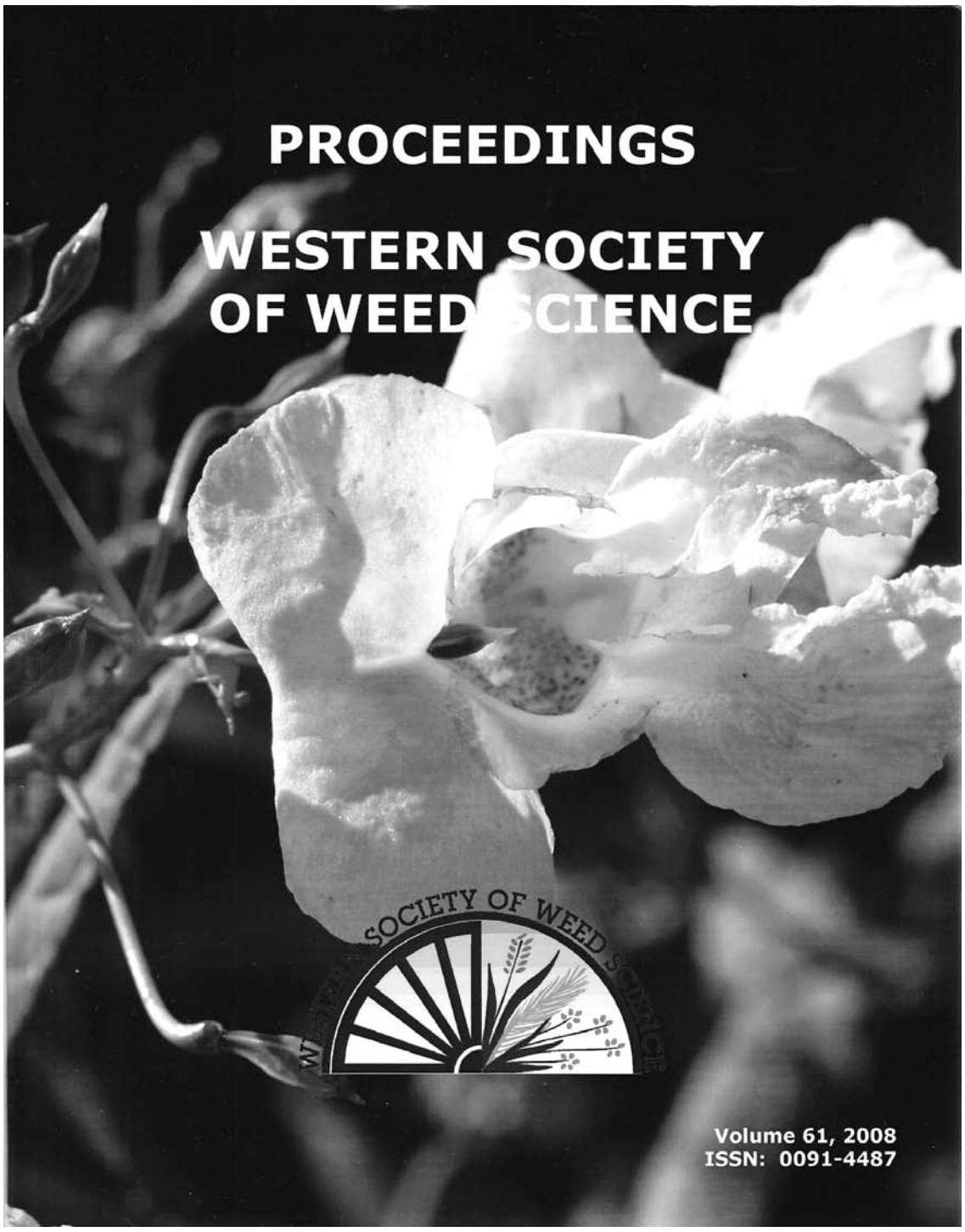
PROCEEDINGS
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2008

PROCEEDINGS

OF

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VOLUME 61

PAPERS PRESENTED AT THE ANNUAL MEETING

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HYATT REGENCY ORANGE COUNTY

ANAHEIM/GARDEN GROVE, CALIFORNIA

PREFACE

The Proceedings contain the written summary of the papers presented at the 2008 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. Authors and keywords are indexed separately. Index entries are published as received from the authors.

Copies of this volume are available at $20.00 per copy from WSWS Business Manager, 205 W. Boutz, Bldg. 4, Ste 5,Las Cruces, NM 88005.

Cover photograph, Policeman's helmet or Himalayan balsam (*Impatiens glandulifera*) by Tim Prather. Policeman's helmet has been traded among garden clubs in the United States for its attractive flower. Policeman's helmet becomes a problem in riparian areas where it can become the dominant stream-side vegetation. It grows to 2.5 m, in stands from 30 to 50 plants, can produce 1,600 seeds/m^2 and has a seed life less than 5 years. In the Czech Republic it currently infests nearly 60% of large river systems. It has reduced species diversity by 25% in riparian areas in one study and become dominant but not affecting diversity in another. It also has been implicated in reduction of rare native plants that are pollinated by long-tongued bumblebees; it seems the bumblebees prefer the nectar of Policeman's helmet to nectar of native species. It is listed as a noxious weed in Washington and Idaho.

Proceedings Co-Editors: Joan Campbell and Traci Rauch

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GENERAL SESSION

WSWS PRESIDENTAL ADDRESS: PERSONAL REFLECTIONS ON A CAREER IN WEED SCIENCE. LOOKING BACK, WHILE WALKING FORWARD. Ron P. Crockett, Vancouver, WA.

President Ron P. Crockett highlights his career in weed science. He discusses his involvement with projects requiring specialized herbicide application equipment such as the No-Mix, EZ-Ject stem injection, and development of the JK injection tool. He discusses development of glyphosate products and the impact that glyphosate and the tools of biotechnology have had on agriculture. Challenges in aquatic plant management are discussed, including examples of challenges working in estuaries, and the difficulties of making progress against aquatic weeds on public lands. A brief discussion of weed resistance is presented, and a challenge to members is given to mentor younger weed scientists and proactively work to open new horizons for upcoming generations of weed scientists. [55]

EXOTIC MARINE PLANTS: A NEW INVASIVE PEST CONCERN. Lars W.J. Anderson, USDA-ARS Exotic and Invasive Weed Research, Davis, CA.

Aquatic weed researchers and managers are concerned primarily with controlling unwanted, non-native freshwater plants in lakes, reservoirs, ponds and irrigation systems. However, relatively recent introductions of exotic marine algae ("seaweeds" or "kelp") and even marine flowering plants such as Japanese eelgrass (Zostera japonica) in California coastal habitats have ushered in new kind of "weed" problem. For example, see: Graig Johnson (ed.) 2007 "Seaweed Invasions/ A synthesis of Ecological, Economic and Legal Imperatives", Botanica Marina vol 50. Most of these invasive algae and plant species are "habitat engineers": they drastically change the physical conditions in the intertidal zones and near-shore waters. Although some progress is being made on reducing the pathways of introductions, more are certain to come. Unfortunatlely, there are few tools in the box to contain and control these species once they have become established. This is one reason the brown alga Undaria pinnatifida has continued to spread off the California coast-including Catalina Island- over the past decade. The successful eradication of Caulerpa taxifolia in southern California between 2000 and 2006 (at a cost of $$7million!) suggests that management is possible using physical and chemical approaches. But at this time, no algaecides or aquatic herbicides are registered for marine uses (except anti-fouling paints and coatings for boat bottoms). These maritime invaders can affect fish production, fish habitats, oyster and other shellfish production, species diversity, food-web functions and even recreational and commercial vessel activity. A workshop is planned for 2008 to bring together experienced aquatic weed (freshwater) scientists and managers with marine phycologists and ecologists to review existing methods that have "technology-transfer" potential, and to identify high-priority research needed. The similarities between freshwater angiosperms and invasive seaweeds in their, growth form (e.g. canopy structure), dispersal mechanisms, light response, carbon usage, and habitats (moving water) suggests that the full gamut management methods (physical, chemical, possibly biological) could be developed. [57]

PREVENTING INVASIVE SPECIES TRANSPORT ON BOATS KEPT IN SALTWATER. Leigh Taylor Johnson, Marine Advisor, University of California, San Diego.

Marine fouling species colonize vessel hulls, where they create friction, increase fuel consumption and reduce speed. Commercial ships carry aquatic invasive species (AIS) among ports, where they colonize small craft that carry them along the coast. Races, fishing tournaments and coastal cruising increase risks that boats will exchange and carry AIS to new locations. California boats travel thousands of miles among Northern California, Sacramento-San Joaquin Delta tributaries, San Francisco Bay, Central and Southern California and Baja California, Mexico. Mexico's streamlined customs policy and planned expansion of Baja California marinas will increase binational boat traffic and AIS transport risks. Traditional, marine antifouling paints leach heavy metal to discourage attachment of spores and larvae. Heavy metals have

accumulated in coastal boat basins, where water is poorly flushed and boats spend much time at the dock. New, California water quality programs require reductions in heavy metal emissions, making boat owners more reliant on in-water hull cleaning, slip liners and dry storage to control fouling and reduce AIS risks. Boats kept in saltwater are large and expensive to haul from the water for cleaning, so programs to control pests on trailered boats are not economically feasible. Instead, boat owners need to clean boat hulls before departing on and returning from a trip to another area. Boat owners, boating businesses, agencies and policy makers will need to collaborate to construct environmentally, economically, technically and socially sustainable policies. UC Sea Grant Extension Program is conducting technical, economic and policy research and outreach to assist them. [58]

POSTER SESSION

RANGE RENOVATION: MULTI-YEAR WEED MANAGEMENT. Michael T. Edwards *, DuPont Crop Protection, Wilmington, DE.

In 2005 - 2007 field trials were conducted north of Cheyenne, WY to renovate a rangeland site with native grass species common in the high plains. Rimsulfuron applied in the fall or spring when applied at 2-4 oz/ac will control downy brome and if germination is high, control will last into year 2. Grass growth is significantly increased when downy brome is controlled. The addition of a residual kochia material to Rimsulfuron controlled both downy brome and kochia and increased grass cover 50% at 12 months after application. For the highest level of positive grass response, both kochia and downy brome need to be controlled (75% cover after 2 years). Grass response appears to be influenced more by kochia control than downy brome control (55 % cover vs 40% cover respectively). [1]

INTERSPECIFIC INTERACTIONS BETWEEN BLACK HENBANE AND THREE NATIVE GRASSES. Jordana LaFantasie* and Stephen Enloe, University of Wyoming, Laramie.

Black henbane is a poisonous, invasive plant in the family Solanaceae that is typically associated with disturbed situations such as pipelines, roadsides and mammalian burrows. Recent field research has determined that black henbane is unable to invade established rangeland plant communities, but can be successful following removal of native competitors. We conducted a greenhouse study to determine growth of black henbane grown alone and in combination with three common Northern Mixed Prairie grass species. Species utilized were Western wheatgrass (Pascopyrum smithii (Rydb.) A. Love), Idaho fescue (Festuca idahoensis Elmer) and Sandberg bluegrass (Poa secunda J. Presl). We examined both mature plants and seedling grass plants for their ability to grow in the presence or absence of black henbane. Mature grasses grown alone and in combination with black henbane did not differ in tiller numbers, basal area or biomass. Henbane growth was significantly higher among plants grown without a mature grass pot companion. Rosette diameter and biomass of henbane were less when grown with grass seedlings. Idaho fescue seedlings were not negatively impacted by henbane seedling presence. Tiller number or biomass were reduced in Western wheatgrass and Sandberg bluegrass when grown with black henbane seedlings. Although black henbane is not well suited to invasion of mature grass stands, with disturbance black henbane is able to compete with newly emerging native grasses, depending on species. Restoration seeding of rangelands in the presence of black henbane requires that grass species are carefully selected based on site characteristics and their competitive ability. [2]

AN ETHYLATED SEED OIL ADJUVANT FOR USE IN INVASIVE WEED CONTROL PROGRAMS. Philip Westra, Colorado State University, Fort Collins, CO and William Bagley, Wilbur-Ellis, San Antonio, TX.

A strong and expanding interest in invasive weed management in riparian areas of the west has herbicide companies actively pursuing the use of old and new chemistry for control of these invasive weeds.

Frequently these invasive plants are perennials, trees, or shrubs that can be hard to control unless the proper adjuvant systems are used with the herbicides. A critical factor in adjuvant selection is whether or not they are labeled for use in riparian areas next to aquatic zones whether these be streams or irrigation canals. Candidate herbicides from the sulfonylurea, imadazolinone, PGR, and other chemistry families are currently registered for such use, or are candidates for such use. Colorado research in 2007 showed that an ethylated seed oil (Competitor – Wilbur-Ellis) provided excellent activation of several herbicides and that the level of invasive weed control was similar to or slightly better than that provided when a high grade MSO was used as an adjuvant. The major advantage of this ESO was the fact that it is labeled for riparian area use and that it can be used to spray plants up to the water's edge. We will continue to evaluate more adjuvant systems in 2008. [3]

PLANT COMMUNITY RESPONSE TO AFRICAN RUE CONTROL WITH THREE HERBICIDES. Tracy Sterling*, Laurie Abbott, Greg Bettmann, Kevin Branum, Nina Klypina, and Amber Vallotton, New Mexico State University, Las Cruces.

African rue is an invasive herbaceous perennial which belongs to the Caltrop family (Zygophyllaceae). Native to the desert shrublands of northern Africa and the Middle East, African rue was originally introduced to North America at Deming, New Mexico in 1928. Since then, African rue populations have been recorded in eight western U.S. states, with the greatest distribution in southern New Mexico and western Texas. African rue is common along roadways and pathways used by wildlife and livestock, and it often dominates areas where it occurs. Herbicide treatment is the only method of African rue control that is currently available; however several herbicides that effectively control African rue also damage native species. We compared the effect of three herbicides, hexazinone, imazapyr and metsulfuron, applied at rates of 0.02 kg ai ha-1, 0.13 kg ae ha-1, and 0.09 kg ai ha-1, respectively, on the plant species co-existing with two African rue populations in New Mexico, White Sands Missile Range (WSMR) and Lazy E Ranch (Lazy E). Herbicides were applied in May, June, or October 2004 to mature African rue plants receiving rainfall only or rainfall plus supplemental water (Dri-water®). Number of forbs, grasses and shrubs in a 1 m2 plot surrounding the target plant was recorded in Fall 2006, Spring 2007 and Fall 2007. Supplemental water had no effect on response of forbs, grasses or shrubs to herbicides. The highest number of grasses, 69 m-2, was found in control plots at WSMR in Fall 2006, while on all other observation dates the number of grasses was less than 3 m-2 in control plots at both locations. Grass response varied with herbicide, but was not affected by application date at either site. At WSMR, hexazinone reduced grass density by 64 to 74% and imazapyr reduced grass density by 33 to 36% relative to untreated controls. Overall, grass density on imazapyr-treated plots was nearly double of that on hexazinone-treated plots. Metsulfuron did not reduce grass density relative to untreated controls. At Lazy E, response of grasses to herbicides was detected only in Fall 2007 and it was similar to WSMR. Primary forb species found at different observation dates were Russian thistle and Brassica spp. at Lazy E, and broom and threadleaf snakeweed at WSMR. Forb density was substantially higher at Lazy E (10 to 20 m-2) than at WSMR (less than 3 m-2) and was not affected by imazapyr or metsulfuron at either site. Hexazinone reduced forb density at both sites through Spring 2007. Shrub density was very low (less than 1 m-2) and was not influenced by herbicides at either site. Overall, at both sites, hexazinone reduced grass and forb density the most, and metsulfuron had no effect. Although imazapyr had some negative effect on grasses, it was less damaging to native plants than hexazinone. [4]

PERENNIAL GRASS TOLERANCE TO ALS HERBICIDES. Karl R. Israelsen*, Corey V. Ransom, Utah State University, Logan; and Thomas Monaco, USDA-ARS, Logan, UT.

A better understanding of the relative tolerance of desirable perennial grasses to ALS herbicides will aide in the management of foxtail barley (Hordeum jubatum) and downy brome (Bromus tectorum) infestations. Seventeen perennial grass species were evaluated for tolerance to postemergence applications of imazapic, propoxycarbazone, and sulfosulfuron. Grass species included: crested,

intermediate, hybrid, and tall wheatgrasses, smooth and meadow brome, meadow foxtail, orchardgrass, timothy, and big bluegrass. Grasses were established for three years and were actively growing when herbicide treatments were applied on April 13, 2007. Grass tolerance was determined by evaluating plant injury, height, biomass, and seed head production. Grass varieties exhibited varying degrees of tolerance to each herbicide tested. Herbicide injury ranged from a low of 6% to a high of 83%. Herbicide treatments caused 39 to 59% injury and reduced plant height 39 to 52% when averaged across all grass varieties. Hybrid wheatgrass varieties appeared more tolerant of imazapic and less tolerant of propoxycarbazone and sulfosulfuron. Propoxycarbazone displayed lower injury in orchardgrass, big bluegrass, and the intermediate wheatgrasses. Crested wheatgrasses and intermediate wheatgrasses displayed greater tolerance to sulfosulfuron treatments. Both treatments of propoxycarbazone and sulfosulfuron resulted in lower injury to the intermediate wheatgrasses when compared to imazapic. Control and management of foxtail barley and downy brome will be improved by determining which herbicides effectively control foxtail barley and downy brome infestations while causing the least injury to desirable perennial grasses. [5]

LONGEVITY OF HERBICIDE EFFICACY ON AFRICAN RUE PLANTS. Nina Klypina*, Laurie Abbott, Greg Bettmann, Kevin Branum, Amber Vallotton, and Tracy Sterling, New Mexico State University, Las Cruces.

African rue is an invasive perennial weed found in several western states, primarily on disturbed areas. It propagates by seeds or vegetatively by sprouting from lateral roots or a woody crown, and tends to dominate in areas where it occurs. This species is difficult to control: mechanical methods are ineffective, and biological control is not available. Herbicides provide some measure of control, but generally require repeated applications and are potentially damaging to desirable plant species. Since the success of herbicide treatment can depend on many factors, a field experiment was designed to evaluate the effects of moisture availability and season of application on the long term efficacy of three herbicides on African rue. Hexazinone, imazapyr, and metsulfuron were applied at rates of 0.02 kg ai ha-1, 0.13 kg ae ha-1, and 0.09 kg ai ha-1, respectively, to plants receiving rainfall only or rainfall plus supplemental water (Dri-water®). Herbicides were sprayed on three application dates (May, June, and October) in 2004. These experiments were conducted on two populations in southern New Mexico, White Sands Missile Range (WSMR) east of Las Cruces, NM, and the Lazy E Ranch (Lazy E) near Deming, NM. To test the longevity of treatment effects, herbicide efficacy was evaluated four times: Summer 2005, Fall 2006, Spring 2007, and Fall 2007. Response variables were percent necrosis and size of the target plant, and the number of African rue seedlings and mature plants in a 1 m2 plot surrounding the target plant. Moisture status of soil at the time of herbicide application had no effect on plant response to herbicides. Significant interactions of herbicide and application date were detected at both sites. Relative to non-sprayed controls, plants treated with imazapyr and hexazinone were at least 30 to 40% more necrotic at both sites through Fall 2007; after Fall 2006, percent necrosis of target plants treated with metsulfuron did not differ from control plants. Imazapyr was consistently more efficient when applied in October at Lazy E or in October and June at WSMR. Hexazinone was most effective at both sites when applied in June, although the effects of application date for hexazinone were no longer detectable at WSMR by 2007. Metsulfuron treatments at Lazy E were most successful when applied in October, but effects of application date were not observed at WSMR. In addition to necrosis, target plants treated with hexazinone and imazapyr were significantly smaller than control plants through 2007. The number of non-sprayed, mature African rue plants in the plots was reduced by hexazinone and imazapyr through Fall 2007 at WSMR only. Hexazinone reduced the number of African rue seedlings by at least 73% compared to the other treatments leaving ca. 10 seedlings m-2 at WSMR; there were few seedlings at Lazy E and no herbicide effect. Regardless of herbicide treatment, most of the seedlings did not persist through Fall 2007 at either site, suggesting that seedlings are a very vulnerable stage of African rue establishment. Overall, hexazinone and imazapyr provided greater control than metsulfuron, and this increased level of control was sustained through at least three complete growing seasons. [6]

THE EFFECTS OF DPX-KJM44 ON NATIVE AND NON-NATIVE COLORADO RANGELAND SPECIES . Ryan Edwards*, University of Northern Colorado, Greeley .

A screen of Colorado native and nonnative prairie species was conducted in the summer of 2007. Population counts were first preformed on 16 different prairie species to determine baseline data for species presence inside of plot. Applications of herbicides had two major priorities. The first was to determine an effective control for the 16 species using DPX KJM-44 applied at three rates (70 Gms AI/HA, 140 Gms AI/HA, and 280 Gms AI/HA). The second priority was to compare DPX KJM-44 to Aminopyralid, Picloram and Clopyralid applied at122.5 Gms AI/HA, 280 Gms AI/HA, and 420 Gms AI/HA, respectively. Percent control data was recorded for nine species which were present in every plot; Species included Andropogon gerardii, Artemisia frigida wild., Artemisia ludoviciana,Opuntia polyacantha haw., Ferocactus wislizenii,carduus nutans L., Linaria genistifolia ssp. Dalmatica (L.), Liatris spicata, and Ambrosia psilostachya. Ratings for percent control were taken every 30 days over a 90 day period. Results concluded that DPX KJM-44 applied at a rate of 280 Gms AI/HA was the most effective at controlling nonnative plants, but adversely was also the most efficient in controlling native beneficial prairie species for all nine species. DPX KJM-44 at a 140 Gms AI/HA was effective at controlling nonnative prairie species and offered far less percent control for native beneficial prairie species. Results also concluded that DPX KJM-44 was a more effective means of controlling nonnative prairie species, and being lenient on native prairie species when compared with Aminopyralid, Picloram and Clopyralid. [8]

SITE CHARACTERISTICS DETERMINE THE SUCCESS OF PRESCRIBED BURNING FOR MEDUSAHEAD CONTROL. Guy B. Kyser*, University of California, Davis; Morgan P. Doran, University of California Cooperative Extension, Fairfield; Neil K. McDougald and Ronald N. Vargas, University of California Cooperative Extension, Madera; Stephen B. Orloff, University of California Cooperative Extension, Yreka; Robert G. Wilson, University of California Cooperative Extension, Susanville; and Joseph M. DiTomaso, University of California, Davis.

Medusahead is one of the most problematic rangeland weeds in the western United States. In previous studies, prescribed burning has been used successfully to control medusahead in some situations, but burning has failed in other circumstances. In this study, trials were conducted using the same protocol at four locations in central to northern California to evaluate plant community response to two consecutive years of summer burning and to determine the conditions resulting in successful medusahead control. During 2002-2003 large-scale experiments were established at two warm-winter sites (Fresno and Yolo counties) and two cool-winter sites (Siskiyou and Modoc counties). Plant species cover was estimated using a point-intercept method, and biomass samples were taken in each plot. In the year after the second year burn, medusahead cover was reduced by 99, 96 and 93% for Fresno, Yolo, and Siskiyou counties, respectively, compared to unburned control plots. Other annual grasses were also reduced, but less severely, and broadleaf species increased at all three sites. In contrast, two consecutive years of prescribed burning resulted in a 55% increase in medusahead at the coolest winter site in Modoc County. In the second season after the final burn, medusahead cover remained low in burned plots at Fresno and Yolo counties (1% and 12% of cover in unburned controls, respectively), but at the cool-winter Siskiyou site medusahead recovered to 45% relative to untreated controls. The success of prescribed burning was closely correlated with the dry biomass of grasses, other than medusahead, preceding a burn treatment. Forage production was greater in warm-winter areas with a longer growing season. It is hypothesized that greater production of combustible forage resulted in increased fire intensity and greater seed mortality in exposed inflorescences. These results demonstrate that burning can be an effective control strategy for medusahead in low elevation, warm winter areas characterized by high biomass production, but may not be successful in semi-arid cool winter areas with shorter growing seasons. [9]

YELLOW NUTSEDGE CONTROL IN POTATO WITH IMAZOSULFURON. Rick A. Boydston, USDA-ARS, Prosser, WA Joel Felix, Oregon State University, Ontario.

Yellow nutsedge control in potato with imazosulfuron was evaluated in trials conducted on a sandy loam soil near Pasco, WA and on a silt loam soil near Ontario, OR in 2007. Imazosulfuron was tested at 0.34, 0.45, and 0.56 kg ai/ha applied preemergence (PRE), PRE followed by postemergence (POST), and POST following standard treatments of s-metolachlor and rimsulfuron applied PRE in commercial fields naturally infested with yellow nutsedge. All POST applications included methylated oil at 1% (V/V). Shepody potatoes were planted March 20, 2007 in 86 cm rows at the Pasco site and harvested July 9, 2007; while Russet Burbank potatoes were planted April 6, 2007 in 91 cm rows and harvested October 5, 2007 at the Ontario site. POST applications were applied 25 days after PRE applications when potatoes were 15 cm tall and yellow nutsedge had begun to emerge with some plants 10 cm tall. Yellow nutsedge control at the time of potato canopy closure tended to be greater with sequential applications of imazosulfuron applied PRE and POST than with single applications of imazosulfuron applied PRE. Sequential applications of imazosulfuron controlled yellow nutsedge 91 to 98% at Pasco and 79 to 90% at Ontario. No herbicide symptoms were evident on potato treated with imazosulfuron PRE or POST, but potato row closure was slightly delayed at the Pasco location with POST applied imazosulfuron treatments. At the Pasco location, herbicide treatments did not affect total or U.S. #1 potato yields, which averaged 26.8 and 23.4 ton/acre, respectively. At Ontario, all herbicide treatments increased total potato tuber yield compared to the nontreated control except the lowest rate of imazosulfuron 0.34 kg/ha applied PRE. U.S. #1 yields tended to be greatest with sequential herbicide treatments applied PRE and POST than with imazosulfuron applied only PRE. Imazosulfuron appears to be a promising tool for yellow nutsedge suppression in potato. [10]

MILESTONE® VM PLUS (AMINOPYRALID + TRICLOPYR), A NEW INDUSTRIAL VEGETATION MANAGEMENT PRODUCT. Vanelle Peterson, Dow AgroSciences, Mulino, OR; Byron Sleugh*, Dow AgroSciences, West Des Moines, IA; Randy Smith, Dow AgroSciences, Indianapolis, IN; Jeff Nelson, Dow AgroSciences, Calgary, Canada; Pat Burch, Dow AgroSciences, Christiansburg, VA; Mike Melichar, Dow AgroSciences, Indianapolis, IN.

