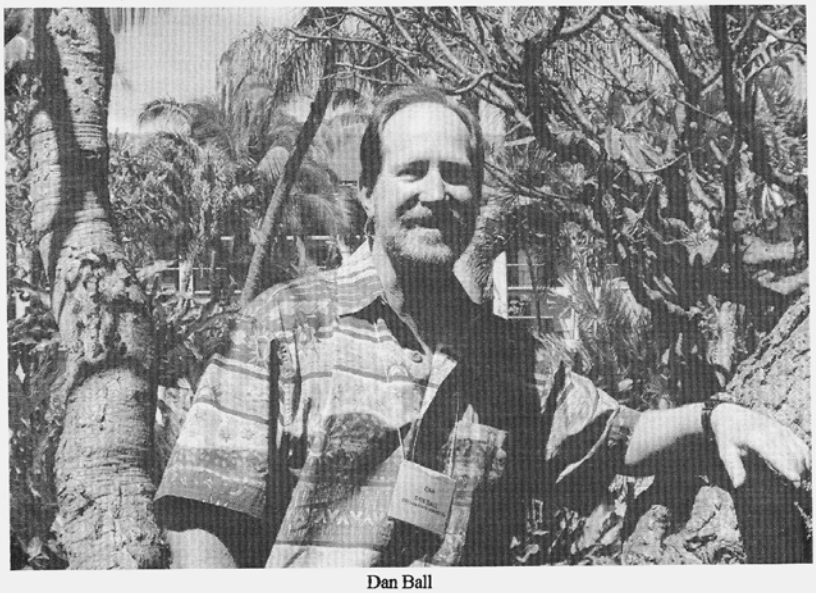
Frank L. Young

Bill Brewster

Nelroy Jackson, Presidential Award of Merit

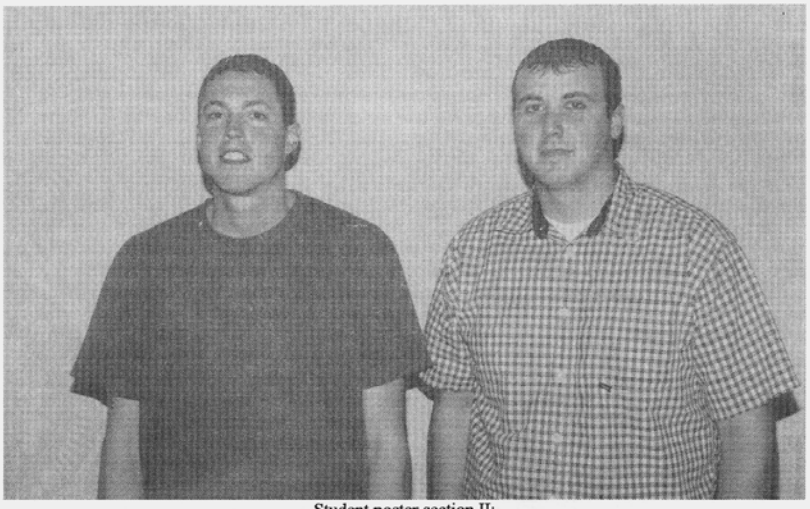
WSWS Incoming president Gil Cook and immediate past president Jill Schroeder

2003-2004 WSWS officers: (L to R) Rod Lym, Nelroy Jackson, Wanda Graves, Phil Stahlman, Gil Cook, Kassim Khatib, Monte Anderson, Pete Forster, Jill Schoeder (not pictured Dan Ball)

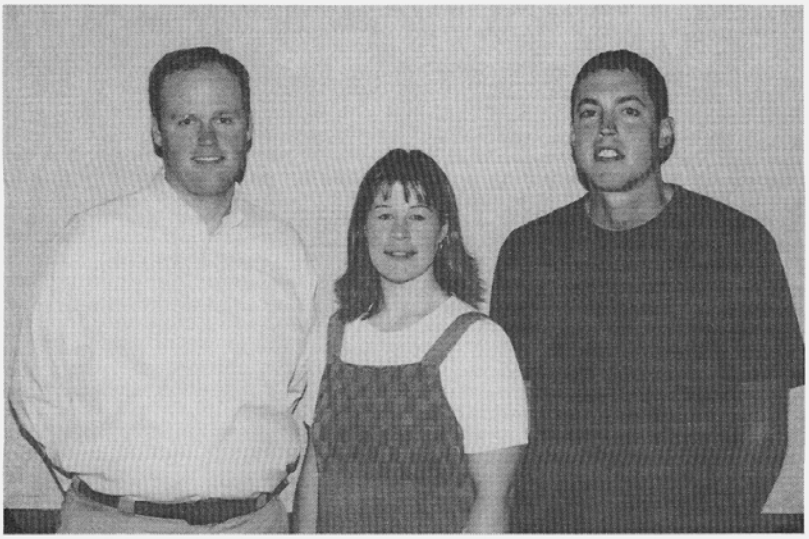


Dan Ball

Student poster section I:
(Left) 1st place, Amber D. Vallotton, New Mexico State Univ.; 2nd place, Eric Dvorak, North Dakota State University