Milestone® VM Plus is a new herbicide developed by Dow AgroSciences for control of herbaceous broadleaf weeds and sensitive woody plants in non-cropland areas including industrial sites, rights-of-way (such as roadsides, electric utility and communication transmission and distribution lines, pipelines, and railroads), fencerows, non-irrigation ditch banks, natural areas (such as wildlife management areas, wildlife openings, wildlife habitats, recreation areas, campgrounds, trailheads and trails), and grazed areas in and around these sites. Use within these listed sites may include applications to seasonably dry wetlands (including flood plains, marshes, swamps, bogs, or naturally-subirrigated habitats) in and around standing water on sites, such as deltas, riparian areas, wetlands, ponds, and lakes. The formulated product is a non-ester formulation containing 12 g/L aminopyralid and 120 g/L triclopyr amine and has a 'Caution' signal word. It provides postemergence and preemergence residual control of susceptible broadleaf plants and seedlings and some sensitive woody plants. Most established warm- and cool-season grasses are tolerant to Milestone VM Plus applied at rates up to 12.7 L/ha (9 pints/acre). At 5.6 to 8.4 L/ha (4 to 6 pints/acre), Milestone VM Plus controls over 70 species of annual, biennial, and perennial broadleaf weeds including Russian Knapweed, spiny amaranth, ragweeds, Absinth wormwood, plumeless thistle, musk thistle, diffuse knapweed, spotted knapweed, yellow star thistle, oxeye daisy, Canada thistle, bull thistle, common teasel, henbit, scentless mayweed, bulbous buttercup, curly dock, horse nettle, tropical soda apple, and common cocklebur. Milestone VM Plus effectively controls glyphosate resistant weeds such as marestail, hairy fleabane, and giant ragweed when applied at 8.4 L/ha (6 pints/acre) for 3 to 4 months. Milestone VM Plus at 8.4 to 12.7 L/ha (6 to 9 pints/acre) controls woody species such as

Scotch broom and Himalaya blackberry. ®Trademark of Dow AgroSciences LLC Always read and follow the label directions [11]

EFFECT OF PRE-TRANSPLANT AND MID-SEASON HERBICIDES ON NEWLY PLANTED STRAWBERRIES. Timothy Miller and Carl Libbey*, Washington State University, Mount Vernon.

Three strawberry cultivars 'Shuksan', 'Honeoye' and 'Puget Reliance' were evaluated in 2005, 2006 and 2007, respectively, for phytotoxicity and general weed control from post-transplant (PRE weed emergence) and mid-season (POST weed emergence) applications of herbicides. Herbicides evaluated at least once were sulfentrazone, flumioxazin, pendimethalin, oxyfluorfen, dimethenamid-p, s-metolachlor, napropamide, flucarbazone, penoxsulam, KIH-485, V-10142, and V-10204. PRE treatments were applied immediately after transplanting in early June, and POST applications were applied approximately 30 days after transplanting each year. Prominent broadleaf weed species in each trial included common chickweed, shepherd's-purse, common lambsquarters, henbit, pale smartweed and ladysthumb. In all trials, treatments caused < 10% visual crop injury for the three cultivars by three weeks after POST applications. In 2005, the treatments that resulted in acceptable weed control through early August included PRE applications of flumioxazin, pendimethalin + flumioxazin, pendimethalin + sulfentrazone, sulfentrazone + s-metolachlor, and oxyfluorfen + s-metolachlor (88, 89, 89, 86, and 86%, respectively). Split-applications that resulted in acceptable weed control included flumioxazin (PRE) followed by POST applications of napropamide, pendimethalin, or sulfentrazone (90, 94, and 99%, respectively). In 2006, the combinations that resulted in acceptable weed control through mid-July included PRE applications of oxyfluorfen + dimethenamid-p, sulfentrazone + dimethenamid-p and pendimethalin + flumioxazin (89, 88, and 86%, respectively). In 2007, the two PRE treatments that resulted in acceptable weed control by late August were pendimethalin + flumioxazin and sulfentrazone + oxyfluorfen (81, and 80%, respectively). At the end of each summer, strawberry vegetative growth parameters were measured, including number of leaves per plant, leaf area, number of runners, and number of daughter plants. Results from these measurements indicate that these herbicides caused minimal or no phytotoxicity on these strawberry cultivars. Overall, the PRE application of pendimethalin + flumioxazin was the only treatment that resulted in weed control > 85% for all three years. [12]

EVALUATION OF PRE-EMERGENCE HERBICIDES IN STONE FRUIT FIELD NURSERIES. Bradley D. Hanson*, USDA-ARS, Parlier, CA.

Open field production of fruit and nut tree nursery stock depends upon preplant soil fumigation, extensive tillage, and hand labor throughout the growing season for adequate weed control. Because methyl bromide, the favored fumigant, is being phased out due to environmental concerns and the costs of both fuel and labor continue to rise, herbicides are likely to become a more important weed management tool in the tree nursery industry. Two trials were conducted to evaluate weed control and crop safety with several herbicides applied following fumigation with methyl bromide or 1,3-dichloropropene in central California stonefruit nurseries. PRE and POST-directed applications of several labeled and unlabeled materials were applied in a band over seeded peach rootstock or applied after emergence with a drop-nozzle spray boom. Crop productivity and weed control were monitored throughout the one year growing season. PRE oryzalin and dithiopyr provided the best weed control with very little crop injury. PRE flumioxazin, rimsulfuron, and sulfentrazone did not have adequate crop safety at the rate and timing tested. However, POST-directed applications of flumioxazin and rimsulfuron were much safer to the peach/almond crops and should be evaluated in future trials. Additional herbicides and application techniques are needed to find acceptable, safe control of weeds such as California burclover, common mallow, and redstem filaree, which often are poorly control with preplant fumigation in tree nurseries. [13]

ECONOMICS OF CROP ROTATION FOR INTEGRATED PEST MANAGEMENT IN CHILE PEPPER. Jessica L. Ebler*, James Libbin, Jill Schroeder, Stephen H. Thomas, New Mexico State University, Las Cruces; and Leigh Murray, Kansas State University, Manhattan.

Yellow nutsedge, purple nutsedge, and root-knot nematodes occur simultaneously in many crops grown throughout the southern and western regions of the USA. Management that targets individual pests has not been successful or economically sustainable due to enhancement of pest populations that result from interactions among these pest species. This research examined whether a rotation to root-knot nematode resistant alfalfa followed by two mid-season herbicide treatments in the subsequent chile pepper crop would provide acceptable suppression of the pest complex and increase profitability of the rotational system. A two year alfalfa rotation followed by chile pepper ('NM 6-4') was grown in a field infested with this complex. The design was a paired plot design with two subplots; two rows were treated with halosulfuron for nutsedge suppression and two rows were untreated. Red chile was harvested in November of 2007. The herbicide treatment suppressed the nutsedge; however, yields were not affected by treatment and were not acceptable according to production averages for the region. The yield from the herbicide treated areas averaged 1617 ± 827 Kg dry weight/ha and the untreated subplots averaged 1868 ± 748 Kg/ha. The yields were not acceptable due to the failure of the two year alfalfa rotation to adequately suppress the pest complex. Cost and returns were calculated and the time value-adjusted profitability of alfalfa-chile rotations were computed to provide an estimate of the yield required to make the field economically productive. [14]

GLYPHOSATE-RESISTANT HAIRY FLEABANE (CONYZA BONARIENSIS) DOCUMENTED IN CALIFORNIA. Anil Shrestha*, University of California, Parlier; Bradley D. Hanson, USDA-ARS, Parlier, CA; and Kurt J. Hembree, University of California Cooperative Extension, Fresno.

Hairy fleabane is a common weed infesting roadsides, orchards, ditchbanks, vineyards, and fallow areas in Central California. Relatively inexpensive postemergent herbicides such as glyphosate are generally used for weed control in these areas; however, in recent years poor control of this species with glyphosate has been observed. Since glyphosate-resistance in a related species (Conyza canadensis) was recently documented in similar locations, we suspected glyphosate-resistance in hairy fleabane. Hairy fleabane seeds were collected from Davis, Fresno, and Reedley, CA and seedlings were treated with glyphosate rates of 0 (untreated), 0.22, 0.43, 0.87, 1.74, 3.47, 6.94, and 13.89 kg ae/ha in greenhouse experiments. Each experiment was a completely randomized design with five replications and was repeated. Growth stage of the treated plants differed between experiments. In the experiments comparing plants from Fresno and Reedley, the plants were at the 12-15 and at the 15-18 leaf stage in the first and second round, respectively. In the experiments comparing the Davis and Reedley plants, the plants were at the 8-11 and 18-23 leaf stage in the first and second round, respectively. Mortality and aboveground dry weight of the treated plants were recorded two weeks after glyphosate applications. Interactions ($P<0.05$) occurred between glyphosate rates and the experimental run for plant dry weights. Therefore, GR50 values for each experimental run were calculated separately. In these experiments, some of the plants from Reedley survived even the highest rate of glyphosate used. None of the Fresno or Davis plants survived glyphosate rates greater than 0.87 kg ae/ha. The GR50 of the Fresno and Reedley plants ranged from 0.30 to 0.67 and 1.82 to 2.0 kg ae/ha, respectively. Similarly, the GR50 of the Davis and Reedley plants ranged from 0.32 to 0.33 and 1.0 to 3.2 kg ae/ha, respectively. Based on the GR50, the hairy fleabane plants from Reedley showed at least a 3-fold level of resistance to the labeled rate (0.87 kg ae/ha) of glyphosate. However, the level of resistance ranged up to 10-fold based on the growth stage of the plants. These results are the first confirmed report of a GR hairy fleabane biotype in the US. This study also showed that the level of glyphosate-resistance in hairy fleabane can be influenced by growth stage of the plants at the time of glyphosate application. [15]

ACTIVITY DENSITY AND WEED SEED PREDATION POTENTIAL OF GROUND BEETLES IN ANNUAL ROW CROPS OF THE PACIFIC NORTHWEST. Ed Peachey*, Alysia Greco, Jessica Green, Oregon State University, Corvallis; and Rick Boydston, USDA-ARS, Prosser, WA.

Regulation of weed seed banks in agricultural systems involves management of seed input from seed rain, and seed removal from mortality and germination. While seed rain, germination, and emergence are managed using a number of methods such as tillage and herbicides, management of seed mortality is frequently overlooked. Seed predation by invertebrates such as carabid beetles is a key source of mortality in many cropping systems. The influence of ground beetles on weed seed density in the soil, and the potential to increase the abundance of these seed predators in agricultural systems has not been determined in commercial vegetable production sites in the Pacific Northwest, and is poorly understood in many cropping systems. Objectives were to determine the impact of select agronomic practices on seed predator activity density and seed predation efficacy. Project objectives were addressed by measuring activity density of seed predator ground beetles and weed seed consumption rates in farm fields and research plots in the maritime Willamette Valley of Oregon and the high desert Columbia Basin region of Washington. Pterostichus melanarius and Harpalus pensylvanicus were the primary species of all fields in the Willamette Valley. Activity density (AD) tended to increase as summer progressed but inconsistently among sites. Mid-season insecticide treatments applied to plots in farm fields reduced seed predator activity density most at the center of the plot, but beetles slowly recolonized the insecticide treated areas. In the high desert Columbia Basin, species diversity was similar in both years. The primary species in both the organic (37% of total species in organic) and conventional fields (36% of total species in conventional) was Harpalus pensylvanicus. The second and third most prevalent species were Agonum melanarium (23% of organic and 27% of conventional) and Pterostichus melanarius (20% of organic and 12% of conventional), respectively. At the maritime research station site in Corvallis, the primary species trapped was P. melanarius and insecticide treatments reduced density of this species by 86%. No effects of spring tillage system were noted on AD. The rate of wild proso millet seed loss to ground beetle predation declined from 15% to 4% when insecticides were applied mid-season, and from 15% to 1% when insecticides were applied broadcast in conventional tillage. [16]

SAFFLOWER TOLERANCE TO SULFENTRAZONE . Brian M. Jenks, Shana Mazurak, and *Gary P. Willoughby, North Dakota State University, Minot.

Safflower (Carthamus tinctorius) is a deep-rooted, drought-tolerant crop grown in western North Dakota. It is an oilseed commonly used for oil, meal, or birdseed. Acreage in ND has increased from 22,800 acres in 2002 to over 41,000 acres in 2007. Safflower is not a very competitive crop and early season weed control is necessary to maintain yield at an economic level. A study to evaluate the effect of sulfentrazone on safflower was established in 2005 and 2006 at three locations in North Dakota; Minot, Hettinger, and Williston. The study was repeated again in 2007 in Minot only. Sulfentrazone was applied pre-plant and PRE in conventional and no-till systems. At Minot in 2005, visible safflower injury in the conventional tillage system on June 15 was as high as 36% from sulfentrazone at 2.25 oz ai; however, safflower height and density were not significantly different than the untreated check. Injury tended to be lower in the no-till system, with only 16% injury with the same herbicide treatment. Safflower yields tended to be highest where sulfentrazone was applied at 1.5 oz ai pre-plant, followed by the lower rates of sulfentrazone applied PRE. Safflower tended to yield higher where sulfentrazone was applied at any rate compared to the untreated or handweeded check in either tillage system. Approximately 11 inches of rain fell at Minot in June 2005 alone. In 2006, rainfall was well below normal. There was very little visible safflower injury in 2006 with any treatment or tillage system. Safflower density, height, and yield were not affected by any herbicide treatment. In 2007, sulfentrazone caused slight early-season injury (3-21%) in June; however, injury was 10% or less by early July. No growth differences or injury was visible in August. Safflower yields were similar across treatments and averaged 3380 lb/A. At Hettinger in 2005, initial visible injury

tended to increase with increasing herbicide rates but diminished over time. Plant stands and heights were not significantly different where sulfentrazone was applied compared with handweeded or untreated checks. Safflower yields were similar where sulfentrazone was applied compared with the untreated check, regardless of tillage system. In 2006, conditions were extremely dry at Hettinger. There was no visible safflower injury in 2006 with any treatment or tillage system. Safflower density and yield were not impacted by herbicide treatments. At Williston in 2005, there were no significant differences in stand density or crop injury between sulfentrazone treatments and the untreated check in both the conventional and no-till systems. Safflower tended to yield higher where sulfentrazone was applied compared to the untreated or handweeded check in either tillage system. In summary, sulfentrazone tended to cause more safflower injury in the conventional system compared with the no-till system. In addition, the safflower in the no-till system tended to yield higher compared to the safflower in the conventional system. However, sulfentrazone treated safflower yielded similar or greater than untreated safflower, regardless of tillage system. In 2006, early safflower injury was higher in the highest sulfentrazone rates in the conventional till system. However, by July injury was generally less than 15%. Safflower yields were not significantly different between treatments. As in 2005, safflower yield was higher in the no-till system compared to the conventional till system. [17]

A SECOND YEAR ASSESSMENT OF LONG-TERM VIABILITY OF GLYPHOSATE-RESISTANT CROPPING SYSTEMS-MEASURING TH SEEDBANK.. Patricia M. Nielsen*, Lori A. Howlett, Robert G. Wilson, Gustavo M. Sbatella, University of Nebraska, Scottsbluff, NE; Micheal D. K. Owen, Iowa State University, Ames, IA; David R. Shaw, Mississippi State University, Mississippi State, MS; Stephen C. Weller, Purdue University, West Lafayette, IN; David Jordon, North Carolina Sate University, Raleigh, NC; and Bryan G. Young, Southern Illinois University, Carbondale, IL..

Weed scientists from, Illinois, Indiana, Iowa, Mississippi, Nebraska, and North Carolina are conducting similar studies over a four-year period at on farm sites to determine the viability of various cropping management strategies for the preservation of Roundup Ready® programs as an affective tool for weed control. This research initially employed a grower survey of approximately 200 growers in each state to determine trends, and based on the survey results a subset of 28 to 30 of the growers surveyed in each state were contacted to establish alternative management strategies on their farms over the next four years, shifts in weed populations, changes in weed species present, and levels of weed control will be monitored over this period with various combinations of cropping, tillage, and herbicide rotation systems. In Nebraska 28 growers located across the state and who had been planting a Roundup Ready crop the past three years were included in the four year study. Three Roundup Ready cropping systems were identified; continuous Roundup Ready corn, Roundup Ready soybeans followed the next year by Roundup Ready corn or Roundup Ready soybeans followed the next year by conventional corn. Each grower's field was divided into two 20 acre subsets. In one subset the grower continued his present glyphosate based weed management program while in the second subset the university researchers incorporated an alternative glyphosate weed management program to address potential weed shifts or problem weeds observed in the field. The seed bank was measured in 20 GPS marked locations in each of the two subsets. A 6.4 cm diameter by 15 cm deep core was taken at each of the 20 locations in early spring before tillage or preemergence herbicide application. Soil samples were frozen and kept frozen until analysis in November. Each soil sample was placed in the greenhouse and data on weed germination was collected following three germination cycles. In crop weed emergence was correlated with seeds in the seedbank with the best correlation achieved with growers utilizing no tillage in their farming operation. Growers in a continuous Roundup Ready corn rotation had three times as many weed seeds present in the seedbank compared to growers in a Roundup Ready soybean / Roundup Ready corn rotation. Corn at one of the sites was hailed in mid July of 2006 which reduced the corn canopy and allowed more late season weed growth. The number of weed seeds in the seedbank increased over a 100 fold from the spring of 2006 to the spring of 2007.The increase in weed seed resulted in a 10 fold increase

in weed emergence with corn in 2007. Experiments are ongoing and results to this point suggest that herbicide, tillage, cropping, and environment factors all have an impact on the seedbank. [18]

LENTIL TOLERANCE TO LINURON, DIURON, AND KIH-485. Brian M. Jenks, Gary P. Willoughby, Shanna A. Mazurek, and Kent R. McKay*, North Dakota State University, Minot.

Studies were conducted in 2006 and 2007 to evaluate lentil tolerance to soil-applied herbicides including linuron, diuron, and KIH-485. These herbicides have been shown to control or suppress weeds that are troublesome in North Dakota lentil production such as prickly lettuce, false chamomile, kochia, and wild buckwheat. In 2006 at Beach, ND, glyphosate and pendimethalin were tank mixed with all preemergence treatments. All treatments provided good to excellent prickly lettuce control; however, we expect that prickly lettuce control provided in this study was primarily from glyphosate. Linuron and KIH-485 caused 8% or less crop injury at any rate. However, diuron caused moderate to severe crop injury (13-41%) at three rates. In 2006 at Minot, ND, linuron and KIH-485 caused 8% injury or less, while diuron caused 8-27% crop injury. However, there was no significant difference in lentil yield between treatments. In 2007, very wet conditions in May and June (13 inches rainfall) resulted in moderate to severe lentil injury. However, we believe much of the injury was caused by pendimethalin. We tank mixed pendimethalin with linuron, diuron, and KIH-485 to help reduce weed competition. In treatments where these herbicides were not tank mixed with pendimethalin, lentil injury was much less. Linuron applied alone at 0.5 lb ai caused only 10% injury, while linuron + pendimethalin caused 39% injury. Diuron alone at 1.6 lb ai caused 58% injury, while diuron + pendimethalin caused 82% injury. KIH-485 applied alone at 0.15 lb ai caused 27% injury, while KIH-485 + pendimethalin caused 62% injury. These 2007 evaluations were completed June 21. By July 9, the lentil crop in each treatment had recovered slightly. In July, linuron + pendimethalin caused 11-17% injury; diuron + pendimethalin caused 43-71% injury; KIH-485 + pendimethalin caused 30-33% injury. Linuron, diuron, and KIH-485 applied alone caused 5, 39, and 17% lentil injury, respectively, at the July 9 evaluation. Lentil injury due to pendimethalin alone was rated at 34 and 8% in June and July, respectively. [19]

ORGANIC TRANSITION CROPPING SYSTEMS FOR WEED MANAGEMENT IN EASTERN WASHINGTON. Randall Stevens*, Amanda Snyder, Washington State University, Pullman; Robert Gallagher, Pennsylvania State University, University Park; Dennis Pittman, Kate Painter, Ian C. Burke, E. Patrick Fuerst, and Richard Koenig, Washington State University, Pullman.

Certified organic grain production in eastern Washington presents many challenges in the areas of weed control. An organic transitions study was initiated near Pullman, WA in spring, 2003. The study examined nine different crop rotations ranging from intensive grain production to intensive legumes for forage or green manure, as well as systems with alternating cereal grains and legumes. Weeds were managed using a prototype rotary harrow pre-plant and a high-residue rotary hoe in-crop. An undercutter was utilized starting in fall, 2005, for alfalfa control and the following spring for pre-plant weed control. The entire study was sown to certified organic spring wheat in 2006 and winter wheat in 2006-2007. Increasing the frequency and intensity of legumes managed as green manure or forage during transition resulted in higher wheat yields, better weed control, and improved soil fertility than rotations with a higher frequency of spring cereals or spring peas. The spring pea crop failed in 2005 due to weed problems, primarily wild oats. Transitional cropping systems had a major impact on weed control problems in spring wheat in 2006. Winter wheat, winter pea green manure, and alfalfa during the transition reduced weed biomass in 2006, whereas spring peas during the transition resulted in very high weed biomass. In the 2007 winter wheat crop, all systems had much lower weed biomass, with fewer differences among systems. Field bindweed has become a serious threat. Additional research is needed on crops that are weaker competitors, including spring peas, canola, lentils, and garbanzos. [20]

SEARCHING FOR WEED CONTROL OPTIONS IN BROWN MUSTARD. Robert K. Higgins*, Drew J. Lyon, University of Nebraska Panhandle Research & Extension Center, Scottsbluff, NE.

Field studies were initiated to study weed control options in brown mustard at the University of Nebraska High Plains Agricultural Lab located near Sidney, NE from 2004-2006. Interest in brown mustard production in the High Plains is being driven by the demand for bio-diesel. While brown mustard is thought to provide superior heat tolerance compared to canola, weed control options in brown mustard are limited. The purpose of these studies was to identify promising herbicide treatments that could be used in a no-till brown mustard production system. In 2004, Treflan, Sonalan, Prowl, and Spartan were applied EPP and/or PRE without mechanical incorporation. Starane was applied POST. Only Spartan provided commercially acceptable control of Russian thistle, but Spartan caused unacceptable crop injury. This injury included stand loss, stunting, and some leaf chlorosis and necrosis. Prowl H20 caused some crop injury at the highest use rate. In 2005, we investigated various implements for the mechanical incorporation of Treflan TR10 and Sonalan 10G. These implements included a tandem disk, 30-inch sweep blades with and without a trailing mulch treader, a mulch treader alone, and no mechanical incorporation. The best weed control and seed yields were obtained with the tandem disk and the mulch treader alone. No differences were observed between Treflan TR10 and Sonalan 10G. The mulch treader treatment retained more surface crop residues than the tandem disk treatment. In 2006, liquid and granular formulations of Treflan and Sonalan, and Prowl H20, were applied and either incorporated with a mulch treader (scratch) or left undisturbed on the soil surface. Russian thistle and kochia control were best with shallow mechanical incorporation, however, volunteer proso millet control was reduced with mechanical incorporation. Brown mustard does not compete well with weeds for the first four weeks following planting. Once brown mustard begins to bolt it can be very competitive with weeds. Although no-till production of brown mustard may be the ultimate goal for dryland producers, minimum tillage may be the best solution for weed control in brown mustard at this time. [21]

FALL VS SPRING APPLICATION OF SULFENTRAZONE IN CHICKPEA (CICER ARIETINUM). Eric N. Johnson*, Agriculture and Agri-Food Canada, Scott, SK, Robert E. Blackshaw, Agriculture and Agri-Food Canada, Lethbridge, AB, Ken L. Sapsford, and Frederick A. Holm, University of Saskatchewan, Saskatoon.

Sulfentrazone is a Group 14 herbicide that inhibits the protoporphyrinogen oxidase (PPO) enzyme. It is not currently registered in Canada but registration is being sought in chickpea, field pea (Pisum sativumL.), flax (Linum usitatissimum L.), and sunflower (Helianthus annusL.). Sulfentrazone is a soil-applied herbicide that requires soil moisture for activation and root uptake. Initial studies conducted in Western Canada indicated inconsistent weed control, particularly when applied in spring seasons that received below normal rainfall. Also, control of wild mustard (Sinapis arvensis L.) and other Brassica species was variable. The hypothesis was that late fall application may improve the consistency of weed control since the spring snow-melt would move the sulfentrazone into the rooting zone allowing activation to occur. Eight site-years of field studies were conducted from 2003-2008 at Scott, SK and from 2004 to 2007 at Lethbridge, AB, Canada. Sulfentrazone was applied at rates ranging from 0 to 840 g ai ha-1 in late October and in early spring (3 days after seeding desi chickpea). Application timing had no effect on the control of kochia (Kochia scoparia L.) with rates of 140 g ai ha-1 providing greater than 80% control with either fall or spring application. Spring applied sulfentrazone was superior in controlling wild mustard and volunteer canola (Brassica napus L.); however, spring application rates of > 420 g ai ha-1 were required to provide control. This rate would likely injure subsequent crops based on re-cropping studies. Chickpea yields were higher with spring application than fall application in three of the eight site-years, with similar yields occurring in the other five site-years. Ongoing studies are examining tank

mixtures of sulfentrazone at 70 to 280 gai ha-1 with isoxaflutole to attain broad spectrum weed control in chickpea without herbicide carryover concerns in following crops. [22]

DETERMINATION OF RUSSIAN THISTLE EPICUTICULAR WAX DENSITY AND COMPOSITION IN RESPONSE TO WATER STRESS. Lillian Kuehl*, Ian C. Burke, Washington State University, Pullman; and Frank L. Young, USDA-ARS, Pullman, WA.

Russian thistle is a prominent broadleaf weed in the low rainfall zone of the inland Pacific Northwest. Herbicides, including glyphosate, are the most desirable form of weed control. The epicuticular wax layer is a major barrier to herbicide penetration and its characteristics may be affected by drought. An experiment consisting of two separate studies repeated in time was conducted to examine the effects of drought on the epicuticular wax composition of Russian thistle. Three months after germination half of the Russian thistle seedlings in the experiment were subjected to drought conditions. The remaining plants were watered regularly. To impose the drought condition, the incipient wilting point for each plant was identified by withholding water and recording the weight of the system (plant, pot, and soil). Once the plants reached their incipient wilting point they were held there for 25 days by adding 10% of the total water back into the system. Above ground biomass was harvested and total above ground area was recorded. Epicuticular wax was extracted, dried and derivatized for measurement, and then analyzed using a GC-MS. Drought stress did not significantly affect leaf wax density ($p = 0.8725$) or total wax mass per plant ($p = 0.2159$), but it did decrease total leaf area per plant ($p = 0.0102$). No differences were observed between the epicuticular wax composition of drought-stressed and non-drought stressed plants. The epicuticular wax of Russian thistle was primarily composed of pentacosane, heptacosane, and nonacosane, although several primary components were not identifiable. [23]

DUPONT EXPRESSSUN TRAIT WITH PIONEER 63N81 SUNFLOWER HYBRID AND DUPONT HERBICIDE SYSTEMS . James D. Harbour*, Michael T. Edwards, Robert N. Rupp, Jeff Meredith, DuPont Crop Protection, Wilmington, DE; Eric Hoeft, Pioneer Hybrid Internation, Inc., Woodland, CA.

In 2007, fourteen tests were conducted to determine DuPont ExpressSun trait system and Pioneer 63N81 NuSun hybrid tolerance and weed efficacy to tribenuron-methyl herbicide. The objectives were two-fold; 1) determine crop response of Pioneer 63N81 sunflower hybrid, which contains the ExpressSun trait, to single and sequential tribenuron-methyl herbicide applications; and 2) determine crop response of Pioneer 63N81 sunflower hybrid and weed efficacy to pre-emergence herbicides followed by a single post-emergence application of tribenuron-methyl herbicide compared to Clearfield sunflower. Herbicides were applied pre-emergence and / or as a single or sequential applications to V4 to V8 growth stage to Pioneer 63N81 or Clearfield sunflower hybrids using small-plot sprayers. Crop response and weed efficacy was recorded. Crop response as minimal and transient to Express, but significant to Clearfield for the first objective. Kochia control was 83% with the single application of tribenuron-methyl at 0.125 oz ai/a. However, kochia control increased to 95-98% with the single application of tribenuron at 0.25 oz ai/a or with the sequential applications of tribenuron (0.125 oz ai/a followed by (fb) 0.125 oz ai/a, and 0.25 oz ai/a fb 0.25 oz ai/a). Tumble pigweed control was 80% with the single application of tribenuron-methyl at 0.125 oz ai/a. Tumble pigweed control increased to >96% from the single application of tribenuron at 0.25 oz ai/a or the sequential tribenuron applications. For the second objective, herbicide program trials containing a pre-emergence herbicide followed by a single post-emergence application of tribenuron (0.125 and 0.25 oz ai/a) exhibited crop response (23%) at a TX location. Crop response symptoms were determined to be from the pre-emergence application of sulfentrazone. Pre-emergence herbicides followed by post-emergence tribenuron provided control of tumble pigweed (99%) and redroot pigweed (>93%). Velvetleaf control increased from 12% with Prowl to 95% with 0.125 or 0.25 oz ai/a tribenuron. Tribenuron at 0.125 or 0.25 oz ai/a controlled jimsonweed and puncture vine in these trails. [24]

DUPONT AFFINITY PRODUCTS TANKMIXED WITH STARANE NXT, CLEANWAVE OR FLORASULAM. Michael T. Edwards*, Eric P. Castner, James D. Harbour, C. William Kral and Jeff H. Meredith, DuPont Crop Protection, Wilmington, DE.

In 2007 twenty-five tests were conducted to determine the efficacy when Affinity Tankmix and Affinity BroadSpec (Thifensulfuron-methyl and Tribenuron-methyl premixes) were tankmixed with Florasulam (6 tests) or Starane NXT (10 tests - Floroxypyr + Bromoxynil) or Cleanwave (9 tests - Floroxypyr + Aminopyralid). Cleanwave was tested at 7 and 14 floz/ac (7 floz = 0.074 ozai Aminopyralid+1.05 ozai fluroxypyr). No crop response was seen with any treatment. Only lambsquarter, sunflower, kochia and wild buckwheat were controlled with 7 fl oz/ac of Cleanwave. Control with Cleanwave alone at 7 fl oz/ac was poor on mayweed chamomile, blue mustard, flixweed, Russian thistle and prickly lettuce. Doubling the rate to 14 fl oz/ac improved flixweed, Russian thistle and prickly lettuce to near control levels >80%, but control of mayweed chamomile and blue mustard remained poor. The addition of Affinity BroadSpec to the 14 fl oz/ac rate controlled mayweed chamomile. All other species were controlled with the addition of Affinity BroadSpec to the 7 fl oz/ac rate. The addition of Affinity Tankmix to the 14 fl oz/ac rate and Affinity Tankmix at 1.0 oz/ac to the 7 fl oz/ac rate controlled Russian thistle and mayweed chamomile. All other species were controlled with the addition of Affinity Tankmix at 0.6 oz/ac to the 7 fl oz/ac rate Starane NXT was tested at 3 rates (1/2 pt/a, 3/4 pt/a, 1 pt/a = 1.2 ozai fluroxypyr + 4.66 ozai bromoxynil) and at 2 timings of application – 2" and 4" weeds. No crop response was seen with any treatment at the early application timing. Control with Starane NXT alone at 8, 12 or 16 fl oz/ac controlled redroot pigweed, lambsquarter, sunflower, wild buckwheat, cocklebur, kochia and Russian thistle. The addition of Affinity BroadSpec to the 8 fl oz/ac rate improved control 5-8% on pigweed and sunflower. No crop response was seen with any treatment at the late application timing. Control with Starane NXT alone at 8, 12 or 16 fl oz/ac controlled sunflower, wild buckwheat, redroot pigweed, lambsquarter and cocklebur. Kochia and Russian thistle were not controlled with Starane NXT alone at 8 fl oz/ac. The addition of Affinity BroadSpec to the 8 fl oz/ac rate controlled all species. Florasulam at 1X or 2X rates did not control lambsquarter, kochia, Russian thistle and was marginal on prickly lettuce. Florasulam at 1X suppressed blue mustard and flixweed, and at 2X did provide control. Frontline did not control prickly lettuce, kochia or Russian thistle, but did control flixweed, and blue mustard. Florasulam + Axial only controlled blue mustard and flixweed, and crop response increased to 6%. Frontline + Affinity BroadSpec and Florasulam + Axial + Affinity Tankmix controlled all species except kochia and Russian thistle. Addition of 2,4-D ester to Florasulam + Affinity BroadSpec controlled kochia, Russian thistle and lambsquarter (data not shown), but did increase crop response to 13%. [25]

THE EFFECTS OF PH ON LACTUCA SERRIOLA GERMINATION. Cherie Flint* and Ian Burke, Washington State University, Pullman.

Prickly lettuce (Lactuca serriola L.) is a problem weed in the inland Pacific Northwest, particularly in the direct-seed dryland cropping systems of the Palouse region of eastern Washington. It has a prolonged emergence period throughout the fall and spring and an indeterminate flowering habit, it produces numerous wind-dispersed seeds. Fertilizer applications in no-till systems in eastern Washington and the accumulation of organic matter have combined to lower surface soil pH levels in direct-seed cropping systems. The objective of this research was to determine prickly lettuce seed germination response to six different pH levels to determine if prickly lettuce is better adapted to germinating at lower rather than higher soil pH. Ph levels of 4, 5 and 6 were made with 0.01 M HEPES buffer, while pH 7, 8 and 9 were simulated using 0.01 M Borax. Each pH treatment had four repetitions of 10 seed each, and the trial was repeated in time. A control with deionized (DI) water was included (pH 6.1). Germination varied by pH, with the greatest germination observed at a pH 4 (72%). Germination at ph 6 and pH 5 were similar, at

65% and 60%, respectively. Some germination was observed at pH 9 (0.1%), although the seedlings were deformed. No germination was observed at pH 7 or pH 8. Germination in DI water was 70%. It appears that prickly lettuce may be better adapted to germinate in relatively more acidic soils. [26]

EFFECT OF NO-TILL, DEEP PLOWING, AND HERBICIDE-RESISTANT WINTER WHEAT ON JOINTED GOATGRASS POPULATION DYNAMICS. Frank L. Young*; Laylah S. Bewick; Eric Zakarison; Joseph P. Yenish; and John W. Burns, Washington State University, Pullman, WA.

Over sixty percent of the winter wheat (WW) production area of the Pacific Northwest (PNW) utilizes the same crop rotation of WW rotated with dust-mulch summer fallow (WW/SF) that has been used since the early 1900s. In the PNW, the WW/SF production system is characterized by heavy infestations of jointed goatgrass (JGG) and sever wind erosion. Wind erosion is reduced greatly by decreasing SF, increasing standing stubble, and planting no-till spring crops. Adoption of spring cropping systems reduces JGG populations, however, in the PNW, WW is planted as often as possible because it is the most adapted and most profitable crop to produce. Growers have inquired as to what spring crop tillage system is most effective in reducing JGG populations so that they can return to producing WW the most expediently. In the spring of 2002, a field study was initiated at Lacrosse, WA. to determine the effect of one-time deep plowing, no-till (NT) herbicide-resistant (imidazolinone) winter wheat (HRWW), and the length of absence of WW on JGG population dynamics and crop yield and quality. The specific objectives of this study were to 1.) Determine if a NT chemical fallow (ChF)/HRWW rotation reduces JGG populations more rapidly than 2 years of NT spring cereals (SC); 2.) Determine if one-time spring deep plowing (DP) followed by NT SC reduces JGG populations more rapidly than continuous NT cereals; 3.) Determine if shallow annual preplant tillage (PPtill) following one-time spring DP for SC reduces JGG populations more rapidly than continuous NT SC after one-time spring DP; and 4.) Determine if 3 years or 4 years out of winter wheat (WW) production eliminates or reduces JGG populations more effectively than NT HRWW/ChF. The experimental design was a randomized complete block with four treatments and four replicates. Treatments included: 1.) ChF/HRWW (all NT), 2.) SC/SC/ChF/HRWW/SC (all NT), 3.) spring DP+SC/NTSC/NTSC/NTChF/NTHRWW, and 4.) spring DP+SC/PPtill+SC/PPtill+SC/PPtill+ ChF/NTHRWW. Plowing was to a depth of 18 to 23 cm and light or conservation tillage was disking to a depth of 5 to 8 cm, otherwise all crops were maintained under no-till practices. In the fall of 2001 and spring of 2007 viable JGG seed populations were determined for each treatment (soil surface to a depth of 20 cm). Jointed goatgrass plant populations were recorded preherbicide or preplow, and/or preharvest. In 2002, JGG plant populations prior to any operation was 6, 37, 39, and 18 plants 0.1 m-2 for treatment 1, 2, 3, and 4, respectively. In the spring of 2006, JGG populations for the same treatments were 0.2, 0.05, 0.9, and 0.06 plants 0.1m-2, respectively. The first year (2003) that imidazolinone was applied, cold weather during application resulted in WW injury and poor control of JGG. After two cycles of NTCHF/ HRWW the JGG population was 2.5 plants 0.1m-2. In contrast the JGG population after 2 years of NTSC followed by CHF then HRWW was 0.1 plants 0.1m-2. [27]

YELLOW NUTSEDGE CONTROL IN ROUNDUP READY ALFALFA. Mick Canevari* and Don Colbert, University of California Cooperative Extension, Stockton Calif .

No Abstract. [28]

A SECOND YEAR ASSESSMENT OF THE LONG-TERM VIABILITY OF GLYPHOSATE-RESISTANT CROPPING SYSTEMS - MEASURING WEED DENSITY. Lori A. Howlett*, Patricia M. Nielsen, Robert G. Wilson, Gustavo M. Sbatella, University of Nebraska, Scottsbluff, NE; Micheal D. K. Owen, Iowa State University, Ames, IA; David R. Shaw, Mississippi State University, Mississippi State, MS; Stephen C. Weller, Purdue University, West Lafayette, IN; David Jordon, North Carolina State University, Raleigh, NC; and Bryan G. Young, Southern Illinois University, Carbondale, IL..

Weed scientists from Illinois, Indiana, Iowa, Mississippi, Nebraska, and North Carolina are conducting similar studies over a four-year period at on-farm sites to determine the viability of various cropping management strategies for the preservation of Roundup Ready® programs as an effective tool for weed control. This research initially employed a grower survey of approximately 200 growers in each state to determine trends, and based on the survey results a subset of 28 to 30 of the growers surveyed in each state were contacted to establish alternative management strategies on their farms over the next four years. Shifts in weed populations, changes in weed species present, and levels of weed control are being monitored over this period with various combinations of cropping, tillage, and herbicide rotation systems. In Nebraska 28 growers located across the state who had been planting a Roundup Ready crop the past three years were included in the four-year study. Three Roundup Ready cropping systems were identified; continuous Roundup Ready corn, Roundup Ready soybeans followed the next year by Roundup Ready corn, or Roundup Ready soybeans followed the next year by conventional corn. Each grower's field was divided into two 20-acre sections. In one section, the grower continued his glyphosate based weed management program while in the second section the university researcher incorporated an alternative glyphosate weed management program to address potential weed shifts or problem weeds observed in the field. Weed density was measured in ½ m2 quadrants in 20 GPS marked locations in each of the two sections. Weed density was measured before tillage in early spring, after crop emergence, two weeks following the last postemergence herbicide treatment, and at crop harvest in the fall. Crop yields and crop production inputs were recorded for each segment of the field. In both 2006 and 2007 weed density before the first postemergence herbicide application was greatest in fields cropped to continuous Roundup Ready corn compared to fields in a Roundup Ready soybean followed by Roundup Ready corn rotation. Weed control following the last postemergence herbicide treatment was generally greater where the university weed control recommendation was utilized but the improvement in weed control on average cost $8 per acre. The remaining weeds at harvest in continuous Roundup Ready corn were foxtail species followed by pigweed species while in a Roundup Ready soybean followed by Roundup Ready corn rotation pigweed species were normally the most prevalent weed remaining at harvest. [29]

VOLUNTEER CREEPING BENTGRASS CONTROL IN KENTUCKY BLUEGRASS SEED PRODUCTION WITH MESOTRIONE. Marvin D. Butler*, Richard P. Affeldt and Claudia K. Campbell, Oregon State University, Madras.

From 2004 to 2007 research was conducted in central Oregon to develop a management strategy for volunteer creeping bentgrass in Kentucky bluegrass seed production. Plots were established in commercial seed production fields of creeping bentgrass and Kentucky bluegrass in 2004-2005 to evaluate treatments including mesotrione at 0.25 lb ai/A. Herbicides were applied 7 October and 19 November, 2004. Plots in the creeping bentgrass field were evaluated for control of established creeping bentgrass plants, while plots in the Kentucky bluegrass field were evaluated for crop injury and reduction in seed set. In the spring of 2006 mesotrione was applied at 0.25 lb ai/A and 0.5 lb ai/A in single, double and triple applications on 24 April, 11 May and 29 May to established commercial plantings of 'Shamrock' and 'Merit' Kentucky bluegrass grown for seed. Treatments were evaluated for crop injury and seed yield. During 2007 in a commercial Kentucky bluegrass seed production field, mesotrione was applied 6 March to dormant creeping bentgrass volunteers, 5 April, 2007 at early post emergence, or a split application across both timings. Mesotrione was applied at 0.09 lb ai/A, 0.19 lb ai/A and 0.38 lb ai/A. Results from the 2004-2005 research indicated that mesotrione provided 97 to 98 percent biomass

reduction in creeping bentgrass with no observed crop injury or reduction in seed set in Kentucky bluegrass. In 2006 there was no observed plant injury or reduction from spring applications of mesotrione in seed yield for 'Merit', with non-significant injury and reduction in seed yield for some treatments on 'Shamrock'. Research conducted in 2007 indicated that none of the combinations of treatment rates or timings with mesotrione provided total control of established creeping bentgrass or prevented plants from heading out. [30]

ANSWERS TO SOME APPLICATION ISSUES AND PESTICIDE INTERACTIONS WITH GLYPHOSATE IN ROUNDUP READY SUGAR BEET. J. Daniel Henningsen*, Don W. Morishita, and Donald L. Shouse, University of Idaho, Twin Falls.

Previous work on glyphosate-tolerant row crops has shown little or no interaction when glyphosate is tank mixed with insecticides or fungicides or both. In our previous work with herbicide tank mixtures, we have not seen any problems with glyphosate. Currently, the glyphosate label does not list any approved tank mixtures. It does offer this precaution: tank mixtures of this product with herbicides, insecticides or fungicides may result in crop injury or reduced weed control. Based on this label information, we determined there was need for information on the compatibility of glyphosate with other pesticides for use on glyphosate-tolerant sugar beets. Field studies were conducted in 2007 to further evaluate herbicide tank mixtures and to begin investigating potential application issues and pesticide interactions with insecticides and fungicides with glyphosate for use on glyphosate-tolerant sugar beets. One set of studies looked at glyphosate tank mixtures with other herbicides and another study evaluated three insecticides and two fungicides tank mixed with glyphosate applied to glyphosate-tolerant sugar beets. Herbicides tank mixed with glyphosate included clopyralid, cycloate, dimethenamid-P, EPTC plus trifluralin, ethofumesate, quizalofop, sethoxydim, clethodim, triflusulfuron, and ethofumesate, desmedipham, phenmedipham. Insecticides applied with glyphosate were esfenvalerate, chlorpyrifos, and cypermethrin-S and fungicides tank mixed with glyphosate were trifloxystrobin and azoxystrobin. In another study, glyphosate was applied to demonstrate efficacy under certain conditions that included: glyphosate sprayed on dusty plants with and without ammonium sulfate (AMS); sprayed on plants with heavy dew; sprayed with hard water with and without AMS; mixed glyphosate allowed to stand for 48 hours before spraying; and sprayed with a non-nitrogen based fertilizer in place of AMS. No crop injury, reduced weed control, or reduced sugar beet yield was observed with any of the herbicide, insecticide, or fungicide tank mixtures. The only exception was early common lambsquarters control with trifloxystrobin and azoxystrobin. However, this was not serious and was equal to glyphosate alone at the later evaluation date. There was no difference in root yield or recoverable sugar among any of the tank mix treatments indicating no negative interaction between glyphosate and the herbicides, insecticides, or fungicides. In a third study, the addition of a calcium-zinc fertilizer instead of AMS created the worst weed control and lowest yield of any treatment. The artificial addition of dew created conditions that allowed the best level of weed control, on average. The addition of dust to leaves of weeds before spraying resulted in very poor control in some species and no difference in others. Applying glyphosate on dusty plants resulted in the greatest yield reductions, due to reduced weed control. Dust added after spraying did not affect weed control even though this has been commonly observed commercially. [31]

CROSS-RESISTANCE PATTERNS TO ALS- AND ACCASE- INHIBITING HERBICIDES IN ONE ITALIAN RYEGRASS POPULATION FROM OREGON. Alejandro Perez-Jones and Carol Mallory-Smith, Department of Crop and Soil Science, Oregon State University, Corvallis, OR.

Diclofop-methyl, an ACCase-inhibiting herbicide, was first introduced in 1980, and was effectively used to control Italian ryegrass (Lolium multiflorum) for several years in winter wheat (Triticum aestivum). However, the continuous application of diclofop-methyl led to the selection of several resistant Italian ryegrass populations that have become a major weed problem in the U.S. Diclofop-methyl resistant Italian ryegrass is widely distributed in Oregon. Therefore, other herbicides with different sites of action,

including ALS inhibitors, have been used to control it. Here, we determined the cross-resistance pattern of one diclofop-methyl resistant population from a winter wheat field in Oregon to ALS- and ACCase-inhibiting herbicides. We found that the resistant population was cross-resistant to the aryloxyphenoxypropionic acids (AOPP) quizalofop-p-ethyl and clodinafop-propargyl, but susceptible to the cyclohexanediones (CHD) sethoxydim and clethodim, and the new herbicide pinoxaden. We also found that the resistant population was resistant to the ALS-inhibiting herbicides chlorsulfuron and metsulfuron-methyl, but susceptible to mesosulfuron. Further investigations will be conducted to determine if the mechanisms of resistance involved are target site or nontarget site. [32]

ADJUVANT CLASS SCREENING WITH PROPOXYCARBAZONE FOR CONTROL OF DOWNY BROME. Angela J. Kazmierczak* and Kirk A. Howatt, North Dakota State University, Fargo.

Adjuvants can enhance activity of herbicides to achieve better weed control. Achieving this improved weed control can depend on the adjuvant class, herbicide, or target weed species. Greenhouse experiments were established to evaluate which adjuvant class provides the greatest enhancement of activity with propoxcarbazone when applied to downy brome. Herbicide treatments were applied to downy brome with two-tillers. Treatments included propoxycarbazone at 30 g/ha with one of nine different adjuvants representing different classes. Downy brome was evaluated 21 and 35 d after treatment. Plants were harvested 35 d after treatment and fresh and dry weights were recorded. All treatments provided better than 70% control 21 d after treatment and greater than 68% control 35 d after treatment. Methylated seed oil (MSO), methylated seed oil basic pH blend, and methylated seed oil with nitrogen source provided greater than 82% control at 21 d and 85% control 35 d after treatment. Fresh weights for the above mentioned treatments were reduced by 96% when compared to the control. Petroleum oil concentrate and surfactant with nitrogen provided only 70 to 72% control at both evaluation timings although fresh weights where reduced by as much as 92%. Overall, the addition of an adjuvant system that included a MSO component provided greater control when compared to the other treatments. [33]

HERBICIDE SOLUTION PH EFFECT ON CONTROL OF DOWNY BROME AND WILD OAT. Angela J. Kazmierczak* and Kirk A. Howatt, North Dakota State University, Fargo.

Herbicide solution pH potentially can have a dramatic effect on the efficacy of a herbicide. Greenhouse experiments were conducted to evaluate whether solution pH influenced the activity of weak acid herbicides for control of downy brome and wild oat. Herbicide treatments were applied to two-tiller downy brome and three- to four-leaf wild oat. Treatments included either the herbicide, methlylated seed oil, and ammonium sulfate alone, with Climb™ (raises pH solution), or with Climb™ and Trifol™ (acidifier and buffering agent). Species were visually evaluated 21 and 35 d and biomass was harvested 35 d after treatments were applied. Results from the downy brome 21 d after treatment indicated that within a herbicide, regardless of additive, provided a narrow margin of separation. Thirty-five days after treatment, flucarbazone or propoxycarbazone with mesosulfuron provided less than 43% control of downy brome, but fresh weights were reduced by 70% when compared to the control. Propoxycarbazone with Climb™ and Trifol™ provided 85% control at 21 d which increased to 92% at 35 d with fresh weights 96% less than the control. Results from the wild oat experiment were less variable than the downy brome experiments. Sulfosulfuron at 25 g/ha, alone, provided greater than 94% control of wild oat 21 and 35 d after application and dry weight was 88% less than control plants. All treatments that included propoxycarbazone at 30 g/ha provided greater than 90% control at both evaluation timings. Mesosulfuron at 2.5 g/ha, alone and with the addition of Climb™ and Trifol™, provided 91 to 94% control while mesosulfuron with Climb™ only provided 80% control. In conclusion, downy brome control was affected more with solution pH in comparison to wild oat. [34]

WEED CONTROL IN ALFALFA USING FLUMIOXAZIN (CHATEAU). Erin L. Taylor* University of Arizona Cooperative Extension, Phoenix; and Kevin Rice, University of Arizona Cooperative Extension, Casa Grande.

Chateau (flumioxazin) was evaluated for phyto-toxicity effects at a producer's field in Coolidge, AZ during the summer of 2007. Treatments that were evaluated included Chateau at 2, 3, and 4 oz/A with follow-up treatments at 2, 3, and 4 oz/A 30 days after initial treatment. Evaluations were also made with Chateau at 8 oz/A and Chateau at 2 and 4 oz/A tank mixed with Select Max at 24 oz/A and a non-ionic surfactant at .25% v/v; Prowl H2O at 3 pts/A; and a non-ionic surfactant at .25% v/v. The Chateau treatments at 2, 3 and 4 oz/A were in a randomized complete block replicated 4 times, while the tank mixes and Chateau at 8 oz/A were used as a on site demonstration. Evaluations were taken at 4, 7, 14 and 21 DAT for phyto-toxicity levels. Due to lack of weed pressure it was only noted that there was suppression in sprangle top weed control during the first 30 days across all treatments. Phyto-toxicity to alfalfa was observed in all treatments and fell above the acceptable rate for commercial production. However, all treatments recovered from damage after 28 days and no effects were seen after cutting. [35]

WEED CONTROL POSSIBILITIES FOR NATIVE GRASSES. Barbara Hinds-Cook*, Daniel Curtis, Bill Brewster, Carol Mallory-Smith, and Andy Hulting Oregon State University, Corvallis.

Weed control is the primary issue in new and established stands of native grasses. There are few herbicides for the control of broadleaf weeds that have nonspecific labels for grass seed in both new and established crops. There are no herbicides registered for use on seedling native grass crops for the control of grass weeds. Studies were conducted to evaluate carbon seeded meadow barley, blue wildrye (Elymus glaucus Buckley), tufted hairgrass (Deschampsia cespitosa P.Beauv), and Roemer's fescue (Festuca idahoensis Elmer) tolerance to preemergence applications of diuron. Crop tolerance of the carbon seeded native grasses was excellent to all preemergence applications of diuron except the highest rate, which was more than twice the currently labeled rate for use in grass establishment. In addition, three screening studies were conducted to evaluate the safety of 32 herbicides on blue wildrye, tufted hairgrass, meadow barley, and California brome and to evaluate the control of four of the most common grass weeds, Italian ryegrass, annual bluegrass, roughstalk bluegrass, and downy brome in native grass crops. Ten herbicides from the screening trials were adequately selective. Five of the ten herbicides provided good control of the most common grass weeds found in native grass crops. Pinoxaden caused little injury (0 to 20%) on all of the species except tufted hairgrass and provided excellent control (95 to 100%) of Italian ryegrass and roughstalk bluegrass. [36]

CONTROL OF FOXTAIL BARLEY (HORDEUM JUBATUM L.)IN IRRIGATED PASTURES USING IMAZAPIC. Randall D. Violett*, Abdel O. Mesbah, and Stephen D. Miller, University of Wyoming, Laramie.