Student poster section II:
(Left) 1st place, Douglas Shoup, Kansas State Univ.; 2nd place, Mark D. Lubbers, Kansas State University



Student oral presentation section I: 1st place, Lynn Fandrich, Oregon State University (middle); 2nd place, Travis Osmond, Utah State University; 3rd place Douglas E. Shoup, Kansas State University

Student oral presentation section II: (from left) 1st place, Mark D. Lubbers, Kansas State University; 2nd place, Laurie A. Janzen, North Dakota State University; 3rd place Andrew R. Kniss, University of Nebraska

## NECROLOGY REPORT

**Barbra Mullin** passed away Aug. 15, 2002, in a Great Falls hospital after a brief illness. Barbra was greatly loved by her family; her many friends and colleagues. Barbra was born and raised in Helena, she graduated from Helena High in 1968 and attended Montana State University where she earned Bachelor of Science degrees in botany and plant protection, as well as a master's degree in plant pathology.

For the past 24½ years, she worked for the Montana Department of Agriculture. Her Most recent position was as weed coordinator. Barbra was an active participant in her family, church, community, and her agricultural field. Some of her active roles included memberships in the First Church of Christ Scientist, Helena; Eastern Star Josephine Hepner Chapter #89; Aquatic Plant Management Association; Montana Weed Control Association, and the Japhet Foundation. Most of us remember Barb best as an active member and leader of the Western Society of Weed Science where she served in many roles and capacities. She served as President of the society from 1997 to 1998, as editor of the Research Progress Report for several years, was very involved in the Weed Management Short Course, and served on many committees.

Barbra was preceded in death by her father and mother. She is survived by her husband of 30 years sister, and aunt, all of Helena. She is also survived by here half-brother, half-sister, as well as many beloved aunts, uncles, cousins and numourous cherished friends. She will by greatly missed.

**W.B. "Jim" McHenry:** Jim McHenry, beloved husband, father and grandfather, died Nov. 8, 2002, at his home, surrounded by his family. He lost a valiant battle with Parkinson's disease and cancer at the age of 79.

Born Aug. 5, 1923, in San Jose to Jessie Storrie and Walter Crebbs McHenry, he graduated from San Rafael Military Academy and completed his U.S. Navy pilot training at the end of World War II. Following WW II, Jim enrolled at Oregon State University, where he earned a degree in botany. After graduating from OSU, he was hired at UC Davis as an Extension Weed Specialist where he worked on Forest and Rangeland weed control for 33 years before retiring in 1991. McHenry received a lifetime achievement award from the Forest Vegetation Management Conference and was a Fellow of the Western Society for Weed Science. He developed weed management techniques that are still in use today.

He was an outdoorsman who loved adventure from a young age. His childhood adoration of the book Swiss Family *Robinson* was no surprise! He enjoyed fishing, hunting and just being outdoors, where he would often pause to identify surrounding flora, wildlife footprints and birds. His cabin at Bucks Lake became a sanctuary in his later life and was central for many family celebrations.

He was passionate about his principles and zealous about being account able for one's actions. For example, his children and grandchildren quickly learned that it was forbidden to pluck any plant from the forest (unless of course it was a weed sample for research!) or even to sit in a University car allowed for his work use only. He put great emphasis on resourcefulness and strongly discouraged the disposal of anything, including motors, wiring, or nuts and bolts, that might be used another day.

He had a great sense of humor which enabled him to take most events in stride, like the time he jumped onto his daughter's horse with so much energy that he flew across its bare back and found himself on the ground on the other side, his only response was to laugh. His enjoyment of humor was also manifested in his aptitude as a prankster whenever the opportunity arose. Although it was many years ago, those who ate the dry dog food he mixed into the Botany department candy bowl will always remember this side of him.

Jim rarely talked about his personal accomplishments, but these would certainly include qualifying for carrier landings as a US Navy pilot and his work in Weed Science. Although he was never one to celebrate his own achievements, during his retirement years it gave him great pleasure to watch 49ers football games and to cheer openly and loudly when they won.

One bright beam of light in his life that he was always inclined to talk about was his family: his wife Lillian, his two daughters, his two sons-in-law, who he truly regarded as sons, and his five grandchildren, of all whom he was in awe. He lived his life with great capacity for his family and would rise to any occasion to teach, support or debate. He was especially compassionate, kind and caring with children, particularly those in need. His loving, humorous and unbreakable spirit will always be remembered by those who knew him, none of whom would be surprised to know that, even in the final days of his life, he relished the words: you can't keep a good Scotsman down.

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