Foxtail barley is invasive to irrigated pasture and wet meadow habitats in the Western United States. In pasture settings, foxtail barley rapidly forms monoculture stands that displace favorable vegetation. On much of this land, it is not feasible to apply tillage practices because of poor drainage or shallow soil conditions. Therefore, land managers are seeking an integrated management program to control foxtail barley. A 4 year field experiment was conducted at 2 sites in northwest Wyoming to evaluate management strategies that control foxtail barley and re-establish desirable vegetation. Sites were selected based on foxtail barley concentrations, soil conditions, and the common management of livestock grazing. The soil characteristics at both sites were similar in Ph (8.2), EC (10) and texture (Clayey). Plots were 10 by 27 feet and each treatment was replicated four times in a randomized complete block design. Early application of Imazapic was very effective in reducing foxtail barley biomass by 56 to 73% and suppressing seed head production by 95 to 98%. Similarly, split application of Imazapic using 6 oz/A at 2 and 5 leaf growth stages increased biomass reduction by 12%, compared to early applications, while seed

head suppression was similar. A 98% seed head suppression is valuable in reducing the seed bank of a perennial plant that reproduces by seed. Furthermore, seed head suppression not only will increase the opportunity of desirable pasture species such as creeping foxtail that propagate vegetatively to compete, but also will allow land managers to continue to utilize their pasture. [37]

ROUNDUP READY ALFALFA: EFFECT OF WEED CONTROL ON STAND ESTABLISHMENT AND PRODUCTIVITY . Edward Davis* and Fabian Menalled, Montana State University, Bozeman.

Effective weed control during seedling establishment of dryland alfalfa is essential for optimizing stand establishment by reducing competition with undesirable plants for limited resources. A Roundup Ready alfalfa system allows the use of glyphosate (Roundup WeatherMax) herbicide at a very early timing of alfalfa development while providing broad spectrum weed control without herbicide injury to the alfalfa. A trial was established May 2005 at Bozeman, Montana to compare conventional herbicide treatments to glyphosate treatments in a Roundup Ready alfalfa production system. The study was evaluated for three growing seasons to measure weed control and alfalfa response to the initial treatments in terms of stand density, forage yield and forage quality. Glyphosate (Roundup WeatherMax) was applied at 0.75 lb ae/a (21.3 oz/a) or 1.5 lb ae/a (42.7 oz/a) to alfalfa at the 2-4 trifoliate growth stage and again at the 6-8 trifoliate growth stage. Conventional herbicide treatments included imazamox (Raptor) at 0.047 lb ai/a (6 oz/a) + clethodim (Select) 0.078 lb ai/a (5 oz/a) or Imazethapyr (Pursuit) at 0.063 lb ai/a (4 oz/a) + clethodim (Select) 0.078 lb ai/a (5 oz/a) applied at the 2-4 trifoliate growth stage of alfalfa. Also included were a no-herbicide and mowed treatment. Several broadleaf and grassy weed species were evaluated including ALS resistant kochia and Russian thistle. Total weed control was achieved with both application rates of Roudup WeatherMax when evaluated at harvest during the year of alfalfa establishment, whereas only partial weed control was achieved with the conventional herbicide treatments, due in part to the prevalence of ALS resistant kochia and Russian thistle. Mowing was not effective as a weed control treatment and was very injurious to the alfalfa. Alfalfa forage yield from conventional herbicide treatments was 55% less than the alfalfa forage yield produced from Roundup WeatherMax treatments during the first growing season, 35% less in the second growing season, and 15% less alfalfa forage production over the combined three growing seasons. Alfalfa forage quality was diminished due to the weed component of the forage sample in treatments where weed control was not complete the year of alfalfa stand establishment. [38]

CONTROL OF GLYPHOSATE-RESISTANT ALFALFA WITH HERBICIDES. Steven R. King, SARC-Montana State University, Huntley.

An experiment was initiated in 2006 in Yellowstone County, Montana to determine efficacious herbicide treatments for the control of glyphosate-resistant alfalfa. Treatments included various rates of clopyralid (79, 105, and 157 g ae/ha), dicamba (140 and 280 g ae/ha), dicamba plus diflufenzopyr (140 + 56 and 280 + 112 g ae/ha), 2,4-D ester (735 g ae/ha), and aminopyralid (52, 88, and 122 g ae/ha). Dicamba and 2,4-D were also applied in combination (140 + 350 and 280 + 350 g ae/ha). Treatments were applied 10 d after the last cutting of alfalfa in the fall. The utilization of a tillage operation in combination with herbicide applications was also evaluated. Tillage was implemented two weeks after herbicide treatments were applied. The experiment was designed as a split-plot randomized complete block with herbicide treatment as the main plot and tillage as the subplot. Prior to the first frost, alfalfa necrosis was evaluated at 44 days after treatment (DAT). Alfalfa control was evaluated at 213 and 240 DAT, and alfalfa biomass was recorded from two 61 X 61 cm quadrats placed in each plot at 265 DAT and 1 year after treatment (YAT). Alfalfa was dried and results are presented as kg dry matter per ha. Alfalfa necrosis ranged from 86% with 140 g/ha of dicamba to 100% with 88 and 122 g/ha of aminopyralid. At all evaluation dates, there was no difference between plots that received a tillage operation and those that did not with respect to alfalfa control or biomass. At 213 DAT, all rates of clopyralid and aminopyralid, 280 g/ha of dicamba, 280 + 112 g/ha of dicamba plus diflufenzopyr, 735 g/ha of 2,4-D, and both rates of dicamba plus 2,4-D

controlled alfalfa 96% or greater. 140 g/ha of dicamba controlled alfalfa only 76% at 213 DAT. At 240 DAT, alfalfa was controlled 94% or greater with 105 and 157 g/ha of clopyralid, all rates of aminopyralid, 735 g/ha of 2,4-D and both rates of dicamba plus 2,4-D. At 1 YAT biomass collected was less than 13 kg/ha from plots treated with any rate of aminopyralid. Alfalfa biomass collected from plots treated with 735 g/ha of 2,4-D and 280 g of dicamba plus 350 g of 2,4-D was equivalent to 134 and 350 kg/ha, respectively. All other treatments resulted in greater than 890 kg/ha of alfalfa dry matter. Results indicate that aminopyralid provided excellent control of alfalfa at 1 YAT. Control equivalent to that provided by aminopyralid at 1 YAT was only observed through treatments containing 735 g/ha of 2,4-D, or 280 g/ha of dicamba applied in combination with 350 g/ha of 2,4-D. [39]

DRY PEA TOLERANCE TO LINURON, DIURON, AND KIH-485. Brian M. Jenks, Gary P. Willoughby, Shanna A. Mazurek, and Lee Novak*, North Dakota State University, Minot.

Studies were conducted in 2006 and 2007 in Minot, ND to evaluate dry pea tolerance to soil-applied herbicides including linuron, diuron, and KIH-485. These herbicides have been shown to control or suppress weeds that are troublesome in North Dakota dry pea production such as prickly lettuce, false chamomile, kochia, and wild buckwheat. In 2006, linuron at 0.25, 0.5, or 1 lb ai and KIH-485 at 0.15, 0.225, or 0.3 lb ai essentially caused no visible dry pea injury. However, diuron at 1.2, 1.6, or 2 lb ai caused 14-32% crop injury at the June 14 evaluation, and 8-21% injury at the June 30 evaluation. Only diuron caused significant visible crop injury whether applied alone or tank mixed with pendimethalin. Diuron either completely killed individual plants or did not injure plants at all. There was no significant difference in dry pea yield between treatments. The 2006 growing season was very dry and likely resulted in little herbicide activation and movement. In contrast, soil conditions in 2007 were very wet with 13 inches of rainfall in May and June. Linuron caused 8% injury or less at 0.5, 0.75, and 1 lb ai. KIH-485 caused as much as 24-37% injury at 0.15, 0.225, and 0.3 lb ai. Diuron caused as much as 32-78% injury at 1.2, 1.6, and 2 lb ai. Diuron reduced dry pea yield 200-700 lb/A compared to other treatments. Dry pea yield with KIH-485 tended to be 100-400 lb/A lower than other treatments. [40]

EVALUATION OF HERBICIDES FOR CAMELINA SATIVA, A NEW CROP FOR THE CENTRAL GREAT PLAINS. Alan Helm*, Colorado State University Extension, Julesburg; Curtis Thompson, Kansas State University, Garden City; Drew Lyon, University of Nebraska, Scottsbluff.

No abstract. [41]

HERBICIDE-RESISTANT WEEDS IN THE WESTERN UNITED STATES. Steven King, SARC-Montana State University, Huntley, MT; Steven Seefeldt,University of Alaska, USDA-ARS, Fairbanks, AK; Monte Anderson, Bayer CropScience, Spangle WA; Craig Alford, DuPont Crop Protection, Wilmington, DE; John Obarr, BASF, Pasco WA.

Herbicide resistance is the inherited ability of a plant to survive and reproduce following exposure to a dose of herbicide normally lethal to the wild type. This report was conducted to update information on the number of herbicide resistant weed species that have been documented in the western United States. Information was obtained from published journals and web sites from the early 1980's to present. Resistant weed species that are present in each state were classified based on year of infestation and mode of action. Attention was focused on weed species that were documented to have developed herbicide resistance since 1998. Presently, California, Colorado, Hawaii, Idaho, Montana, New Mexico, Oregon, Utah, Washington, and Wyoming have 17, 3, 2, 7, 4, 10, 1, 8 and 1 weed species, respectively, that have been documented to be herbicide resistant. Since 1998, only California, Oregon, Idaho, Montana and Washington have documented new cases of herbicide resistance. In California, seven weed species developed resistance; Lolium rigidum (1998, ALS inhibitors), Echinochloa crus-galli (2000; ACCase inhibitors/Thiocarbamates), Phalaris minor (2001, ACCase inhibitors), Digitaria eschaemum

(2002,synthetic auxin herbicides) and Conyza canadensis and Conyza bonariensis to glycines in 2005 and 2007, respectively. In Oregon, Camelina microcarpa developed resistance to ALS inhibitors in 1999 and Lolium multiflorum to glycines in 2004. In Idaho, Amaranthus retroflexus was confirmed to be resistant to photosystem II inhibitors in 2005 and Lolium mulitiflorum was observed to be resistant to ALS inhibitors and chloracetamides in 2005. In Montana, Avena fatua was documented to be resistant to ACCase inhibitors in 2002. In Washington, Sonchus asper was documented to be resistant to ALS inhibitors in 2000 and Lactuca serriola to synthetic auxin herbicides in 2007. Although there are many additional weed species that are known to be herbicide resistant, current documentation could not be located. [42]

CONFIRMATION OF ALS-RESISTANT CHEAT AND JAPANESE BROME IN KANSAS. Dallas E. Peterson, Kansas State University, Manhattan and Curtis R. Thompson*, Kansas State University, Garden City.

Cheat and Japanese brome are winter annual bromus species that commonly infest winter wheat fields of the southern Great Plains region. Sulfosulfuron and propoxycarbazone herbicides may be applied to wheat for selective control of winter annual bromes in wheat. Several cases of poor bromus control with sulfosulfuron and propoxycarbazone were reported in central Kansas during the 2006-2007 growing season. Cheat seed from Dickinson county and Japanese brome seed from Cowley county, Kansas were collected from wheat fields that had been unsuccessfully treated with propoxycarbazone. Greenhouse experiments were conducted to determine if the two bromus populations were resistant to ALS inhibiting herbicides. Propoxycarbazone, sulfosulfuron, imazamox, and pyroxsulam were applied at typical field use rates and with recommended adjuvants to susceptible and suspected ALS-resistant cheat and Japanese brome populations at the two leaf stage of growth. Propoxycarbazone also was applied at ten times the labeled field application rate to evaluate the degree of resistance. All herbicides evaluated provided greater than 85% control of susceptible bromus populations four weeks after treatment. Control of the suspected resistant bromus populations was less than 5% with propoxycarbazone, sulfosulfuron, or pyroxsulam at two and four weeks after treatment, even with the 10X rate of propoxycarbazone. Imazamox suppressed growth of the resistant cheat and Japanese brome populations by 50 and 35% at four weeks after treatment, but plants were not killed and recovered over time. Both fields with resistant bromus populations had received several applications of propoxycarbazone or sulfosulfuron during the previous 10 year period. Isolated populations of cheat and Japanese brome in central Kansas have developed resistance to ALS-inhibiting herbicides labeled for bromus control in wheat. Alternative management practices such as crop rotation will be required in wheat fields that have developed ALS-resistant bromus populations. [43]

CAN DRIFT REDUCTION ADJUVANTS INCREASE WEED EFFICACY?. Jerry L. Ries and Richard K. Zollinger, North Dakota State University, Fargo.

In-Place and Coverage G-20 are relatively new adjuvants in the market place. In-Place reduces droplet evaporation and particle drift while increasing retention and deposition by encapsulating the herbicide. Coverage G-20 is a deposition aid and drift management agent that reduces the number of spray droplet fines, creating a uniform droplet size, enhancing deposition and coverage of the spray target, and is specifically used with glyphosate. It is thought that these drift reducing adjuvants may increase weed control by keeping more spray droplets and active ingredients confined to the target area. Studies were conducted in 2007 near Mapleton, ND, using In-Place and Coverage G-20 to evaluate weed control. Herbicides were applied at full labeled and 0.75X rates. In-Place was added to herbicides at 0.75X rates to compare weed control from herbicides at 1X and 0.75X without In-Place. PRE treatments of 1X labeled rates of acetochlor at 28 oz/A and pyroxasulfone (KIH-485) at 3.0 oz/A were applied. Soil characteristics were 3.4% sand, 60.2% silt, 36.4% clay, 4.4% OM, and 7.7 pH. POST treatments of 1X labeled rates were mesotrione at 1.5 oz/A, foramsulfuron&isoxadifen at 1.25 oz/A, topramezone at 0.26 oz/A,

tembotrione&isoxadifen at 2.0 oz/A, and dicamba&diflufenzopyr&isoxadifen at 3.1 oz/A. All 1X PRE and POST treatments were applied with atrazine at 6 oz/A. All POST treatments were applied with a methylated seed oil at 1% v/v, and 28% nitrogen at 1.5 qt/A. In-Place was applied at 1.6 oz/A. Weed control ratings were taken 14 and 28 DAT. Species rated were quinoa (Chenopodium species), amaranth, flax, foxtail millet, forage barley, and sunflower. All treatment gave 99% control of quinoa. Generally, herbicides applied at 0.75X plus In-Place gave greater weed control than 0.75X herbicides applied without In-Place and similar weed control to herbicides applied at the 1X rate without In-Place. In a separate study, seven glyphosate formulations applied at 0.25 oz ae/A and glufosinate at 7.1 oz/A were tank-mixed with Bronc Max at 0.5% v/v. The same eight treatments were also tank-mixed with Coverage G-20 at 3 oz/A product. All treatments contained 423 ppm calcium. Weed efficacy ratings were taken at 14 and 28 DAT for the same species as above. Adding Coverage G-20 increased weed efficacy ratings for all species an average of 5.5 to 18% when compared to treatments that did not contain Coverage G-20. The increase in weed efficacy is due to these drift reducing adjuvants reducing the number of fine droplets, reducing evaporation, increasing retention, therefore delivering more active ingredient to the target area. [44]

CHEMIGATION AND SPRINKLER INCORPORATION SYSTEMS FOR SMALL PLOT RESEARCH. JaNan Farr*, Justin Wheeler, and Pamela J. S. Hutchinson, University of Idaho, Aberdeen.

Abstract. Small-plot research irrigation systems were constructed to conduct chemigation and herbicide sprinkler-incorporation studies in irrigated potato cropping systems. Up to 32 plots, 6 rows (18 ft) wide by 40 ft long can be accommodated with the chemigation system (CS). The CS consists of PVC pipe risers set at a 3-ft ht, mini-wobbler, sprinkler nozzles with 3/8" diameter soft poly pipe drop lines, ¾"diameter soft poly pipe supply lines, 1" sub-mainlines soft poly pipe, and 3" PVC pipe mainline. Separate shut-off ball valves at the end of each plot line enable selective herbicide and irrigation amounts and timing on individual plots. The risers are placed between rows 1 and 2 and data is collected from rows 3 and 4. Herbicide treatments are mixed in 3 L bottles and injected into the CS with CO2. CS irrigation output is 0.31 compared with 0.21 inches per hr through a conventional solid-set system. Three, independent wheel-line system (WLS) units used for sprinkler-incorporation studies each have 7 evenly-spaced mini-wobbler sprinkler nozzles set into a 3/4'" PVC pipe attached to the 40 ft span between the wheels. Nozzles are at a 3 ft ht and directed towards the ground. Herbicides are ground-applied to 6-row, 40 ft long plots and then desired sprinkler-incorporation water amounts are applied through the WLS unit positioned parallel to and between rows 3 and 4. The WLS irrigation rate is 0.5 inches per hr. Each unit can be wheeled/carried to the next treatment plot in the replication/block. [46]

DEVELOPING AN EXTENSION IDENTIFICATION GUIDE FOR COMMON WEEDS OF THE YARD AND GARDEN. Brenda J. Lowry*, Ralph E. Whitesides, and Steven A. Dewey, Utah State University, Logan.

Invasive plants can go unnoticed by uninformed homeowners, and can spread to the wider community. It is therefore important for homeowners to be able to identify potential problems and to make informed decisions about their properties. In order to reduce the number of man-hours required to create a weed identification publication, undergraduate students were enlisted to help develop a pocket-sized booklet, entitled Common Weeds of the Yard and Garden: A Pocket Identification Guide. The project was approached with the assumption that upper level undergraduate students have the skills and ability to produce quality research and written work. The students were each assigned to write a six-page research paper on one of fifty weeds to be included in the booklet. The students were given 10 weeks to complete a rough draft, provided with suggestions for improvement, and then given 2 additional weeks to produce a final paper. Only 22% of the final papers were of high enough quality to use as direct resources for the publication. Fifty-three percent of the final papers were partially useful, particularly as sources of relevant

references. The quality of approximately 25% of the final papers was too poor for them to be used as resources for the publication. [47]

STRATEGIC PLANNING AND DECISION-MAKING: HOW THE WEED SCIENCE SOCIETY OF AMERICA (WSSA) BOARD OF DIRECTORS DECIDES WHAT TO DO. Tom C. Mueller*, University of Tennessee, Knoxville, TN and John J. Jachetta, Dow AgroSciences, LLC, Indianapolis, IN.

The Weed Science Society of America (WSSA) is a blend of volunteers and paid professionals. Much of the work of the society is accomplished by the hard work of dedicated volunteers. The WSSA has also hired Allen Marketing and Management to assist in several aspects of the operations of our society. From time to time, new ideas and proposals are submitted the board of directors (BOD) for consideration for actions and programs the WSSA should undertake. This poster discusses the decision making process and how a project is evaluated by the BOD, how the project is initiated, and how the project can become successful and a benefit to WSSA and society. [48]

WATER USE ANALYSIS OF GREENHOUSE GROWN WEEDS COMMON ON THE LEASBURG CANAL SYSTEM IN DONA ANA COUNTY, NEW MEXICO. Cheryl Fiore*, Jill Schroeder, April Ulery, New Mexico State University, Las Cruces; and Leigh Murray, Kansas State University, Manhattan.

Crop production lands in New Mexico's arid Mesilla Valley are dependent on irrigation water supplied by Elephant Butte Irrigation District. Weeds that grow along the network of canals and laterals reduce the amount of available water for irrigation, obstruct the flow of water, and produce seeds that are deposited and germinate in irrigated lands and surrounding riparian areas. A survey of vegetation growing on the Leasburg irrigation canals and laterals was conducted over 5 years. Weeds were identified and densities estimated at 236 randomly chosen sites on 180 kilometers of the Leasburg Canal System. At each sample site, data were collected within a 0.75 m by 1 m quadrat placed on the bank of the canal with the base of the quadrat at the high water line. Data were collected mid-June to late-September, once the vegetation was established along the canals. Statistical analyses were used to determine the most commonly occurring plant species. From this analysis, the following species were chosen for the 24-hour water use (WU) trials: Cynodon dactylon (bermudagrass), Plantago lanceolata (Buckhorn plantain), Rumex crispus (curly dock), Leersia oryzoides (rice cutgrass), Setaria pumila (yellow foxtail), Sorghum halepense (Johnsongrass), Distichlis spicata (saltgrass), Echinochloa crus-galli (barnyardgrass), Cyperus esculentus (yellow nutsedge), Equisetum hyemale (horsetail), Kochia scoparia (kochia), Salsola tragus (Russian thistle), Lepedium latifolium (perennial pepperweed). The experiment was set up to test water use by 12 plant species compared to bermudagrass and a no-plant control within 8 trial groups using a balanced incomplete bock design. Plants were established in cone-tainers, irrigated with water treated by reverse osmosis, and maintained in the greenhouse until the trials were conducted. Ten healthy plants of the same growth stage per species were arranged in a completely random design, and then sub-irrigated to saturate soil prior to initiating each trial. At the beginning of each trial, 500 ml of water were placed in each sub-irrigation cup and left for 24-hours. The cone-tainers were then placed above the sub-irrigation cups to collect excess soil water. The remaining water was weighed and subtracted from the 500 ml to obtain "water used". All harvested plant material was separated into stems, leaves, and flowers and roots to obtain dry weights. Water lost to evaporation in the non-planted controls averaged 31.4 ml in 24 hours. Water used by each species was greater than the non-watered control and varied by trial and species. The data were evaluated graphically by plotting water use versus either dry shoot or dry root weight. As expected, the amount of water used in 24 hours increased with increasing root or shoot weight; however, the pattern differed among species. [49]

SAGO PONDWEED (STUCKENIA PECTINATUS) RESPONSE TO SIMULATED DRY CANAL APPLICATIONS OF IMAZAMOX, IMAZAPYR, FLUMIOXAZIN, FLURIDONE, AND PENOXSULAM. Joseph Vassios, Scott Nissen, Colorado State University, Ft. Collins.

Sago pondweed (Stuckenia pectinatus) is a native aquatic macrophyte that is commonly found infesting irrigation canals across Colorado's front range. In many areas the infestations are so dense that the ability to deliver water is affected. Currently irrigation districts use one of two methods, either dredging canals with a backhoe or making multiple acrolein applications. Both of these methods only provide temporary control and acrolein can be very hazardous to applicators. This research evaluated alternative herbicide treatments that could be applied to dry irrigation canals in the late fall or early spring. Herbicides evaluated included; imazamox, imazapyr, flumioxazin, fluridone, and penoxsulam. Sago pondweed tubers were collected from dry irrigation canals and potted in soil collected from the same canal. Treatments were applied using an overhead track sprayer and incorporated with 1cm of water. Pots were then placed in cold storage for two weeks and then submersed in water. Plants were then allowed to grow for 30 days. After 30 days the plants were harvested and dry biomass was recorded. Initial studies with only imazamox and imazapyr showed that both herbicides provided approximately 95% control, with no significant difference between rates. Another study showed that imazamox, flumioxazin, fluridone, penoxsulam and a combination of fluridone and penoxsulam all resulted in significant control of sago pondweed. All of these herbicides seem to provide good control of sago pondweed and their performance needs to be evaluated in a field environment. [50]

BROADLEAF HERBICIDE EFFECTS ON ESTABLISHED NATIVE FORBS, SHRUBS, AND GRASSES. James R. Sebastian* and K.G. Beck, Colorado State University, Fort Collins.

Our knowledge about the effects that herbicides have on native plant populations is insufficient, particularly for forbs and shrubs. Recent research demonstrates the importance of having forbs as part of the plant community to resist re-invasion by weedy forbs after they are controlled. If herbicide injury and effects on native species are known, one may choose those herbicides that are most efficacious on the target weed yet have the least impact on desirable native species. We initiated this study to compare the effects of commonly used herbicides on specific native forbs and shrubs. Herbicides were sprayed May 25, 2006 and the experiment was a randomized complete block design with four replications. The site was upland and extremely diverse with 71 different species present. Wood's rose (Rosa woodsii; ROSWO, 31% species composition) was the dominant species at this site. Other major native forbs included Howard's evening primrose (Oenothera howardii; OENHO, 11%), fineleaf hymenopappus (Hymenopappus filifolius; HYMFI, 11%), and blue flax (Adenolinum lewisii; ADELE, 9% species composition). Purple threeawn (Aristida purpurea; ARTPU) was the dominant grass species but comprised only 3% of the total species composition. All other native and weedy species comprised trace to 3% of species composition. Species were evaluated individually by determining their densities in each 10 by 30 ft plot and canopy cover of functional groups also was evaluated. There were dramatic species shifts in 2007 (1 YAT). Dicamba plus diflufenzopyr caused the least impact. Native species density, richness, and canopy cover were similar to untreated check plots where dicamba plus diflufenzopyr was sprayed (Tables 1-4). Most herbicides caused increases or decreases in particular forb and shrub species. One-sided penstemon (Penstemon secundiflorus) appeared to be especially sensitive to many herbicides except dicamba plus diflufenzopyr, tripclopyr plus clopyralid, and aminopyralid (Table 1). Little bluestem increased in most herbicide treated plots but increased dramatically in plots treated with clopyralid and metsulfuron plus dicamba plus 2,4-D. Purple threeawn increased in all plots except dicamba plus diflufenzopyr, quinclorac, and 2,4-D ester. Species richness varied among treatments (Table 3). Untreated check plots averaged 30 species/plot of the 64 desirable species present. Plots treated with clopyralid, clopyralid plus 2,4-D, dicamba plus diflufenzopyr, picloram, and quinclorac displayed similar species richness as the untreated plots 1 YAT while plots treated with metsulfuron plus dicamba plus 2,4-D had the lowest species richness (Table 3). There were more weedy forb species present in plots treated with

metsulfuron or metsulfuron plus dicamba plus 2,4-D. The increase in weedy species may have been due to the higher amount of bare ground in these plots. It also appears that the two metsulfuron-treated plots selected for higher grass density and grass canopy cover at the expense of the forbs. Wood's rose density and canopy cover in 2,4-D-treated plots increased compared to untreated checks (Tables 2 and 4). Rose shoots burned down but re-sprouted in response to 2,4-D treatments. Fineleaf hymenopappus, little sunflower (Helianthus pumilus), winged buckwheat (Pterogonum alatum), robust spurge (Tithymalus brachyceras), and one-sided penstemon also decreased in 2,4-D-treated plots. This may have been caused by herbicide injury or competition from re-surging rose, or possibly both. Imazapic, dicamba, metsulfuron, chlorsulfuron, and picloram, decreased rose density 73 to 98% (Table 2) and plants not sensitive to these herbicides increased (Table 1). For example in picloram-treated plots, little bluestem, purple threeawn, Howard's evening primrose, slimflower scurfpea, blue flax, sand lily, and robust spurge density increased 150 to 428% whereas Wood's rose density dropped to 30% of untreated checks. Our research represents a first approximation to define potential injury and species shifts that may occur to native forbs and shrubs when treating invasive weeds. [51]

USU WILDLAND WEED MAPPING METHODS TRAINING SUPPLEMENT. Kimberly A. Edvarchuk* and Steven A. Dewey, Utah State University, Logan.

An integral part of wildland weed management is conducting thorough surveys and inventories to produce accurate maps of weed abundance and distribution. Data gathered during a well-designed and implemented weed survey or inventory provide invaluable information for guiding control and monitoring efforts. Utah State University's weed mapping crews have conducted numerous weed surveys and inventories for various federal, state, and local government entities over the past ten years, gaining considerable knowledge that we believe can improve the success and accuracy of many other weed mapping programs. As the experience of USU's weed mapping crews grew, so did the number of requests to share that expertise with others. Specific needs expressed by various land managers included information on how to conduct thorough yet efficient field searches, defining what constitutes a single weed patch or infestation, ways to accurately determine patch size, documenting weed-free searched areas, and how best to train crews. USU began offering classroom and field training in weed mapping techniques to public land managers in 2003 to help address these and other common questions. Each training course was customized to fit the goals, agency-specified standards and protocols, and equipment resources of those attending. Although there were many differences, it quickly became apparent that all weed mapping projects have many of the same basic needs, and that certain concepts and techniques can be shared by all to improve the quality of data collected. The USU weed mapping methods supplement was created initially as the training manual for our own courses. However, its application has been expanded to help public land managers train their own crews in those topics common to nearly all weed mapping projects, thereby improving and enhancing those procedures already in use by each agency. [52]

COMPARATIVE RATES OF METABOLISM OF ATRAZINE, PROPAZINE, AMETRYN AND METRIBUZIN, IN 19 SOILS WITH DIFFERENT HISTORIES OF TRIAZINE USE.. Dale Shaner* USDA-ARS, Fort Collins, CO; Brien Henry, USDA-ARS, Mississippi State, MS; Jason Krutz, USDA-ARS, Stoneville, MS; Curtis Rainbolt, University of Florida, Belle Glade; Michael Poteet, Hawaii Agriculture Research Center, Aiea.

Atrazine is a soil-applied herbicide that is used for controlling many broadleaf and certain grass weeds in corn, grain sorghum, sugarcane and orchards. Continuous use of atrazine can select for soil microorganisms that rapidly metabolize the herbicide. Research in Colorado and Mississippi showed that atrazine has a half life of three to seven days in fields with a history or atrazine use, which leads to a loss of weed control. However, there are other triazines besides atrazine that are used in these crops for weed control including simazine, propazine, ametryn and metribuzin. This research was conducted to determine if soils that contain microorganisms that can rapidly metabolize atrazine will also metabolize other

triazine herbicides. A laboratory assay was conducted on 19 soils with different histories of triazine use from California, Colorado, Florida, Hawaii and Mississippi. The herbicides tested were atrazine, propazine, ametryn and metribuzin. Atrazine, propazine and ametryn are symmetrical triazines with alkyl substitutions at the 2 and 4 positions and a chlorine or methyl-thio substitution at the 6 position whereas metribuzin is an asymmetrical triazine. Soils were treated with approximately 1 g of each herbicide per 1 kg of soil. The herbicides were extracted by water at 0, 1, 2, 4, 7, 14, 21, 28 and 35 days after treatment and analyzed by HPLC. The rates of degradation ranged from 0.8d to 13.9d, 1.4d to 18.9d, 0.6d to 17.8d, and 4.0d to 17.2 d for atrazine, propazine, ametryn and metribuzin, respectively. The half life of atrazine in these soils was highly correlated to the triazine use history: the longer the history of triazine use, the shorter the half life. The average half life of the herbicides across all soils was atrazine=ametryn<<0.001), whereas there was no correlation between metribuzin degradation and the rate of degradation of the other triazines. The results suggest that the soil microorganisms that have been selected through continuous use of atrazine (or simazine) can metabolize a range of symmetrical triazines with alkyl substitutions but not an asymmetrical triazine. [53]

ENVIRONMENTAL AND GENETIC EFFECTS ON SEED DORMANCY AND GERMINATION IN JOINTED GOATGRASS. Lynn Fandrich* and Carol A. Mallory-Smith, Oregon State University, Corvallis; Tony D. White, Monsanto Company, Hannibal, MO; Thomas F. Peeper and Amber Roberson, Oklahoma State University, Stillwater; Joseph P. Yenish, Washington State University, Pullman.

Environmental and genetic factors that control the onset and release of seed dormancy in jointed goatgrass are not well understood. Four jointed goatgrass populations and several winter wheat cultivars were grown in common garden nurseries at seven sites in Kansas, Oklahoma, Oregon, and Washington over two years. Germination tests were conducted over 12 d using spikelets and seed that were after-ripened (AR) at 10, 20, 30, and 40 C for 12-wk. In both years, results depended on AR temperature, nursery environment, and jointed goatgrass population. There was a general loss of seed dormancy after 12-wk AR. In year one, after-ripened jointed goatgrass seed germinated 41-63% faster and final germination values were 17-28% greater than control seed. AR temperature explained a greater proportion of the variation in germination compared to environment or jointed goatgrass population. Germination of wheat seed was not affected by AR temperature or cultivar. In year two, after-ripened jointed goatgrass seed germinated 43-70% faster and final germination values were 20-45% greater than control seed. Nursery environment was more influential on germination than AR temperature or jointed goatgrass population. Dormancy in jointed goatgrass is more a function of environment than genetic variation. Mean monthly temperatures and total monthly precipitation during spikelet development did not predict dormancy and germination in jointed goatgrass. [54]

UTILIZING R SOFTWARE PACKAGE FOR DOSE RESPONSE STUDIES: THE CONCEPT AND DATA ANALYSIS. Stevan Z. Knezevic, Associate Professor, Haskell Ag. Lab., University of Nebraska, Concord, NE, 68728-2828, and Jens C. Streibig, and Christian Ritz, Professor and Post Doc, Royal Veterinary and Agricultural University (KVL), Copenhagen, Denmark ..

Advances in statistical software allow both standard and more complex statistical methods for non-linear regression analysis of dose response curves to be carried out conveniently by non-statisticians. One such statistical software is the freely available program R with the drc extension package. The drc package can: (1) simultaneously fit multiple dose-response curves, (2) compare curve parameters for significant differences, (3) calculate any point along the curve as the response level of interest, commonly known as an effective dose (eg. ED30, ED50, ED90), and determine its significance, (4) generate graphs for publications or presentations. We believe that when it comes to dose response data, the drc package has advantages over many currently available statistical software programs for non-linear regression analysis. Therefore, our objectives are to: (1) provide a review of few common issues in dose response curve

fitting, (2) facilitate the use of up-to-date statistical techniques for analysis of dose response curves and (3) invite further debate on the subject (sknezevic2@unl.edu). [54a]

GROWTH DYNAMICS OF GIANT REED FROM LEAF TO STEM. Kira M. Zhaurova* and Georgianne W. Moore Texas A&M University, College Station.

Giant reed is a tall invasive grass that forms dense monoclonal stands along rivers and streams of North America. Existing evidence suggests that this weed out-competes the native riparian flora and provides an unsuitable habitat for the wildlife. As such, there is much interest in developing methods to quantify this weed's stand dynamics and estimate its spatial and temporal growth variability. The main objective of this study is to develop allometric relationships of stand characteristics, such as stand height, density, and basal stem diameter, in order to reliably predict biomass and leaf area. Additionally, spatial and temporal variation is captured to apply these measurements on a stand level overtime. Spatial variability is delimited by measuring biomass within a stand both vertically within the canopy and horizontally with distance to the river along a moisture stress gradient, while temporal variation is measured bi-monthly throughout the season. Field measurements used in this study are collected over the period of 1 year along the Rio Grande (TX). Our preliminary results suggest that leaf area (A, n=90 stems) correlates most closely with biomass (M, n=291 stems) and distance from the river (X, n=4 plots). A= e ^ (4.292983 + 0.853487*Ln (M) + (-0.00988)*X), Avg. % Error = 16.076%. In addition to providing an estimate of growth and temporal variation, these measurements will be useful in quantifying Giant Reed's water use, a subject of much interest in measuring its ecological impact and developing management strategies. This work is a contribution to our general understanding Giant Reed's stand dynamics and a vital step towards measuring its impact on water resources. [55a]

PROJECT 1: WEEDS OF RANGE AND FOREST

FALL APPLICATIONS OF RIMSULFURON IN RANGELANDS FOR THE CONTROL OF DOWNY BROME AND MEDUSAHEAD. Craig M. Alford*, Ronnie G. Turner, Jerry R. Pitts, Michael T. Edwards, Norman D. McKinley, C. William Kral, John D. Cantlon, Roxanne K. Gutschenritter DuPont Crop Protection, Wilmington, DE .

Downy brome and medusahead are non-native, winter annual grass species that are rapidly invading rangeland communities across the western United States. Research has been conducted with the low use rate, sulfonylurea herbicide, rimsulfuron, showing excellent control of downy brome and medusahead. The studies were established in rangeland sites in the western US, using a randomized complete block test design containing a minimum of three replicates. Plots sizes ranged from 10 by 30 to 50 feet and application dates ranged from late October to early December. Evaluations were made the following spring, rimsulfuron alone treatments at rates of 0.75 - 1 oz ai/A plus a surfactant provided 88-92% control of downy brome, 180 DAT. In trials established on medusahead, rimsulfuron alone at 1 oz ai/A plus surfactant provided 84% control, 180 DAT. Treatments that included chlorsulfuron to provide additional broadleaf weed control also increased downy brome and medusahead control by 2-11%. These studies indicate that late fall applications of rimsulfuron could be an excellent tool to help manage these two invasive weed pests and aid in restoring infested rangeland to productive use. Additional trials are being conducted to establish grass plant back intervals for rimsulfuron. [75]

SOIL CHARACTERISTICS ASSOCIATED WITH DOWNY BROME INVASION OF A WYOMING RANGELAND. Caley Gasch-Salava* and Stephen Enloe, University of Wyoming, Laramie, WY.

The pervasiveness of exotic annual bromes has encouraged numerous studies to examine their biology, control, and invasion ecology. However, we lack understanding in how these changes influence soil biota, which fulfill important functions in plant communities. Arbuscular mycorrhizal fungi (AMF) are soil

mutualists that associate with plant roots, effectively increasing root surface area in exchange for carbon. This study examined soil characteristics and AMF activity associated with annual brome-invaded sagebrush communities. Soil was collected at 18 native and 18 invaded plots near Worland, Wyoming in the spring of 2007 and separated into three depths. Soil samples were analyzed for phosphorus, nitrogen, carbon, and AMF spore abundance. Samples were subject to a greenhouse bioassay to measure growth rates of a native perennial grass (Sandberg's bluegrass) and an annual bromegrass (downy brome). Phosphorus and carbon were higher in invaded soils at all depths. Low nitrogen levels precluded detecting trends within and between native and invaded soils. Spore abundance was similar between native and invaded soils and decreased as depth increased. Bioassay results indicate that surface soils from all plots supported greater downy brome growth, and invaded soils supported greater growth than native soils at 0-5 cm. Growth of Sandberg's bluegrass declined in invaded soils as depth increased. These results demonstrate that annual brome invasion is altering soil characteristics within the top 30 cm of soil; spore stages of AMF are unaffected by annual brome invasion; and brome performs best in invaded soils, while native perennial performance differs between native and invaded soils. [76]

INTEGRATED GIS BASED INVASIVE SPECIES MANAGEMENT. John L. Baker* and Kim K. Johnson, Fremont County Weed and Pest, Lander, WY.

Fremont County Weed & Pest Control District is charged with implementing an effective program for the control of designated weeds and pests across six million acres of land in central Wyoming. The district works with Federal, State, Tribal, and private land managers to provide an integrated approach to invasive plant control and general vegetation management. In 1994, the District began to convert from a paper based mapping system to a GIS computer based system. Over the years this effort has evolved into a highly integrated system that ties planning, mapping, treatment activity, accounting, monitoring, reporting, public awareness, and resource management together. This GIS system relies on digital data from different sources and numerous software applications from a variety of vendors to produce tools used daily to manage District operations. [77]

PROBABILITY OF OCCURRENCE MAPS FOR INVASIVE WEEDS USING ONLY WEED PRESENCE LOCATIONS. Melissa Bridges*, Thomas J. Stohlgren, Paul H. Evangelista, Sunil Kumar, Philip Westra, and Robin M. Reich, Colorado State University, Fort Collins.

A current challenge for land managers is efficiently spatially characterizing the distribution of noxious weeds at a resolution relevant for prioritizing management, restoration, and long-term monitoring. Generating probability of occurrence maps for individual species and combining that information with estimates of species abundance may provide the information needed to effectively plan precision management strategies; however, many statistical models that estimate species distribution require both presence and absence data. The objectives of this study were to derive methods for generating a species distribution map with presence-only data and developing a habitat risk model for an invasive species. Presence locations and estimates of percent cover for Russian-olive (Elaeagnus angustifolia L.) were collected on multiple open space areas within Boulder County, Colorado. A probability of occurrence map for Russian-olive was derived at a 10 m resolution using an ecological niche model, Maxent. Maxent uses a maximum entropy approach to modeling the spatial distribution of a species based on the sample locations for the species and a set of geo-referenced environmental data layers. The Maxent-derived model for Russian-olive had an area under the curve (AUC) of 0.95 and correctly classified 96% of the presence points in an independent dataset. A geographic model depicting estimates of percent cover was also derived using discriminant analysis. Techniques for producing habitat risk models derived from species distribution and vegetation density estimates will be discussed using the Russian-olive data with an emphasis on methods for generating model inputs. [78]

INTEGRATING HERBICIDES AND PERENNIAL GRASS REVEGETATION FOR WEED SUPPRESSION IN PASTURE AND NON-CROP AREAS IN NORTHERN CALIFORNIA. Rob Wilson*, University of California Cooperative Extension, Susanville; Steve Orloff, University of California Cooperative Extension, Yreka; Don Lancaster, University of California Cooperative Extension, Alturas; Joseph DiTomaso, University of California, Davis; Harry Carlson, and Don Kirby, University of California IREC, Tulelake.

Non-cropland such as ditch levees, roadsides, field borders, fencerows, and wildlife areas are very vulnerable to weed invasion. Most of these sites have been disturbed and lack competitive, desirable vegetation. This project addressed the importance of revegetation and integrated weed management for weed control in non-crop areas. The study evaluated 13 perennial grass species on their establishment success, vigor, and ability to suppress weeds. The study also evaluated the influence herbicides have on weed control and grass establishment. Treatments were applied to six non-crop sites heavily infested with weeds in Northeastern California starting in 2005. The experiment was a split-block design. Chemical weed control the year of seeding and year after seeding was critical for successful native and introduced perennial grass establishment. In untreated plots, weed cover was greater than 50% and average seeded grass cover was less than 6% at all sites two years after seeding (one year after the final herbicide treatment). In plots where herbicides gave effective weed control and grass safety, average seeded grass cover was 25 to 35% two years after seeding. Individual grass species cover differed between sites. Crested wheatgrass (Agropyron cristatum (L.) Gaertn.), tall wheatgrass (Thinopyrum ponticum (Podp.) Z.-W. Liu & R.-C. Wang), Russian wildrye (Psathyrostachys junceus (Fisch.) Nevski), western wheatgrass (Pascopyrum smithii (Rydb.) A. Löve), bluebunch wheatgrass (Pseudoroegneria spicata (Pursh) A. Löve), and thickspike wheatgrass (Elymus lanceolatus (Scribn. & J.G. Sm.) Gould.) showed broad acclimatization and had grass cover over 30% averaged across sites two years after seeding. Grass species with high cover, especially crested wheatgrass, had up to 90% lower weed cover when used in combination with herbicides compared to herbicide-treated plots without zero grass cover two years after seeding. [79]

THE EFFECTS OF PUCCINIA JACEAE ON YELLOW STARTHISTLE COMPETITION AND GROWTH. Jon M. O'Brien*, Joseph M. DiTomaso, Guy B. Kyser, University of California, Davis, and Dale M. Woods, California Department of Food and Agriculture.

A new bio-control rust, Puccinia jaceae var. solstitialis, was introduced to control yellow starthistle (Centaurea solstitialis) in 2003. To test the effects of the rust on the weed under field conditions, we performed two experiments in 2006 and 2007. The objective of the first experiment was to examine the effects of the pathogen on the above ground biomass production of yellow starthistle (YST) using both an additive and replacement series design. As part of this experiment, we also evaluated the effect of the rust on the competitive ability of YST with the common rangeland annual grass wild oat (Avena fatua). The objective of the second experiment was to test the interaction of the rust with two common insect bio-control agents (Eustenopus villosus and Chaetorellia succinea). In both experiments, we measured infection rates over time, YST chlorophyll levels, seedhead production, and vegetative biomass. Insect attack rates were also determined on a subset of mature seedheads. On a per leaf basis, chlorophyll levels were significantly reduced by increased infection with the rust. In YST monocultures, the rust had no effect on any of the growth or reproductive variables measured. However, in the competition experiment with wild oat, there were several rust-induced reductions in YST performance. Infected plants had fewer leaves overall than non-infected plants. The rust decreased overall YST biomass/m2 over both years of the experiment, and seedling diameters in 2007. Seedheads in inoculated plots developed earlier in the season than those in non-inoculated plots. Also, there was a trend towards reduced total seedhead numbers. No interaction effect was found between the rust and the insect bio-control agents. The results indicate that the rust had minor negative affects on yellow starthistle growth and reproduction, especially under conditions of interspecific competition. However, these effects do not appear to be biologically

significant and the presence of the rust is unlikely to lead to large-scale declines in the YST populations statewide. [80]

INCUBATOR FOR INVASIVE PLANTS: A SURVEY OF INVASIVE PLANTS ON THE ARIZONA STATE UNIVERSITY TEMPE CAMPUS. Amy E. Coe* and John H. Brock, Applied Biological Sciences, Arizona State University Polytechnic, Mesa.

Urban landscapes can often be utilized to infer the invasive nature of horticultural species. A common point of plant introduction may be an urban area with a species escaping the anthropogenic area into adjacent natural landscapes. The Tempe campus of Arizona State University was surveyed in the spring of 2007 for plants displaying invasive characteristics in the campus landscape. This site was chosen because it has landscaping representative of urban areas of the desert southwestern USA and a history of horticultural plantings dating to 1855. This campus also has been designated as an arboretum. Invasive species were identified, the number present at that point recorded and the site of occupany marked by global positioning (GPS) equipment. A total of twenty-three non-native species growing "out of place" were recorded. Thirteen plant families representing five continents make up the data set. The most common invasive species was Bermuda grass (Cynodon dactylon) and African sumac (Rhus lancea) was the most common invasive woody plant. The GPS and plant density data were placed in a geographic information system (GIS) to display invasive species distributions across the campus. [81]

GREASEWOOD (SARCOBATUS VERMICULATUS), RUBBER RABBITBRUSH (CHRYSOTHAMNUS NAUSEOSUS) AND PLANT COMMUNITY RESPONSE TO CHLORSULFURON AND METSULFURON. Jordana LaFantasie*, Stephen Enloe, Andrew Kniss, Mark Ferrell, University of Wyoming, Laramie.

Greasewood and rubber rabbitbrush (Chrysothamnus nauseosus (Pall.) Britt.) are important shrub components of several plant communities throughout Western North America. While these species may be viewed positively or negatively by land managers with differing goals, greasewood and rabbitbrush communites are often invaded by Russian knapweed, perennial pepperweed, and halogeton. Metsulfuron and/or chlorsulfuron effectively control these invaders, but how they impact greasewood and rabbitbrush is uncertain. Therefore, our objective was to quantify the impact of these herbicides on greasewood and rabbitbrush communities. Field studies were established in 2004 and 2005 near Laramie, Wyoming in a pasture with mixed stands of greasewood and rubber rabbitbrush. Treatments included metsulfuron at 21, 42, 63, 84, 126, and 168 g/ha, chlorsulfuron at 52, 105 and 157 g/ha, and an untreated control. All treatments contained methylated seed oil at 2% v/v. Treatments were broadcast applied at 187 l/ha in mid-June to 3.3 by 9 m plots. The study design was a randomized complete block with three replicates. We sampled at 12, and 24 months after treatment (MAT), utilizing visual control estimates and point frame sampling for plant cover. We found metsulfuron at 42 g/ha and chlorsulfuron at 105 g/ha provided approximately 80% control of greasewood 24 MAT while lower rates of both herbicides provided approximately 40-50% control. For rubber rabbitbrush, metsulfuron at 63 g/ha provided approximately 60% control 24 MAT while chlorsulfuron had little impact. Based upon these results land managers can expect shifts in greasewood and rabbitbrush community composition when these herbicides are broadcast applied. [82]

RUSH SKELETONWEED (CHONDRILLA JUNCEA); ONLY FOUR GENOTYPES FOUND IN NORTH AMERICA. John Gaskin, USDA ARS, Sidney, MT Mark Schwarzlaender, University of Idaho, Moscow.

Rush skeletonweed (Chondrilla juncea L.; Asteraceae) is a perennial invader from Eurasia, now found in temperate regions of the Americas and Australia. In North America this species is especially problematic in Idaho, Washington, Oregon, California and southern British Columbia. The plants appear to be

obligate apomicts in the invaded areas, and are thus represented by clonal lineages. Earlier research described only a few morphotypes in the USA and Australia, compared to hundreds of morphotypes in the native range. Some invasive morphotypes appear to be resistant to some current biological control agents. Hundreds of plants from invaded areas were studied with a more variable molecular marker (AFLPs; Amplified Fragment Length Polymorphisms) than was used in previous studies (enzyme analysis). The results indicated that there are five genotypes in North America, three in Australia, and one in Argentina, with no genotypes shared between invasions. In addition, North American AFLP genotypes correlated significantly with many morphological features. Based on these results, the intention is to utilize and integrate optimum biological control methods among invaded countries, and eventually determine distinct origins of invasive genotypes so as to enable discovery of genotype-specific biological control agents. [106]

PRAIRIE COMMUNITY RESPONSE TO AMINOPYRALID. Travis L. Almquist* and Rodney G. Lym, North Dakota State University, Fargo.

Aminopyralid will control Canada thistle in non-crop areas, but the efficacy on native plant communities is unclear. A study was conducted to evaluate the effect of aminopyralid on Canada thistle and native species at the Glacial Ridge Preserve on a restored prairie managed by The Nature Conservancy in Polk County, MN. Thirty Canada thistle-infested and native blocks were selected and aminopyralid was applied at 120 g/ha in Sept. 2006. Blocks were 9 m x 6 m and consisted of treated and non-treated plots which were 4.5 m x 6 m. Canada thistle density and plant community composition were determined prior to and 10 mo after treatment (MAT) in all plots. Canada thistle stem density was reduced from 16 to 0.1 stems/m2 10 MAT while foliar cover was reduced from 11% to 0.1%. Other forb species, both desirable and undesirable, were reduced by aminopyralid. Native grass foliar cover increased 10 MAT in both Canada thistle-infested and native plant communities. Species richness, evenness, and diversity were reduced by aminopyralid 10 MAT in both Canada thistle-infested and native plant communities. For example, native plant community richness 10 MAT averaged 15 species in non-treated compared to 10 species in treated plots. The reduction in species richness was due to the removal of forb species from the treated plots while reduction in species evenness was due to the increased native grass cover and decreased forb cover. [107]

PRICKLY LETTUCE RECRUITMENT AND CONTROL IN CRP LAND IN EASTERN WASHINGTON. Randall Stevens* and Ian C. Burke, Washington State University, Pullman.

Field trials were established in the spring of 2007 on two different conservation reserve program (CRP) sites in the Palouse region of Eastern Washington, Dusty (11 to 14 inches of rainfall) and Harder (18 to 21 inches of rainfall). Success of prickly lettuce was evaluated at each site as well as the efficacy of combinations of herbicides with soil residual activity (PRE) and herbicides with postemergence (POST) activity. The study was an RCBD design with a factorial arrangement of treatments. The study had three factors: 1) flumioxazin (0.25lb ai/A), imazapic (0.05lb ai/A), or nothing; 2) 2,4-D (0.5lb ai/A), aminopyralid (0.109lb ai/A), aminopyralid + 2,4-D, triclopyr (1 lb ai/A), triclopyr + 2,4-D, clopyralid (0.375lb ai/A), clopyralid + 2,4-D, or nothing; and 3) mowing or no mowing. Prickly lettuce cover was evaluated using a point-intercept method across the diagonal of each plot at intervals of 14, 32, 71, and 106 days after treatment (DAT). Percent weed free was calculated from percent cover of prickly lettuce in each plot. At the Dusty site all treatments were >94% prickly lettuce free (including the nontreated control) with no differences among treatments at 106 DAT. This was most likely do to a lack of precipitation during the period of the study that reduced prickly lettuce coverage. At the Harder site POST herbicides applied without either PRE herbicide options had the least control (<68% weed free). POST herbicides applied in combination with flumioxazin PRE reduced prickly lettuce populations considerably, with treatments ranging from 70% to 100% weed free. The highest level of control was provided when flumioxazin was mixed with aminopyralid + 2,4-D. Varied results from the use of

imazapic were observed, from 51% to 92% weed free. In contrast a standard application of 2,4-D alone increased prickly lettuce coverage compared to the nontreated control. Mowing made no difference at the Dusty site, where lower precipitation reduced prickly lettuce coverage. At the Harder site prickly lettuce coverage was less in the mowed treatments, 87% weed free, compared to non-mowed treatments that were 50% weed free. [108]

NOXIOUS WEED AND INVASIVE PLANT CONTROL WITH GF-2050, A NEW RANGELAND AND PASTURE PRODUCT FROM DOW AGROSCIENCES. Mary B. Halstvedt* and Vanelle F. Peterson, Dow AgroSciences, Billings, MT and Mulino, OR; Celestine A. Duncan, Weed Management Services, Helena; Stephen F. Enloe, University of Wyoming, Laramie; and Rob G. Wilson, University of California, Susanville.

A new Dow AgroSciences product with aminopyralid and metsulfuron (GF-2050) is being tested for use on rangeland, pastures, Conservation Reserve Program (CRP) land, and wildland. The maximum label rate for GF-2050 is 2.02 oz ae/A (3.3 ounces product/acre). Field studies were initiated at five locations to determine efficacy of GF-2050 on mixed noxious weed populations. GF-2050 at 1.12, 1.56, and 2.02 oz ae/A was compared to aminopyralid at 1.3 and 1.71 oz ae/A, metsulfuron at 0.29 oz ae/A, and metsulfuron + chlorsulfuron at 0.143+0.164 oz ae/A. Weeds included in the experiments were Canada thistle (Cirsium arvense), hoary cress (Cardaria draba), common tansy (Tanacetum vulgare), and houndstongue (Cynoglossum officinale). GF-2050 applied at the correct timing will be an excellent option for weed managers to control a complex of key noxious weeds. [109]

USE OF AMINOPYRALID IN HABITAT RESTORATION PROJECTS. Vanelle Peterson*, Dow AgroSciences, Mulino, OR; Dean Gaiser, Eco-Logical Management, Newman Lake, WA; Jerry Benson, BFI Native Seeds, Moses Lake, WA; and Mike Finch, Washington Dept of Fish and Wildlife, Creston, WA .

Aminopyralid (Milestone® specialty herbicide) is a new herbicide developed by Dow AgroSciences for managing noxious and invasive plants in range and pasture, rights-of-way, and other non-cropland sites that controls over 60 susceptible herbaceous broadleaf plants including yellow starthistle (Centaurea solstitialis), Canada thistle (Cirsium arvense), and spotted knapweed (Centaurea maculosa). A research trial was established in fall 2005 in Creston, Washington to investigate the effects of applications of aminopyralid around the time of planting grasses in a restoration project. A randomized complete block arranged as a split plot was used to investigate the effect of aminopyralid application timing on establishment of fall dormant planted grasses compared to picloram applications. Herbicides were applied May 10, 2005 (before planting), November 22, 2005 (at fall dormant planting), and June 8, 2006 (after grass seeding emergence). Treatments were: aminopyralid at 1.75 oz/A; aminopyralid + 2,4-D at 1.75 oz + 16 oz/A; aminopyralid at 3.5 oz/A (2 times the maximum broadcast use rate per acre); picloram at 8 oz/A; picloram + 2,4-D at 8 oz + 16 oz/A; picloram at 16 oz. Plots were 20 X 50 ft in size and treatments were applied with an ATV-mounted Boominator 1250 nozzle at a spray volume of 26 GPA. Grass seed planted on November 11, 2005 included bluegrass (Sherman, Sandberg, Canby), bluebunch wheatgrass (Secar, Whitmar), thick spike wheatgrass, Idaho fescue, and basin wildrye. Forbs were also planted, but did not establish in herbicide-treated areas or areas not treated with herbicide. Grass stand counts and height were measured June 21, 2006 and June 11, 2007. Grass biomass (g/m2) was harvested August 10, 2006. Plant counts and height across grass species were not affected by the herbicide or herbicide application timings. Grass injury attributed to herbicides occurred to a varying degree depending on herbicide and application timing. Symptoms included twisting of leaves and stems and less erect growth but not leaf discoloration. Usually, aminopyralid at 1.75 oz with or without 2,4-D caused the least grass injury. The greatest injury to planted grasses was observed where herbicides were applied post emergence when grasses were at the 4 to 7 leaf growth stage. Although injury symptoms were observed, there were no differences in grass biomass between herbicide and non-treated treatments. Percent visual control

assessments of tumble mustard (Sisybrium altissimum) and downy brome (Bromus tectorum) were taken June 21, 2006 and May 3, 2007. The most effective timing of application for control of tumble mustard was post grass emergence when all treatments provided 98 to 100% control. Pre plant and at plant fall applications of picloram were more effective (82 to 96%) than the same timings with aminopyralid (33 to 65%) at controlling tumble mustard. Good to excellent control of tumble mustard continued through May 2007 for all treatments applied at post grass emergence (80 to 98%), and for pre plant spring application of picloram at 16 oz/A (95%) and at plant fall treatments of picloram at 16 oz/A (98%) and picloram + 2,4-D at 8 oz + 16 oz/A (92%). Control of downy brome was highly variable, but control was excellent with pre plant spring and at plant fall applications of aminopyralid at 3.5 oz (88 to-92%), 2 times the maximum broadcast use rate per acre. No herbicides controlled downy brome when applied at the post grass emergence timing (3 to 23%). ®Trademark of Dow AgroSciences LLC [110]

CANADA THISTLE CONTROL FROM COMBINATIONS OF AMINOPYRALID AND PERENNIAL GRASSES. Robert G. Wilson*, University of Nebraska, Scottsbluff; Scott J. Nissen, Colorado State University, Ft. Collins; and Stephen Enloe, Auburn University, Auburn.

Experiments were conducted near Scottsbluff, NE, Ft. Collins, CO, and Laramie, WY from 2005 through 2007 to determine the efficacy of aminopyralid alone or in combination with perennial grasses for Canada thistle control. The experiment at each site consisted of five treatments: aminopyralid applied at 122 g ae/ha either in the fall of 2005 or spring of 2006, aminopyralid applied in the spring or fall plus a dormant seeding of perennial grasses during the winter of 2005/2006, or a treatment that received no aminopyralid. Plot size varied between 3.5 to 6 m wide by 11 to14 m long and treatments were replicated four times. Each plot seeded to perennial grasses was split in half and half the plot was seeded with a mixture of introduced forage grasses and half with a mixture of native grasses. At Nebraska and Colorado the introduced mixture consisted of Luna pubescent wheatgrass, Oahe intermediate wheatgrass and Bozoisky Russian wild rye at a ratio of (4:3:1) while the native mixture was composed of western wheatgrass, slender wheatgrass, sideoats grama, and alkali sacaton at a ratio of (2:2.5:2.5:1) with both mixtures seeded at 9 kg of PLS/ha. At the Wyoming site the introduced mixture was composed of Luna pubescent wheatgrass, smooth brome, and Bozoisky Russian wild rye at a ratio of (4:3:1) while the native mixture was composed of needle-and-thread grass, Nezpar indian ricegrass, Critana thickspike wheatgrass, and alkali sacaton at a ratio of (2:2.5:2.5:1) with both mixtures seeded at 9 kg of PLS/ha. At the Nebraska site perennial grasses became established during the spring of 2007 and by late summer biomass averaged 560 kg/ha (dry wt) in seeded plots and by the end of the 2007 growing season had increased to 2600 kg/ha. At the Colorado and Wyoming sites spring and summer rainfall was lacking and grasses did not emerge until the spring of 2007. At the end of the 2007 growing season perennial grass biomass averaged 1390 and 280 kg/ha for the Colorado and Wyoming sites, respectively. In the fall of 2006 Canada thistle control was 55 and 79%, respectively for aminopyralid application the previous fall (2005) or spring (2006). By 2007 Canada thistle control had improved at all sites and averaged 70 and 99% respectively, for aminopyralid treatments applied in the fall (2005) or spring (2006). Perennial grass establishment in combination with aminopyralid treatment enhanced Canada thistle control at both the Nebraska (2006 and 2007) and Colorado (2007) sites. In order to determine the sustainability of Canada thistle control with perennial grass competition these sites will continue to be evaluated for the next 2 years. [111]

EFFECT OF AMINOPYRALID ON NON-TARGET VEGETATION FOLLOWING AERIAL APPLICATION. Celestine Duncan*, Weed Management Services, Helena; Andy Kulla, USDA Forest Service, Missoula; Mary Halstvedt, Dow AgroSciences, Billings,MT.

Noxious weed control treatments may be applied for wildland conservation purposes on rangeland, open forest habitat types, and big game winter ranges. Aminopyralid is a broadleaf weed management herbicide that has reduced risk to the environment compared with other commercially available herbicides, making it a desirable herbicide alternative for noxious weed control on these sites. Tolerance

of desirable vegetation to aminopyralid is an important consideration for land managers to meet conservation goals. Aminopyralid at 1.25 oz ae/A (5 fl oz product/A) was aerially applied by helicopter in fall of 2006 in western Montana to control spotted knapweed and improve elk winter range. Application volume was 2 gpa. Prior to treatment, 4 paired plots (10 by 50 ft sub-plots) were established within the treated area. Tarps were used to shield herbaceous vegetation from aminopyralid application within paired plots. Permanent transects were also established to determine level of injury to desirable trees and shrubs. Cover and production data were collected on herbaceous vegetation, and visual injury evaluations were taken on trees and shrubs within transects 9 MAT (months after treatment). Aminopyralid removed spotted knapweed from the plant community. Percent cover and production of perennial grass increased significantly, while forb cover and production declined in response to aminopyralid treatment. Arrowleaf balsamroot (Balsamorhiza sagittata), the most abundant forb on the site, was injured but not removed from the plant community. In general, shrubs in the rose family were susceptible to aminopyralid averaging 50 to 77% injury; however, chokecherry (Prunus virginia) appeared to be tolerant to the herbicide treatment (<10% injury). Injury to new terminal growth of trees in the willow family including aspen (Populus tremuloides), cottonwood (Populus sp), and Scoulers willow (Salix scouleriana), averaged less than 5%. Maple (Acer glabrum) was less tolerant than other deciduous trees and averaged 18% injury to new growth. Coniferous trees including Douglas-fir (Pseudotsuga menziesii), Ponderosa pine (Pinus ponderosa), and lodgepole pine (Pinus contorta) averaged 11, 8, and <5% injury to new growth, respectively. Trees less than 15 feet in height were more susceptible to injury than larger trees. Western larch (Larix occidentalis), with an average of 38% injury, was more susceptible to aminopyralid than either pines or Douglas-fir. Based on these observations 9 MAT, fall-applied aminopyralid provided excellent control of spotted knapweed and increased grass production. Injury to non-target vegetation was dependent on plant species. Aminopyralid at 1.25 oz ae/A applied in fall caused minimal injury to trees in the willow family. Western larch, Douglas-fir, and maple appear to be somewhat susceptible to the herbicide. Shrubs in the rose family tend to be more susceptible to aminopyralid. [112]

DOES ADDING DIFLUFENZOPYR + DICAMBA TO AUXINIC HERBICIDE TREATMENTS IMPROVE FALL RUSSIAN KNAPWEED CONTROL. Stephen F. Enloe*, Auburn University, Auburn, AL.

Diflufenzopyr has been shown to improve the activity of certain growth regulator herbicides on creeping perennials such as leafy spurge. However, very little is known concerning its role as a tank mix partner with growth regulator herbicides for Russian knapweed control. Currently, the only available product for range and pasture that contains diflufenzopyr is a dicamba + diflufenzopyr premix (Overdrive™). Our objective was to determine the role of dicamba + diflufenzopyr applied alone and in combination with commonly used growth regulator herbicides for fall applications for Russian knapweed control. Studies were initiated in 2005 and 2006 near Ethete, Wyoming in a pasture completely dominated by Russian knapweed. Treatments included dicamba + difluzenzopyr alone, commercial and reduced rates of aminopyralid, clopyralid, picloram, clopyralid + 2,4-D, and clopyralid + triclopyr, and all combinations of dicamba + diflufenzopyr and each growth regulator herbicide. Treatments were applied in September when Russian knapweed was post seed set but still green. Plot size was 3.3 by 9 meters and the study design was a RCBD with four replications per treatment. Visual evaluations were taken at 12 and 24 months after treatment (MAT) where 0 = no control and 100 = complete control. Twelve MAT, we found significant interactions between dicamba + diflufenzopyr and clopyralid, tordon, and clopyralid + triclopyr. However, improvements in control were minimal as both the commercial and reduced herbicide rates generally provided very good Russian knapweed control. Twenty-four MAT, we found no significant interactions between dicamba + diflufenzopyr and any other herbicide and analyses of main effects generally indicated significantly better control with commercial rates than reduced rates. These data do not strongly support the addition of dicamba + diflufenzopyr to the growth regulator herbicides tested for fall treatments for Russian knapweed control. However, further studies are warranted to determine if these tank mixes are beneficial at earlier knapweed phenological timings. [113]

WEED MANAGEMENT IN PASTURE AND RANGELAND WITH PROPOXYCARBAZONE. Charlie Hicks*, Tom Kleven and Mary Paulsgrove, Bayer CropScience, Research Triangle Park, NC.

Propoxycarbazone-sodium is currently registered for use in wheat under the trade name Olympus. Propoxycarbazone acts as an inhibitor of acetolactate synthase (ALS) and is a member of the sulfonylaminocarbonyl triazolinone class of chemistry. Olympus is used extensively in winter wheat for control of many problem grass and broadleaf weeds. In 2003, Bayer CropScience began testing Olympus for use in non-crop situations. Results indicate that Olympus provides control of many important annual and perennial grass as well as broadleaf weeds in rangeland and permanent grass pastures and is highly active on downy brome, cheatgrass and Japanese brome. Olympus controls a wide array of broadleaf weeds including wild mustard, black mustard, and tumble mustard. Best weed control can be expected when applications are made before grass weeds tiller and broadleaf weeds are smaller than 2 inches in diameter. In recent field trials, cool season grasses have exhibited good tolerance to propoxycarbazone-sodium at 45 to 60 g ai/ha applied in a single application with a non-ionic surfactant at a concentration of 0.25-0.5% v/v. Olympus has excellent promise as a management tool for re-establishing desirable grasses in rangeland settings and Bayer CropScience has submitted an application to EPA for registration of this use. The low use-rate, excellent weed control and desirable range grass safety combined with favorable toxicological and environmental properties will make this product a valuable new tool for use in rangeland and permanent grass pasture management. [114]

PROJECT 2: WEEDS OF HORICULTURAL CROPS

EFFICACY OF TOPRAMEZONE AND TEMBOTRIONE HERBICIDES IN SWEET CORN: EFFECT OF ATRAZINE RATE, ADJUVANTS, AND TIMING . Ed Peachey*, Oregon State University, Corvallis; Marty Williams, USDA, Urbana, IL; and Rick Boydston, USDA, Prosser, WA. .

Experiments determined the effect of soil residual tankmix, atrazine rate, and adjuvant on control of wild proso millet and other broadleaved weeds with topramezone and tembotrione. Topramezone (18 g ai/ha) and tembotrione (92 g ai/ha) were applied as a tankmix with dimethenamid-P plus atrazine (0.95 + 0.56 kg ai/ha) or S-metolachlor plus atrazine (1.6 + 0.56 kg ai/ha) to V2 or V4 corn. Leaf burn of corn was observed in both years of the study, and was most prominent for tankmixes with S-metolachlor in 2007 and with dimethenamid-P in 2006. Higher temperatures in 2006 at the time of the dimethenamid-P application may have predisposed corn to injury and reduced yield. Weed control was better and crop yield greater when these treatments were applied at V2 rather than V4, particularly at sites with a high weed density. Additional treatments evaluated the impact of methylated seed oil (0.25% or 1% v/v) and urea ammonium nitrate (0 or 2.5% v/v) on topramezone and tembotrione efficacy. Weed control improved substantially for both herbicides when the MSO rate increased from 0.25% to 1%, with slight differences in efficacy between tembotrione and topramezone depending on weed species present. In Oregon, tembotrione (92 g ai/ha) and topramezone (18 g ai/ha) were applied to hybrid Super Sweet Jubilee with 0, 123, 370, or 1120 g ai/ha of atrazine to determine the most efficient rate of atrazine. Both weed control and corn yield declined as the atrazine rate was reduced from 1120 to 123 g ai/ha. An exception to the trend was apparent when tembotrione was applied without atrazine. Yields of tembotrione and topramezone treatments without atrazine were similar to yields when tankmixed with 1120 g ai/ha atrazine, probably because the number of ears harvested increased when the two HPPD herbicides were applied without atrazine. A similar study was conducted that included sites in Illinois and Washington. Tembotrione (31 g ai/ha) was applied with 0, 42, 123, 370, or 1120 g ai/ha of atrazine to varieties Code 128 and Quickie. On average, the variety Quickie was 115 cm tall and intercepted 70% of the available PAR at silking. Code 128 was 221 cm tall and intercepted 91% of the available PAR. Weed control declined as the atrazine rate declined, but only in the less competitive variety Quickie, and only at the site with the greatest weed density. [96]

USING BRASSICACEAE SEEDMEALS AS A BIOHERBICIDE IN FRESH CARROT PRODUCTION. Lydia A. Clayton* and Donald C. Thill, University of Idaho, Moscow.

Weed management is one of the most troublesome and expensive components of organic agricultural production. A field study was conducted in 2007 to determine the effect of yellow mustard seed meal on emergence and subsequent growth of common lambsquarters (Chenopodium album L.) and 'Nelson' carrot (Daucus carota var sativa L.). Common lambsquarters seed was sown at 1000 seeds/m2. Yellow mustard and canola seed meals were applied at 0.0, 0.5, 1, 2, 3, and 4 mt/ha and 'Nelson' carrot was seeded at 1, 3, 6, and 12 days after treatment (DAT) during May. Carrot emergence was measured 31, 33, 37, and 41 DAT. Above-ground dry biomass of common lambsquarters was determined at 47 and 74 DAT. Carrot weight and number were determined for the 1, 3, 6, and 12 DAT seeding dates at 89, 92, 95, and 102 DAT, respectively. Regression analysis showed that carrot emergence was not different between the 3 and 6 DAT seeding dates. However, at the 1 and 12 DAT seeding dates emergence decreased and increased, respectively, compared to 3 and 6. Carrot yield for seeding dates 1, 3, and 6 DAT was not different among yellow mustard seed meal doses. However, carrot yield for the 12 DAT seeding date was significantly greater than the other seeding dates at all meal doses. Common lambsquarters biomass at 47 DAT was reduced with increasing doses of yellow mustard seed meal. Seeding date did not significantly affect weed biomass, however there was a trend for decreasing biomass with increasing DAT. [97]

MUSTARD SEED MEAL SUPPRESSES WEEDS IN POTATO AND PEPPERMINT. Rick A. Boydston, USDA-ARS, Prosser, WA.

Seed meal is a co-product remaining after pressing mustard seed to remove the oil. Seed meals containing high glucosinolates have been reported to have herbicidal activity. Weed suppression with seed meal of Sinapis alba, variety Ida Gold was evaluated in field trials on potatoes and peppermint in 2006 and 2007. In potato, mustard seed meal at 0.5 ton/acre applied to the soil surface reduced the number of early season weeds compared to the nontreated check in 1 of 2 years and 1 and 2 ton/acre rates significantly reduced early season weed counts both years. Final weed dry weight was similar among all treatments except the 2 ton/acre mustard meal, which was 13% and 32% of the nontreated checks in 2006 and 2007, respectively. Dried distillers grains applied at 1 ton/acre increased early season hairy nightshade counts and total weed counts in 2006, but slightly reduced hairy nightshade and total weed counts in 2007. Potato tuber yield or specific gravity were not statistically significantly different among treatments, but nontreated checks and plots treated with dried distillers grains, which lacked weed suppression, averaged the lowest yields in 2006. Mustard seed meal applied to the soil surface at 1 to 2 ton/acre reduced the number of broadleaf and grass weeds 2 WAT in newly planted peppermint in 2006 and 2007. By 4 WAT, the weed density in plots treated with 0.5 and 1 ton/acre mustard meal was similar to the nontreated checks, but weeds were smaller in the plots treated with mustard meal. Some initial phytotoxicity was evident on peppermint treated with white mustard seed meal at 2 ton/a in 2006, but it was short-lived and peppermint grew normally thereafter. Field pennycress (Thlaspi arvense) seed meal applied at 0.5, 1, and 2 ton/acre did not reduce total weed emergence at 2 WAT and tended to increase the number of grass weeds in 1 of 2 years. [98]

COVER CROP CHOICE AFFECTS OVERWINTERING WEEDS IN PACIFIC NORTHWEST ORGANIC VEGETABLES. Tim Miller, Tyler Breum, Christiane Steen, and Carl Libbey, Washington State University, Mount Vernon.

Winter cover crops were tested for their productivity and weed suppression over a three-year organic vegetable rotation. Cover crops tested include winter wheat mixed with hairy vetch, cereal rye mixed with either buckwheat or winter pea, and mustard (combination of Brassica juncea and Sinapis alba). Dry weight among cover crops averaged 2290 lbs/a in April, 2004, compared to 2538 lbs/a in 2005 and 1768 in 2006. Dry weed biomass averaged 224 lbs/a in November, 2004 and had increased to 309 lbs/acre just prior to incorporation in April, 2005. This contrasts with weed biomass increases from 767 lbs/a in

November, 2003 to 1377 lbs/a in April, 2004 and from 46 lbs/a in November 2005 to 497 lbs/a in April, 2006. Weed biomass among all cover crop mixes accounted for 40, 12, and 28% of total biomass incorporated in April, 2004, 2005, and 2006, respectively. Winter rye + hairy vetch provided the most weed suppression in 2005, with weeds accounting for about 7% of the total biomass, but was the poorest competitor in 2004 and 2006, with 46 and 19% of the total biomass that year being weeds. The predominant winter weed during 2003-04 was common chickweed, accounting for about 90% of the weed biomass at both measurements. After one cycle of the rotation, however, common chickweed was 86% of the biomass in November but only 63% in April, with populations of shepherd's-purse, henbit, common groundsel, ivyleaf speedwell, and pineappleweed, and annual ryegrass and annual bluegrass making up the remainder. By April, 2006, common chickweed had declined to account for about 50% of the weed biomass. Winter rye biomass in April was reduced by some 40 to 55% when grown in mixture with hairy vetch, compared to rye grown with buckwheat; buckwheat winter-killed in November of each year. The mustard crop suffered extensive winter kill during 2003-04, resulting in mustard biomass being reduced from 1920 to 263 lbs/a from November to April. [99]

EVALUATION OF HERBICIDE AND FERTILIZER PROGRAMS FOR WEED MANAGEMENT IN AMENITY TURF. Cheryl Wilen*, University of California Statewide IPM Program, South Coast;and J. Michael Henry, University of California Cooperative Extension, Riverside County.

Long term weed control in turf depends on the competitive ability of the turf species and on reducing vegetation gaps. Methods to improve the competitiveness of the turf and decrease the size and number of gaps should make the site less susceptible to weed invasion. From an integrated pest management standpoint, cultural practices such as proper fertilization to encourage a vigorously growing turf as well as overseeding to reduce gaps are better approaches than use of herbicides to restore the turf once invaded. We conducted a study in southern California to evaluate whether 3 herbicide and fertilizer combination products applied at label recommended rates and times with and without overseeding would improve competitiveness and reduce weed invasion in low maintenance tall fescue turf. We evaluated turf quality and weed pressure over one year. We also measured gaps in the turf using digital analysis and calculated species richness. Treatments which included fertilizer improved the green cover and consequently, deceased gaps. However, there were no significant differences in species richness or weed control among treatments until nearly one year after the study was initiated. At the last two evaluation dates (April, 2007) only the treatments that included herbicides had lower species diversity that the other treatments. In low maintenance turf areas, using solely cultural controls such as fertilizing and overseeding will not control an established weed population. [100]

EVALUATION OF POSTEMERGENCE HERBICIDES FOR KHAKIWEED CONTROL IN TURF. Kai Umeda, University of Arizona Cooperative Extension, Phoenix.

The premix herbicide, Speedzone (carfentrazone + 2,4-D + mecoprop + dicamba) at 4.0 pt product/A provided rapid postemergence (POST) control of khakiweed also known as mat chaff-flower (Alternanthera caracasana) and gave 82% control at 17 days after treatment in one of three experiments. Spotlight (fluroxypyr) at 1.0 pt product/A alone was only effective at about 50%. BAS-514 and BAS-790 were not effective against khakiweed when applied alone. In a second experiment, sequential applications of Speedzone and Spotlight plus Turflon Ester (triclopyr) provided exceptional control of greater than 95%. Initial applications of the POST applications that were combined with Gallery (isoxaben) offered control of new emerging seedlings of khakiweed. Monument (trifloxysulfuron) combined with Gallery gave decreased khakiweed control compared to Monument applied alone. An antagonistic effect could be occurring with the tank-mix combination of the two herbicides. Carfentrazone containing products, QuickSilver at 2 oz product/A alone was not effective against khakiweed compared to the premix product Speedzone. For the ALS-inhibiting herbicides, flazasulfuron and Certainty (sulfosulfuron) were the least

effective while penoxsulam and Image (imazaquin) were comparable to Monument in providing about 50% control. [101]

OFF-TARGET MOVEMENT POTENTIAL OF TWO OXYFLUORFEN FORMULATIONS. Jesse Richardson, Barat Bisabri, Jeff Nelson, James Mueller and Roger Gast, Dow AgroSciences, Indianapolis, IN.

Dow AgroSciences introduced a new water-based 4.0 lb a.i./gallon flowable formulation of oxyfluorfen in 2004. In contrast to the original emulsifiable concentrate 2.0 lb a.i./gallon formulation, the new formulation exhibits little or no odor. Since lettuce leaves are known to be very sensitive to oxyflourfen, studies were established in commercial lettuce fields comparing the differences in potential off-target movement of these two formulations. A Watsonville, California study was initiated in 2003, while two studies were established in 2005--at Yuma, Arizona and Camarillo, California. In all three experiments, a block of lettuce was treated with a broadcast application of each formulation, followed by visual damage assessments several days later at each of the four primary compass points, up to 100 ft away from the treated block. In each of the three studies, foliar assessments at 3, 6, 12, 24, 48 and 100 ft from the treated block showed that the new water-based formulation caused less off-target damage in lettuce, compared to the original formulation. [102]

BAS 800H: A NEW HERBICIDE FOR USE IN TREE GRUIT AND NUT CROPS. Philip H. Munger*, John H. O'Barr, Max A. Landes, Kyle E. Keller, BASF Corporation, Research Triangle Park, NC.

BAS 800H (saflufenacil), a new herbicide under development by BASF, has demonstrated excellent tree fruit and nut crop tolerance and broad spectrum postemergence control of broadleaf weeds important in orchard production systems. In field studies conducted in California, combinations of BAS 800H at 25 to 50 g ai/ha plus glyphosate demonstrated excellent application timing flexibility and effective postemergence control of hairy fleabane and horseweed and were more efficacious than treatments of glyphosate alone or glyphosate plus flumioxazin or oxyfluorfen. Additional broadleaf weeds controlled postemergence by combinations of BAS 800H plus glyphosate included willowherb, burning nettle and cheeseweed. Plantings of almond, citrus, apple, pear, peach, walnut and pistachio exhibited excellent tolerance to multi-year treatments of BAS 800H. Tolerance of other orchard crops to BAS 800H is currently under investigation. [103]

HAIRY NIGHTSHADE CRITICAL INTERFERENCE PERIOD IN POTATO. Pamela J.S. Hutchinson*, JaNan Farr, and Justin Wheeler, University of Idaho, Aberdeen.

Field research trials were conducted at the Aberdeen Research and Extension Center in 2006 and 2007 to determine the critical interference period of hairy nightshade in potatoes. Russet Norkotah variety was planted both years in plots 3 rows wide by 40 ft long. When the potatoes had emerged, 1 to 2 lf hairy nightshade plants which had been germinated and grown in the greenhouse in jiffy pots were transplanted at a 2 per m row density and allowed to grow for 10, 20, 30, or 40 days after emergence (DAE) before removal or the potatoes were maintained weed-free for 0, 10, 20, 30, or 40 DAE before transplanting. Potatoes were harvested from the center row at the end of each growing season and yield and grade according to USDA standards was determined. Russet Norkotah is a small-canopied potato variety and often does not completely shade over between the rows in Idaho. Recent research results showed that season-long hairy nightshade densities as low as 1 plant per m row reduced Russet Norkotah total tuber yield 20 percent compared with the weed-free control yield. Yields of Russet Burbank, a more competitive full-canopy variety, were not affected until hairy nightshade density had been doubled. In the 2005-06 study, Russet Norkotah total tuber yield increased when hairy nightshade transplanting was delayed up to 30 DAE and decreased if hairy nightshade was allowed to remain beyond potato

emergence. Therefore, the critical weed-free period for the Russet Norkotah potato variety is between 0 and 30 DAE. [104]

WEED CONTROL AND POTATO CROP SAFETY WITH CHEMIGATED DIMETHENAMID-P APPLIED EARLY POSTEMERGENCE. Pamela J.S. Hutchinson and Justin J. Wheeler*, University of Idaho, Aberdeen.

Abstract Since crop safety and weed control by POST, chemigated dimethenamid-p is not known, a University of Idaho field trial was conducted in 2007 to determine crop safety of preemergence (PRE) compared with POST dimethenamid-p alone ground-applied or chemigated, and weed control with POST, chemigated dimethenamid-p tank mixtures. As expected, dimethenamid-p PRE at 0.64, 0.84, or 1.0 lb ai/A ground-applied or chemigated caused less than 2% early crop injury. Injury from POST dimethenamid-p ground-applied at the two highest rates reached 13 to 15%, however, compared with less than 4% injury by all rates POST chemigated. Regardless of rate or application timing and method, injury was no longer visible by row closure. Only chemigated or ground-applied dimethenamid-p + metribuzin provided greater than 90% season-long redroot pigweed control. Dimethenamid-p ground-applied with pendimethalin or metribuzin controlled common lambsquarters 90 or 98% respectively, and when chemigated with metribuzin, provided 100% season-long control. The best hairy nightshade control was from chemigated dimethenamid-p mixed with EPTC resulting in 88% control. All U.S. No. 1 and total tuber treatment yields were greater than the weedy control yields. Yields ranged between 85 and 100% of the nontreated, weed-free controls for all rates and application timing and methods. Dimethenamid-p applied POST by chemigation would be safe to the potato crop, and the appropriate POST, chemigated tank-mixtures could provide broad spectrum control comparable to already-labeled PRE applications. A POST, chemigated dimethenamid-p label would be useful to potato growers because of the wider application window. [105]

PROJECT 3: AGRONOMIC SECTION

2,4-D RESISTANT PRICKLY LETTUCE (LACTUCA SERRIOLA L.) IN WASHINGTON. Ian C. Burke*, Joseph P. Yenish, Dennis Pittmann, Washington State University, Pullman; and Robert Gallagher, Pennsylvania State University, University Park..

Prickly lettuce has become a widespread and troublesome weed in the PNW. It occurs in all rainfall zones and is difficult to control largely due to ALS resistance but also due to increased tolerance to 2,4-D and glyphosate. Although prickly lettuce is not a relatively competitive weed in-crop, it can deplete the soil of moisture for following crops. In wheat fields adjacent to Pullman, WA, several individual plants within a prickly lettuce population were observed to survive two separate broadcast applications of a glyphosate plus 2,4-D in mixture (0.84 kg ae/ha each). Other broadleaf weed species and most prickly lettuce plants within the treated area were effectively controlled. Consequently, seed were collected from the surviving plants to determine tolerance to glyphosate and 2,4-D. The objectives of this study where to identify any antagonistic interactions of 2,4-D and glyphosate for control of prickly lettuce and to determine response of putatively resistant prickly lettuce biotypes to increasing rates of 2,4-D. When glyphosate and 2,4-D where applied in mixture at 0.42 kg ae/ha, antagonism was observed in prickly lettuce found to be resistant to 2,4-D. Conversely, synergism was observed when the same treatment was applied to susceptible prickly lettuce. In dose response experiments, the GR50 for susceptible prickly lettuce was 8 and 9 times less than the field-collected biotype and its progeny, respectively. The resistant prickly lettuce biotype was found to be 27-fold more resistant to 2,4-D than the susceptible biotype based on regrowth. The resistant prickly lettuce biotype is cross-resistant to MCPA and dicamba, but not to aminopyralid or fluroxypr. [60]

EFFICACY OF NICOSULFURON AND RIMSULFURON IN ACETOLACTATE SYNTHASE (ALS) RESISTANT GRAIN SORGHUM. D. Shane Hennigh* and Kassim Al-Khatib, Kansas State University, Manhattan; and Mitch R. Tuinstra, Purdue University, West Lafayette, IN.

Postemergence herbicide treatments to control grasses are limited in grain sorghum. Acetolactate synthase (ALS)-inhibiting herbicides are very effective in controlling many grass species in corn, however, use of these ALS-inhibiting herbicides is not an option in conventional grain sorghum due to grain sorghum being highly susceptible to injury by these herbicides. With the development of ALS-resistant grain sorghum, several postemergence ALS-inhibiting herbicides can be used to control weeds in grain sorghum. Field experiments were conducted near Manhattan, KS in 2007 to evaluate the efficacy of nicosulfuron + rimsulfuron (26 + 13.5 g ha-1) applied alone or in combination with atrazine (561 g ha-1), bromoxynil (280 g ha-1), halosulfuron + dicamba (33.6 g + 140 g ha-1), prosulfuron (20 g ha-1), 2,4-D (421 g ha-1), metsulfuron methyl + 2,4-D (4.2 g + 280 ha-1), or a combination of these herbicides with atrazine on grass and broadleaf weeds. Herbicide treatments were applied when weeds were 7.5 to 15 cm in height. Barnyardgrass, green foxtail, giant foxtail, velvetleaf, ivyleaf morningglory, common sunflower, overall grass, and overall broadleaf control were visually determined 2 and 4 weeks after treatment (WAT) based on a scale where 0% = no control and 100% = complete control. Weed populations and biomass were also determined 6 WAT. Percent control of barnyardgrass, green foxtail and giant foxtail was greater than 90% and 80% for all herbicide treatments 2 and 4 WAT respectively. Overall broadleaf control was greater than 70% for all treatments except nicosulfuron + rimsulfuron + atrazine 2 WAT and 60% for all herbicide treatments 4 WAT. Nicosulfuron + rimsulfuron + metsulfuron methyl + 2,4-D and Nicosulfuron + rimsulfuron + halosulfuron + dicamba both controlled greater than 96% of all grasses and broadleaf weeds 2 and 4 WAT. Overall control of grass and broadleaf weeds was greater when nicosulfuron + rimsulfuron were applied with various broadleaf herbicides as compared to when it was applied alone. Grass and broadleaf weed density and biomass were significantly reduced with the application of nicosulfuron + rimsulfuron in combination with various broadleaf herbicides. [61]

NEW TECHNOLOGIES TO MANAGE WEEDS IN GRAIN SORGHUM. Kassim Al-Khatib, Kansas State University, Manhattan; Mitch R. Tuinstra, Purdue University, West Lafayette, IN; David L. Regehr*, D. Shane Hennigh, and Kellan Kershner, Kansas State University, Manhattan.

The development of herbicide resistance in plants offers significant production and economic advantages, as such the use of herbicides for controlling weeds in crops has become almost a universal practice. Of particular interest to farmers is the use of herbicides with greater potency, broad weed spectrum effectiveness and rapid soil degradation. Plants, plant tissues and seeds with resistance to these compounds provide an attractive solution by allowing the herbicides to be used to control weed growth, with small risk of damage to the crop. One such class of broad-spectrum herbicides is those that inhibit the activity of the acetolactate synthase (ALS) enzyme in a plant. Sorghum is susceptible to many ALS inhibiting herbicides that target monocot species, making the use of these herbicides to control grassy weeds almost impossible, as they will also inhibit the growth of the crop plant. Due to the importance of sorghum on the world stage, what are needed are sorghum hybrids that are resistant to the inhibitory effects of ALS herbicides, thereby allowing for greater crop yield when these herbicides are used to control grassy weeds. A project was initiated in 2003 to develop and ultimately commercialize sorghum varieties with tolerance to ALS-inhibiting herbicides. The development of this technology would allow for more effective postemergence grass control for sorghum producers and also improve crop rotation and replant options for farmers interested in planting sorghum in fields treated with ALS-inhibiting herbicides in the previous crop (e.g. hail- or frost-damaged wheat). A natural sorghum mutant with high levels of tolerance to ALS-inhibiting herbicides was identified. Genetic crossing and backcrossing was used to transfer this trait into elite grain sorghum varieties. Resistance appeared to be controlled by a single, incompletely-dominant, target-site mutation and at least 2 other modifier genes. The ALS mutation provides cross-resistance to several different herbicides in the imidazolinone and sulfonylurea chemical

families. As part of this effort, Kansas State University and the Kansas State University Research Foundation developed and released two sets of sorghum genotypes with tolerance to ALS-inhibiting herbicides in 2007. One set of 18 ALS-herbicide tolerant sorghum families representing important sorghum seed and pollinator parents was made available to commercial seed industry partners early in 2007. A second set of 34 ALS herbicide tolerant sorghum parent lines was released later in the year for development of ALS-herbicide tolerant hybrids. This set of seed and pollinator parent pedigrees showed good early green-up and excellent field tolerance to ALS inhibiting herbicides. In addition, as part of these efforts, a project was established with IR-4 program to register nicosulfuron and rimsulfuron for weed control in grain and forage sorghum. [62]

ABSOPTION AND TRANSLOCATION OF 2,4-D IN RESISTANT PRICKLY LETTUCE. Dilpreet S. Riar*, Ian C. Burke and Joseph P. Yenish, Washington State University, Pullman, WA.

Prickly lettuce is a problematic and well-adapted weed throughout the inland Pacific Northwest (PNW) production region. Recently, prickly lettuce has developed resistance to the synthetic auxin herbicide 2,4-D. To begin to determine the mechanism of resistance, absorption and translocation studies using 14C-2,4-D were conducted on the suspected 2,4-D resistant biotype and a known susceptible biotype. Maximum absorption of 2,4-D was observed at 96 hours after treatment (HAT) in each biotype. At 96 HAT, resistant and susceptible biotypes absorbed 33.8 and 42.7% of applied 14C-2,4-D respectively and out of the total herbicide absorbed, 74.5 and 70.1 % remained within the treated leaves of resistant and susceptible biotypes, respectively. At 96 HAT, the total amount of radioactivity translocated from the treated leaf to different plant parts was similar in both biotypes (25.5 and 29.9% for resistant and susceptible biotypes, respectively). However, 2.3% less 2,4-D was translocated to the crown of resistant biotype compared to susceptible biotype. Re-growth of resistant prickly lettuce biotypes commonly occurs from apical or lateral meristems located in the crown. Reduced herbicide translocation to the crown in resistant biotypes could be, in part, a mechanism for 2,4-D resistance in prickly lettuce. [63]

WEED CONTROL IN SORGHUM WITH PYRASULFOTOLE. Amy M. Wyman*, Greg W. Hudec, Charles P. Hicks and Michael Weber, Bayer CropScience, RTP, NC.

No abstract. [64]

SUNFLOWER TOLERANCE TO IMAZAMETHABENZ. Shanna A. Mazurek*, Brian M. Jenks, and Gary P. Willoughby. North Dakota State University, Minot.

Imazamethabenz is labeled for use in sunflower as a postemergence herbicide for control of troublesome mustard species such as wild mustard, field pennycress, or volunteer canola. The Assert label states that the herbicide should be applied at the 2- to 8-leaf growth stage (less than 15 inches tall). The Canadian label states that “crop injury in the form of head deformation and stunting can occur from applications made after the 8-leaf stage.” Growers in North Dakota have noted head deformation issues in 2006 and 2007. In a 2006 sunflower study, we observed deformed heads where imazamethabenz had been applied with clethodim + NIS + AMS applied at 4- to 6-leaf sunflower. This combination resulted in 15-19% early-season visible crop injury expressed as chlorosis and stunting. As heads began to form in July, approximately 61% of the heads did not form properly. Sunflower yield was reduced approximately 50%. A study was conducted in 2007 to determine whether the injury was caused by imazamethabenz alone or by the combination of imazamethabenz with tank mix partners. Treatments consisted of 1) untreated; 2) clethodim + NIS + AMS; 3) imazamethabenz + clethodim + NIS + AMS; 4) imazamethabenz + clethodim + NIS; and 5) imazamethabenz + NIS. All treatments containing imazamethabenz caused injury similar to what was observed in 2006. Approximately 60% of the heads were deformed and resulted in a 50% yield loss. This injury was only observed in treatments containing imazamethabenz. The same variety was used each year and the herbicides were applied at the 4- to 6-leaf stage. 2006 was a

very dry year, while 2007 was very wet in May and June, but dry thereafter. Pendimethalin + sulfentrazone were applied preemergence in both years to control weeds. More research is needed to determine if this injury is variety specific and/or related to environmental conditions. [65]

BROADLEAF WEED CONTROL IN TRIBENURON TOLERANT SUNFLOWER WITH PREEMERGENCE FOLLOWED BY SEQUENTIAL POSTEMERGENCE HERBICIDES. Richard N. Arnold*, Michael K. O'Neill and Dan Smeal, New Mexico State University Agricultural Science Center, Farmington, NM.

Research plots were established on June 4, 2007, at the Agricultural Science Center, Farmington, New Mexico, to evaluate the response of tribenuron tolerant sunflower (var. Pioneer 63N81) and annual broadleaf weeds to preemergence followed by sequential postemergence herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with four replications. Treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 35 psi. Individual plots were 4, 34 in rows 30 ft long. Sunflower was planted with flexi-planters equipped with disk openers on June 4. Preemergence treatments were applied on June 5 and immediately incorporated with 0.75 in of sprinkler-applied water. Postemergence treatments were applied on June 27 when sunflowers were in the V3 to V4 leaf stage and weeds were <3 in tall. All postemergence treatments had crop oil concentrate applied at 1.0% v/v. Black nightshade, prostrate and redroot pigweed, were heavy, common lambsquarters were moderate and Russian thistle infestations were light throughout the experimental area. Treatments were evaluated on July 26. Sulfentrazone applied preemergence at 0.14 lb ai/A had the highest sunflower injury ratings of 4 and 5. All preemergence treatments followed by a postemergence treatment of tribenuron at either 0.008 or 0.015 lb ai/A gave good to excellent control of broadleaf weeds. Tribenuron applied postemergence at 0.008 and 0.015 lb ai/A gave poor control of redroot and prostrate pigweed. Yields were 1716 to 2196 lb/A higher in the herbicide treated plots as compared to the weedy check. [66]

TILLAGE AFFECTS IMAZAMOX CARRYOVER IN YELLOW MUSTARD. Jonquil Rood*, Traci Rauch, Donn Thill, Bahman Shafii, University of Idaho, Moscow; Dan Ball, Larry Bennett, Oregon State University, Pendleton; Joe Yenish, Rod Rood, John Nelson, Washington State University, Pullman.

Tillage can affect the rate of herbicide dissipation. A study was conducted near Genesee, ID, Pendleton, OR, and Davenport, WA to determine the effect of tillage on the persistence of imazamox herbicide, which was applied at one, two, and three times the maximum labeled rate to Clearfield® winter wheat during fall 2005 and spring 2006. Grain was harvested during summer 2006 and tillage strips (moldboard, chisel, and direct-seed) were implemented during fall 2006. Yellow mustard was seeded during spring 2007 and harvested that summer. The effect of tillage on persistence of imazamox differed among locations. However, within locations there was no herbicide treatment by tillage interaction. Overall, imazamox applied during fall at the two highest rates to winter wheat injured mustard 21 to 86% at all locations, while imazamox applied in the spring injured mustard 5 to 91%. At Pendleton, mustard was injured most in conventional tillage (32%) followed by minimum tillage (23%), with the least injury in the direct-seeded plots (16%). At Genesee, mustard was injured most in minimum tillage (73%) followed by direct-seed (69%), with the least injury in conventional tillage (58%). At Davenport, mustard was injured most in the minimum (67%) and direct-seed (67%) tillage treatments, with the least injury in conventional tillage (56%). Wheat residue was removed from direct-seed plots during fall 2006 at Pendleton, but not Genesee or Davenport. Removal of the wheat residue may have resulted in faster dissipation of imazamox in direct-seed compared to the other tillage treatments at Pendleton. [67]

DOWNY BROME CONTROL WITH HERBICIDES IN NO-TILL HARD RED SPRING WHEAT. Michael H. Ostlie* and Kirk A. Howatt, North Dakota State University, Fargo.

Winter annual weeds present many challenges with reduced tillage systems in North Dakota. Downy brome (Bromus tectorum L.) is no exception. Early maturity and prolific seed production allow downy brome to remain a constant threat in hard red spring wheat (Triticum aestivum) L.). Not many herbicides offer adequate control of downy brome during the growing season of spring wheat, which makes applying herbicides when they are most efficacious critical for controlling this species. Studies were established to: determine the most efficacious registered herbicide for control of downy brome when applied prior to or after spring wheat emergence, identify the optimum timing for preseeding control of downy brome with glyphosate, and to evaluate downy brome response to differing rates and application timings of propoxycarbazone. In the greenhouse, downy brome biomass was reduced significantly when applied pre-vernalization. Post-vernalization had only about a 50% reduction in biomass. When herbicides were applied in the fall or spring before seeding wheat, glyphosate, imazapic, propoxycarbazone, mesosulfuron + propoxycarbazone, and sulfosulfuron provided control of downy brome species. When treatments of imazamox, propoxycarbazone, mesosulfuron + propoxycarbazone, sulfosulfuron, and flucarbazone were applied during the growing season, control of downy brome ranged from 66% with imazamox to 29% with flucarbazone. Any applications made in the fall of the previous year provided complete control of downy brome. [68]

PYROXSULAM: GRASS AND BROADLEAF WEED CONTROL IN WINTER WHEAT. Monte R. Weimer*, Brett B. Oemichen, Roger E. Gast, Harvey H. Yoshida, and Mark A. Peterson. Dow AgroSciences, Indianapolis, IN 46268.

Pyroxsulam is a new grass and broadleaf herbicide being developed by Dow AgroSciences for utility in cereal crops around the world. For the United States winter wheat market, pyroxsulam will be formulated as a 7.5% WG and sold under the name of PowerFlexTM herbicide. The proposed label use rate for PowerFlex will be 3.5 oz pr/ac (18.4 g ai/ha) and it will be recommended to be applied with a non-ionic surfactant (0.25 to 0.5% v/v) or a crop oil concentrate (0.8% v/v). Important grass weeds in the winter wheat market that PowerFlex will control include downy brome, cheat, Japanese brome, Italian ryegrass, and wild oat. In addition to grass weeds, PowerFlex will also control many broadleaf weeds including flixweed, blue mustard, henbit, wild mustard, tansymustard, field pennycress, lambsquarters, corn gromwell and coast fiddleneck. PowerFlex can be applied either in the fall or spring to grass weeds that are 2-leaf to 2-tiller and broadleaf weeds up to 2-inches tall or 2-inches in diameter. Most labeled weed species are controlled with fall application of PowerFlex, however, depending on conditions, downy brome and henbit are suppressed by spring application. PowerFlex may be applied in spray solution containing liquid fertilizer up to 50% of the spray volume and up to 30 pounds of nitrogen per acre. Rotation intervals will be 9 months or less for all important rotational crops. TM Trademark of Dow AgroSciences LLC [69]

A SURVEY OF ITALIAN RYEGRASS (LOLIUM MULTIFLORUM) HERBICIDE RESISTANCE IN NORTHERN IDAHO AND EASTERN WASHINGTON. Seth A. Gersdorf* and Donn C. Thill, University of Idaho, Moscow.

Italian ryegrass (Lolium multiflorum) is a prevalent weed in Pacific Northwest wheat production systems with known resistance to ACCase inhibitor herbicides. The objective of this study was to determine the frequency of Group 1, 2, and 15/5 herbicide resistance, including cross and multiple resistance patterns, in Italian ryegrass populations collected from farm fields throughout eastern Washington and northern Idaho. In 2006 and 2007, Italian ryegrass seed was collected in 21 total fields from three counties in eastern Washington and in 54 total fields from four counties in northern Idaho (75 total samples). Populations were tested in the greenhouse for frequency of resistance or susceptibility to twelve different

herbicides commonly used to control Italian ryegrass in PNW wheat production systems. Herbicides were selected to determine patterns of cross resistance in herbicide groups 1 and 2 and multiple resistance in herbicide groups 1, 2, and 15/5. Based on 35 Italian ryegrass populations collected in 2006, 85% were resistant to at least one Group 1 herbicide, 69% were resistant to at least one Group 2 herbicide, and 11% were resistant to the Group 15/5 herbicide. Of the 2006 populations, 63% exhibited multiple resistant to Group 1 and 2 herbicides, while 11% of populations had multiple resistance to Group 1, 2, and 15/5 herbicides. The high occurrence of herbicide-resistant Italian ryegrass populations in this region is a serious threat to sustainable crop production and requires research and outreach programs to solve this growing problem. [70]

RYEGRASS MANAGEMENT WITH PYROXSULAM IN OKLAHOMA WINTER WHEAT. B. Heath Sanders* and Thomas F. Peeper, Oklahoma State University, Stillwater.

Italian ryegrass continues to plague hard red winter wheat fields in the southern Great Plains. In wheat fields with mixed weed species, Italian ryegrass is typically the dominant competitor. Yield and grain quality reductions are typical and harvesting Italian ryegrass infested wheat can be difficult or impossible. Pyroxsulam applied in the fall to well tillered ryegrass at 11.25, 15, and 18.75 g ai/ha + 0.5% V/V Agral 90 controlled ryegrass 83, 99, and 95% respectively. When application was delayed until February control with the same three rates was 85, 93, and 90%, respectively. When herbicide treatments were applied to grazed wheat in March control with the same three rates was 80, 85, and 89%, respectively. Applying pyroxsulam with 50% urea ammonium nitrate liquid fertilizer carrier did not affect ryegrass control. At one location pyroxsulam completely controlled hairy vetch. At another location pyroxsulam controlled Virginia pepperweed and cutleaf eveningprimrose. [71]

ROTATIONAL CROP RESPONSE FOLLOWING APPLICATION OF PYROXSULAM IN WHEAT. Brett Oemichen*, Monte R. Weimer, Roger Gast, and Mark Peterson, Dow AgroSciences, Indianapolis, IN.

A key component to exploit the economic and agronomic advantages in diverse cropping systems is having the flexibility to choose and produce a variety of crops at any given time. Chemical weed control is an important component in many cropping systems involving spring and winter wheat. The choice of the rotational crop following wheat may be constrained by the plant back restrictions from the herbicide used for weed control in wheat. Pyroxsulam is a new grass and broadleaf herbicide being developed by Dow AgroSciences for utility in spring and winter wheat. In order to characterize the cropping flexibility after a pyroxsulam application, a series of crop rotation experiments were conducted in the major spring and winter wheat production areas in the United States. In spring wheat, rotational studies were conducted in North Dakota, Montana, and Idaho. Herbicide injury to oat, sugarbeet, canola, safflower, camelina, soybean, sunflower, barley, lentil, flax, alfalfa, dry bean, field pea, and/or potato was evaluated the season after a pyroxsulam application in spring wheat at 15, 30, and 60 g/ha (X, 2X and 4X of the anticipated label rate of pyroxsulam in spring wheat). The rotational crop response to pyroxsulam was compared to treatments of flucarbazone (20 and 40 g/ha) and propoxycarbazone + mesosulfuron (10 + 2.5 and 20 + 5 g/ha). In winter wheat, rotational studies were conducted in Oklahoma, Kansas, Colorado, Washington, and Idaho. Herbicide injury to field pea, canola, lentil, barley, sugarbeet, potato, chickpea, safflower, soybean, sorghum, sunflower, and/or cotton was evaluated to crops planted the spring following a fall application of pyroxsulam at 18.8, 37.5, and 75 g/ha (X, 2X, and 4X of the anticipated label rate of pyroxsulam in winter wheat). The winter wheat crop was terminated in the early spring by applying glyphosate to facilitate planting of the spring crops. This procedure simulates a scenario that results in crop failure and the need for emergency re-cropping. Rotational intervals (treatment to rotational crop planting date) of 142 to 176 days were experienced with this procedure. Pyroxsulam treatments were compared to sulfosulfuron (35 and 70 g/ha), propoxycarbazone (44 and 88 g/ha), or propoxycarbazone + mesosulfuron (15 + 10 and 30 + 20 g/ha). In spring wheat, no visual injury greater than 5% was observed

with pyroxsulam treatments (up to 4X rates) on any of the 14 rotational crops the season following application. Visual injury was observed with rates of 20 and 40 g/ha flucarbazone on oat (5-10% and >10%, respectively), sugarbeet (5-10% both rates), and lentil (>10%, both rates). Visual injury was observed with rates of 10 + 2.5 and 20 + 5 g/ha propoxycarbazone + mesosulfuron on sugarbeet (5-10% both rates), and lentil (>10%, at high rate). For rotational crops planted after a fall application in winter wheat, pyroxsulam demonstrated the greatest safety as compared to sulfosulfuron, propoxycarbazone, or propoxycarbazone + mesosulfuron. Slight injury (5-15%) from pyroxsulam treatments were observed on sugarbeet, chickpea, and corn at 2 and 4X application rates. No injury was observed on all other rotational crops from the 4X pyroxsulam treatment. At 70 g/ha sulfosulfuron (2X), which is known to persist in the soil, injury (>15%) was observed on all rotational crops except cotton. Propoxycarbazone applied at 88 g/ha injured all plant back crops except pea, potato, safflower, and cotton. Propoxycarbazone + mesosulfuron (30 + 20 g/ha) injured all rotational crops except potato and cotton. These data indicate that pyroxsulam has a good margin of safety, and will be non-injurious to the 19 crops tested even at 2X the proposed use rate the season following application. Additionally, pyroxsulam provides the least potential for injury in an emergency re-cropping situation compared to other products tested. This attribute of rotational crop safety in spring and winter wheat will offer growers greater flexibility in a variety of current and developing cropping systems throughout the U.S. wheat growing regions. [72]

MANNAGRASS CONTROL IN ANNUAL RYEGRASS GROWN FOR SEED. Daniel Curtis*, Bill Brewster, Barbara Hinds-Cook, Carol Mallory-Smith and Andy Hulting, Oregon State University.

Mannagrass (Glyceria spp.) infests wet areas of many grass seed production fields in the Willamette Valley of Western Oregon. Few mannagrass control options are available to grass seed producers and the repeated use of ethofumesate has resulted in the development of resistance in many mannagrass populations. In addition to being competitive with the crop, the presence of mannagrass seed as a contaminant in Italian ryegrass (annual ryegrass) seed lots has interfered with marketing opportunities. In a screening study conducted during 2006-2007 at Hyslop Research Farm near Corvallis, OR, mesotrione at 0.094 lb ai/A, pyrasulfotole-bromoxynil at 0.23 lb ai/A, and topramezone at 0.0165 lb ai/A controlled mannagrass 98 to 100% with no Italian ryegrass injury. In two subsequent studies conducted in Italian ryegrass production fields in Linn County, OR, during the 2006-2007 season, pyrasulfotole-bromoxynil controlled mannagrass 78 and 82%. A study initiated in October 2007, included mesotrione and pyrasulfotole-bromoxynil applied at the two leaf, one tiller, three tiller and one node growth stage of the mannagrass. Evaluations of the herbicide treatments applied at the two youngest growth stages were conducted in January 2008. Mesotrione and pyrasulfotole-bromoxynil controlled 100% of the mannagrass when applied at the two leaf stage. At the one tiller application timing, Mesotrione controlled 98% of the mannagrass, pyrasulfotole-bromoxynil controlled 75% of the mannagrass. [73]

CALIFORNIA BROME BIOLOGY AND MANAGEMENT IN GRASS SEED CROPPING SYSTEMS. Andrew G Hulting*, Karin Neff and Carol Mallory-Smith, Oregon State University, Corvallis, OR .

California brome, (Bromus carinatus), is a native, cool-season perennial bunchgrass that can be a difficult to control weed in perennial grass seed production systems in Oregon. This species is of economic significance to grass seed growers not only due to yield loss associated with competition with the grass seed crop, but also in terms of direct costs associated with cleaning of harvested crop seed contaminated with California brome seeds. Fair to excellent (70-100 %) selective control of seedling California brome can be achieved with combinations of several herbicides currently available to growers such as flufenacet + metribuzin, oxyfluorfen, metolachlor, ethofumesate and glufosinate. However, when California brome populations are not controlled during the seedling growth stage and allowed to become established plants, management with currently registered herbicides, other than non-selective herbicide products, is not effective. Information on the biology and ecology of this species in native plant communities or when it is used in reclamation and restoration settings is abundant; however when California brome has become a

weedy species in managed agricultural systems little is known about the general biology of the species. Seed biology data specific to weedy populations of California brome is needed to improve timely management of seedling California brome in grass seed production systems. Therefore, mature California brome seed samples were collected from populations present in tall fescue and perennial ryegrass production fields in the fall of 2007 in the Willamette Valley, Oregon. Seeds were allowed to air dry in paper bags at ambient laboratory temperatures for two months. Growth chamber germination experiments were conducted for 15 days at four temperature ranges (5 to10, 10 to 15, 15 to 25 and 20 to 30 C) with 12/12 hour day/night lengths. Four replicates of 25 seeds per population were used, and germination was quantified every two days. The growth chamber experiments were repeated. Percent germination varied by population and the 15-25 C temperature range was optimal for California brome germination with an average of 74% of the seeds germinating after 15 days. Seventy percent of the seeds germinated at 20-30 C, 59% germinated at 10-15 C and no seeds germinated in the 5-10 C range. Fifty percent of seeds from all samples germinated between 68 and 90 Growing Degree Days (GDD), base 32 F. These data, in addition to local environmental data, will be used to parameterize a California brome germination and emergence predictive model that will facilitate timely chemical management of seedling California brome by grass seed growers. [74]

FIELD DATA COLLECTION WITH A TABLET COMPUTER. Richard P. Affeldt*, Oregon State University, Madras.

From 2005 to 2007 a tablet computer was used to collect visual evaluation data from 88 field trials. A tablet computer is a notebook or slate-shaped mobile computer that allows the user to operate the computer with a stylus or a fingertip instead of a keyboard or mouse. Data was collected predominantly from herbicide efficacy trials in peppermint, grass seed, and wheat. Climate conditions under which the field trials were conducted included the Willamette Valley of western Oregon and the shrub-steppe of central Oregon. Data was collected in every season of the year. The computer used was manufactured by Motion Computing, Inc. model M1400-T003 and ran Microsoft Windows XP Tablet PC Edition operating system. The tablet computer weighed 3 lb and the display was 9.75 inches wide and 7.25 inches tall. Trial development and data management was conducted with ARM software by Gylling Data Management, Inc. and Microsoft Excel. Once a set of visual evaluation data was finished it was backed up in the field on a USB flash drive. After returning from the field a hard copy of the data was produced with ARM and the data was also backed up on more permanent media. Backing up data was conducted with either SmartSync Pro by SmartSync Software, Inc. or Robocopy a command-line utility. The tablet computer functioned well in most weather conditions and the display was visible in full sunlight if kept clean. Fingerprints and smudges on the display reduced visibility in full sunlight. When air temperatures exceeded 90 degrees Fahrenheit the computer did not dissipate heat well and sometimes shutdown to prevent overheating. A weatherproof sleeve for the computer made data collection possible in rainy conditions. The weight of the computer was acceptable if data collection could be completed in less than 1 hour, otherwise the evaluator need to rest. With the screen resolution set to 1024 by 768 pixels an Excel spreadsheet at 100% zoom displayed 480 cells. The hard drive was replaced once during this period because bad sectors developed. When collecting data the battery life was approximately 2 to 3 hours. Use of the tablet computer reduced time spent on data entry. No data collected on the tablet computer was lost. [83]

EVALUATION OF ROUNDUP READY AND LIBERTY LINK COTTON SYSTEMS FOR SHARPPOD MORNINGGLORY CONTROL. Paul A. Baumann, Travis W. Janak, and Matt E. Matocha, Texas Cooperative Extension, College Station.

Perennial morningglory in Texas cotton fields can reduce the harvestability and yield of cotton. Field studies conducted in 2006 and 2007 compared herbicide treatments in Roundup Ready Flex and LibertyLink cotton systems. Studies were conducted at the TAES research farm near College Station on a

site infested with sharppod morningglory (Ipomoea trichocarpa) and Palmer amaranth (Amaranthus palmeri) pigweed. Herbicides evaluated included preemergence treatments of Prowl H2O at 3 pt/A alone or with Caparol and Cotoran at 3.2 pt/A, followed by postemergence treatments of either Roundup WeatherMax at 22 or 32 oz/A, or Ignite at 22 or 29 oz/A. A post-directed treatment of Direx was applied in both cotton systems. All treatments were compared to plots that were untreated, weed free, or pigweed free/morningglory infested. At 14 to 17 days after the early-post timing all treatments containing Roundup WeatherMax provided greater than 80% control of sharppod morningglory, with no significant differences in control among treatments in 2006 and 2007. At this same rating date, all treatments containing Ignite resulted in greater than 85% control, with no significant differences among treatments in either year as well. By 35 days after the mid-post and post-directed application in 2006, all treatments containing Roundup WeatherMax provided greater than 80% control of sharppod morningglory, with the treatment including Direx post-directed at 2 pt/A resulting in significantly higher control than the other treatments. At 30 days after the mid-post and post-directed application in 2007, all treatments containing Roundup WeatherMax provided greater than 90% control, with the treatment including Direx post-directed at 2 pt/A resulting in the numerically highest control. At 35 days after the mid-post and post-directed application in 2006, all treatments containing Ignite resulted in greater than 85% control, with the treatment including Direx post-directed at 2 pt/A providing significantly greater control than the other treatments. By 30 days after the mid-post and post-directed application in 2007, all treatments containing Ignite provided greater than 90% control, with the treatment including Direx post-directed at 2 pt/A resulting in the numerically highest control. All treatments resulted in significantly greater lint yield than the untreated plot. In both years, no significant increase in yield was observed by any treatment that included either Roundup WeatherMax or Ignite when compared to the pigweed free plot that was infested with sharppod morningglory, except for the two Caparol and Cotoran containing treatments in the LibertyLink variety in 2007. The entire research area was treated with a harvest aid that provided mechanical harvestability of all plots except the untreated plots, although two harvest aid applications were required to make the pigweed free/morningglory infested plots mechanically harvestable. [84]

EVALUATION OF WEED CONTROL IN WINTER CANOLA IN THE SOUTHERN GREAT PLAINS. Joshua A. Bushong* Thomas F. Peeper, Mark C. Boyles, and B. Heath Sanders, Oklahoma State University, Stillwater.

Winter wheat producers in the Southern Great Plains are experiencing increasing problems with feral rye (Secale cereale), Italian ryegrass (Lolium multiflorum) and jointed goatgrass (Aegilops cylindrica). Wheat grown annually without rotation is a common practice in this region, in which has increased winter annual grass problems. Controlling winter annual grass species in winter wheat can be difficult. Canola in rotation with winter wheat increases herbicide options for controlling these winter annual grass species. However, in winter canola, volunteer wheat (Triticum aestivum) can become a weed. Registered herbicides were evaluated for control of these species in glyphosate tolerant winter canola. Four experiments were conducted during the 2006-2007 growing season, three near Stillwater, Oklahoma and one near Perkins, Oklahoma. The experimental design at each site was a randomized complete block. Plot size was 1.2 by 7.6 m with four replicates. Herbicide treatments were applied using a C02- pressurized backpack sprayer. Trifluralin at 1120 g ai/ha was applied in 187 L/ha of water carrier and incorporated immediately before planting. Postemergence treatments were applied at labeled rates in 93.5 L/ha of water carrier plus recommended adjuvants in the fall or sequentially in the fall and late winter. Plots were harvested with a small-plot combine. Sub-samples were extracted from each harvested canola sample and weed seed was separated by species and weighed. Canola yields were corrected for weed seed content. All herbicides reduced weed seed content in harvested canola, but differences were found in efficacy of the different herbicide treatments on the various species. Ryegrass was the most difficult grass to control, with no treatment controlling it over 97%. Delaying the planting date of canola from mid September to early October appeared to decrease interference from the winter annual grass species. At the mid September seeded sites all treatments except trifuralin PPI and quizalofop applied in February increased

canola yields. Sequential herbicide applications appeared more effective on ryegrass than any single treatment. All treatments were effective on volunteer wheat except trifluralin alone. [85]

TOLERANCE OF AN OIL SEED CROP, LESQUERELLA, TO PREEMERGENCE HERBICIDES. William B. McCloskey*, University of Arizona, Tucson; and David Dierig, USDA-ARS Arid Land Agricultural Research Center, Maricopa, AZ.

Management of weedy vegetation in fall planted Lesquerella fendleri (Gray) S. Wats. is critical for successful crop production due to the plants slow growth and short stature during establishment. Lesquerella is a broadcast planted crop which makes mechanical cultivation impossible and hand weeding difficult and expensive. The objective of this study was to determine the tolerance of lesquerella to several rates of various preemergence herbicides when the herbicides were applied and incorporated with either sprinkler or flood irrigation at various times after planting. Two experiments were conducted in which lesquerella was planted in level basins in October 2006. In both experiments, benefin (1.34 kg/ha) and pendimethalin (1.06 kg/ha) treatments were applied preplant incorporated (PPI) and all other treatments were preemergence applications where irrigation was used to incorporated the herbicide into the soil. In one experiment, a temporary sprinkler irrigation system was installed after the crop was planted. Two rates of the herbicides pendimethalin (Prowl H2O at 1.06 and 2.13 kg/ha), oxyfluorfen (GoalTender at 1.4 and 2.24 kg/ha), flumioxazin (0.21 and 0.43 kg/ha), metolachlor (0.71 and 1.4 kg/ha), bensulide (4.5 and 6.7 kg/ha) and pronamide (1.12 and 2.24 kg/ha) were applied using a CO2 pressurized, backpack sprayer in both experiments. Both experiments were irrigated either by flood or sprinkler irrigation to incorporate the preemergence herbicides and initiate germination. In the sprinkler irrigated experiment, a second and third set of treatments were applied at about 1 week intervals after planting when the soil surface dried out. The field was sprinkler irrigated to incorporate the herbicides after each set of treatments were applied. After all of the herbicide applications were completed, both fields were flood irrigated for the remainder of the growing season. Data collected included population densities, visual injury ratings and seed yield. Lesquerella density in the sprinkler irrigated experiment was 561 plants/m2 in the untreated control and 185 and 291 plants/m2 in the benefin and pendimethalin PPI treatments, respectively. In the flood irrigated experiment, lesquerella density in the untreated control was 135 plants/m2 and 58 and 32 plants/m2 in the benefin and pendimethalin PPI treatments, respectively. The preemergence pendimethalin, oxyfluorfen and flumixazin treatments almost completely eliminated lesquerella emergence when the herbicides were applied prior to the first or second sprinkler irrigation but crop emergence was similar to the untreated control when the herbicides were applied prior to the third sprinkler irrigation. These herbicides also severely reduced (pendimethalin at 1.06 kg/ha) or eliminated lesquerella emergence when they were applied preemergence after planting and incorporated with flood irrigation. The other herbicides had more complicated injury patterns; bensulide reduced lesquerella emergence the least and had little effect on yield. Metolachlor and pronamide reduced emergence and yield the most when incorporated by the second sprinkler irrigation, caused intermediate injury following the first sprinkler irrigation and had no effect on emergence or yield when incorporated by the third sprinkler irrigation. Herbicide tolerance in lesquerella is limited and more research is needed to develop weed management programs that can be utilized by growers. [86]

WEED CONTROL IN DIRECT-SEEDED FIELD PEA. Gregory Endres* and Blaine Schatz, North Dakota State University, Carrington.

Field trials were conducted in 2006-07 at Carrington, North Dakota to examine weed control and field pea response to selected herbicides. Experimental design was a randomized complete block with three replicates. The trials were conducted on a loam soil with 6.9 pH and 3.2 to 3.3% organic matter. Herbicides were applied with a CO2 pressurized hand-held plot sprayer at 17 gal/A at 30 to 35 psi through 80015 or 8002 flat-fan nozzles. Herbicide application timing included fall (early November), spring preplant (PP), preemergence (PRE), postemergence (POST), and preharvest (PH). Weeds

evaluated included green and yellow foxtail, common lambsquarters, and prostrate and redroot pigweed. Inoculated 'Admiral' field pea was direct-seeded into standing wheat stubble in 7-inch rows at a rate of 300,000 pure live seeds/A on April 27, 2006 and May 2, 2007. During the 2006 growing season, fall- or spring-applied (PP and PRE) sulfentrazone at 0.14 lb ai/A provided 95 to 99% control of broadleaf weeds. Spring PP sulfentrazone at 0.105 lb/A + imazethapyr at 0.016 lb/A provided 98 to 99% control of foxtail and broadleaf weeds. PRE pendimethalin at 1.5 lb/A provided 93 to 99% broadleaf weed control compared to 84 to 89% control with fall application. PRE Linuron at 1 lb/A and KIH 485 at 0.15 lb/A provided 90 to 99% control of broadleaf weeds and essentially no crop injury during both years of testing. In 2006, sequentially-applied POST bentazon at 0.5 lb/A + sethoxydim at 0.1 lb/A provided 97% control of pigweed spp. compared to 84% control with the single application of bentazon at 1.0 lb/A + sethoxydim at 0.2 lb/. Also, bentazon at 0.5 lb/A + sethoxydim at 0.1 lb/A + imazamox at 0.016 lb/a provided similar foxtail and common lambsquarters control, and improved pigweed control compared to bentazon at 1.0 lb/A + sethoxydim at 0.2 lb/A. In 2007, PH crop desiccation with flumioxazin at 0.06 lb/A + MSO was highly effective and similar to paraquat at 0.5 lb/A + NIS for whole plant dry down when visually evaluated 1 wk after application. [87]

BROADLEAF WEED CONTROL IN DRY BEANS WITH PREEMERGENCE FOLLOWED BY SEQUENTIAL POSTEMERGENCE HERBICIDES. Richard N. Arnold*, Michael K. O'Neill and Dan Smeal, New Mexcio State University Agricultural Science Center, Farmington, NM .

Research plots were established on May 29, 2007, at New Mexico State University Agricultural Science Center, Farmington, New Mexico, to evaluate the response of dry beans (var. Bill Z) and annual broadleaf weeds to herbicides. Soil type was a Wall sandy loam with a pH of 7.8 and an organic matter content of less than 1%. The experimental design was a randomized complete block with four replications. Individual plots were four, 34 in rows 30 ft long. Dry beans were planted with flexi-planters equipped with disk openers on May 29. Preemergence treatments were applied on May 31 and were immediately incorporated with approximately 0.75 in of sprinkler applied water. Sequential postemergence treatments were applied on June 27 after cultivation and to dry beans in the 3rd to 4th trifoliate leaf stage. Postemergence treatments were applied with a crop oil concentrate and urea ammonium nitrate at 0.5 and 1.0% v/v. All treatments were applied with a compressed air backpack sprayer calibrated to deliver 30 gal/A at 35 psi. Preemergence treatments were evaluated on June 27 and preemergence followed by sequential postemergence treatments were evaluated on July 30. On June 29, all treatments except the check gave excellent control of redroot and prostrate pigweed, common lambsquarters, and black nightshade. Dimethanamid-p alone at 0.56 lb ai/A, or in combination with either pendimethalin H2O or pendimethalin at 0.56 plus 0.8 lb ai/A gave 40% or less control of Russian thistle. However, flumioxazin alone at 0.05 lb/ai/A, or in combination with either pendimethalin H2O or pendimethalin at 0.8 lb ai/A gave 98% or better control of Russian thistle. When treatments of imazamox plus bentazon at 0.032 plus 0.25 lb ai/A were applied postemergence over preemergence treatments of dimethenamid-p alone or in combination with either pendimethalin H2O or pendimethalin, Russian thistle control increased approximately 61%. Yields were 2475 to 3843 lb/A higher in the herbicide treated plots as compared to the weedy check. [88]

A CROPPING SYSTEMS APPROACH TO MANAGING SOYBEAN CYST NEMATODE AND WINTER ANNUAL WEEDS. J. Earl Creech*, University of Nevada Cooperative Extension, Fallon; Valerie A. Mock, and William G. Johnson, Purdue University, West Lafayette, IN.

Soybean cyst nematode (SCN) is a threat to profitable soybean production throughout the soybean growing regions of the U.S. Research has shown that a number of winter annual weed species can serve as alternative hosts for SCN in the greenhouse. The objective of this research was to evaluate the impact of winter annual weed management and crop rotation on SCN population densities, winter annual weed populations, and crop yield. Field trials were established in the fall of 2003 at the Agronomy Center for

Research and Education in West Lafayette, IN and at the Southwest Purdue Agricultural Center in Vincennes, IN. The experimental design was a randomized complete block split-plot with six replications. The main plots consisted of two crop rotations: continuous soybean and a 2-yr rotation of soybean-corn. The subplot treatments were comprised of various herbicide application timings and cover crops. Cover crops included fall-seeded annual ryegrass and winter wheat. Winter weed control timings were 1) a non-treated control, 2) fall and spring control, 3) spring control, and 4) fall control. After establishment, the plots to which the main- and sub-plot factors were applied remained fixed throughout the entire experiment to determine the cumulative treatment effects over time. To date, winter annual weed management has not influenced SCN egg density but crop rotation and SCN resistant cultivars have proven to be important SCN management tools. The failure of winter weed management to impact SCN population density is likely due to the low weed pressure in the plot area at the onset of the experiment. Herbicides have been more effective than cover crops at reducing the amount of weed seed in the soil seedbank. Cover crops negatively influenced corn and soybean yield at West Lafayette but not Vincennes. [89]

COMBINING WEED AND FEED TREATMENTS FOR WINTER WHEAT. Robert N. Klein* and Gordon E. Hanson, University of Nebraska, North Platte.

Combining herbicide application and fertilizer application in the early spring is a popular practice. It is economical combining the operations, spring herbicide application allows timely and inexpensive post-emergence weed control, and spring fertilizer application avoids excess fall growth which can deplete soil moisture and invite disease problems. However, the leaf burn from nitrogen application is often aggravated by the co-application of herbicides. Producers are often alarmed at the sight of a lush green wheat field turned yellow by a weed and feed nitrogen application. The effect of combining early spring herbicide and fertilizer applications was studied in two locations in southwest Nebraska. The first site was near McCook and the second was on the University of Nebraska-Lincoln WCREC Dryland Research Farm near North Platte. The two locations were of similar fertility in the fall before winter wheat was sown. Herbicide treatments were applied to 'Jagalene' winter wheat in combination with 0, 30, and 60 lb/A N from 28-0-0 urea-ammonium nitrate. The three treatments were a control and 0.018 lb ai/A metsulfuron + thifensulfuron methyl mixed with 0.125 or 0.25 lb ai/A of the ethylhexyl ester of 2,4-D. All treatments were applied with and without 0.094 lb ai/A of dicamba. Increased fertilizer rates caused significant injury with increased 2,4-D rates causing only slightly more injury. The addition of dicamba to the treatments caused little injury. However dicamba did result in increased lodging at harvest. Increased fertilizer and herbicide decreased lodging. All treatments depressed grain yields. [90]

ASSESSING LONG-TERM VIABILITY OF GLYPHOSATE-RESISTANT TECHNOLOGY AS A FOUNDATION FOR CROPPING SYSTEMS – ON - FARM COMPARISONS OF WEED MANAGEMENT PROGRAM EFFICACY. Gustavo M. Sbatella*, Robert G. Wilson, University of Nebraska, Scottsbluff; William G. Johnson, Stephen C. Weller, Purdue University, West Lafayette; Michael D. K. Owen, Iowa State University, Ames; David R. Shaw, Mississippi State University, Mississippi State; John W. Wilcut, David L. Jordan, North Carolina State University, Raleigh; and Brian G. Young, Southern Illinois University, Carbondale.

Weed scientists from Illinois, Indiana, Iowa, Nebraska, North Carolina, and Mississippi conducted similar studies from 2006 to 2007 at 156 on-farm sites to determine the viability of various crop management strategies for the preservation of glyphosate programs as an effective tool for weed control. On-farm sites were divided into seven cropping systems: continuous glyphosate-resistant (GR) corn, soybean, or cotton; GR soybean followed by GR corn; GR soybean followed by non GR corn; GR cotton followed by GR soybeans; and GR soybean followed by a non GR crop. In the spring of 2006, the grower selected a field that had previously been in a GR cropping system for a minimum of 3 yr to enroll in the project. The field was divided into two sections with each section approximately 8 ha in size. On the grower side of the

field the farmer continued with his established glyphosate-based weed management program. In the second half of the field the weed control program was managed by the university weed scientist with the goal of expanding the weed management program to include glyphosate plus herbicides with other modes of action. In both the grower and university sections of the field, 20, 0.5 m^2 observation points were established in a W pattern across the field. Each point was mapped using a GPS positioning instrument so each point could be examined throughout the growing season and in following years. Weed populations were observed at four times during the growing season: in early spring before crop planting, after crop emergence but before the first POST treatment, 2 wk following the last POST treatment, and before crop harvest in the fall. When averaged over the different cropping systems initial weed populations in the grower and university sections of the field were similar. In both 2006 and 2007 weed populations recorded after crop emergence were greater in continuous GR corn and least in a GR soybean followed by GR corn rotation. Weed density declined approximately 70% in the grower side of the field and 80% in the university side of the field from crop emergence to 2 wk following the last POST weed control treatment. Members of the Amaranthus and Setaria genera were two of the more prevalent weeds observed at study sites 2 wk following the last POST treatment. [116]

AN ECONOMIC COMPARISON OF WEED CONTROL IN GLYPHOSATE-RESISTANT AND CONVENTIONAL ALFALFA SEEDINGS. Robert G. Wilson*, University of Nebraska, Scottsbluff.

Experiments were conducted near Scottsbluff, NE from 2005 through 2007 to compare efficacy and economic aspects of glyphosate-resistant alfalfa with that of conventional herbicide programs applied to a near-equivalent conventional cultivar. Treating alfalfa at the unifoliate or two-trifoliate growth stage with glyphosate reduced weed density 68 and 81%, respectively when compared to the untreated. A postemergence treatment at the two-trifoliate growth stage with imazamox or imazethapyr reduced weed density 63 and 65%, respectively. Weed control could further be enhanced by applying a second application of glyphosate or by combining imazamox or imazethapyr with either bromoxynil or 2,4-DB however, combining imazamox or imazethapyr with bromoxynil or 2,4-DB increased the potential for seedling alfalfa injury. First cutting forage harvested from untreated plots consisted of 38% alfalfa and 62% weeds, averaged 2.6 tons/acre at 12% moisture, and had a RFV of 172. Compared to weed-free plots, weed competition from crop emergence to the first cutting resulted in a 28% reduction in alfalfa density and a 24% suppression of second cutting forage yield. Reducing weed density 68% with glyphosate resulted in forage with fewer weeds which improved the RFV value of the first cutting to 204 but reduced forage yield to 1.7 tons/acre. Imazamox also reduced the quantity of weeds in the first cutting which improved RFV to 202 and resulted in a forage yield of 1.3 tons/acre. Combining imazamox with bromoxynil improved weed control but caused alfalfa injury which resulted in a first cutting forage yield of 0.8 tons/acre. During the year of establishment the total forage yield from three cuttings was 5.3, 4.5, 4.4, and 4.4 tons/acre for the untreated, glyphosate, imazamox, and imazethapyr treatments, respectively. [117]

EVALUATION OF THE ROUNDUP READY SYSTEM FOR WEED CONTROL IN SEEDLING ALFALFA IN CALIFORNIA. Steve B. Orloff, University of California Cooperative Extension, Yreka; Rob G. Wilson, University of California Cooperative Extension, Susanville; and W. Mick Canevari, University of California Cooperative Extension, Stockton.

Alfalfa in the Intermountain Region of Northern California is primarily grown as a cash crop and is sold off-farm to the dairy industry, hobby horse market, or to local cattle producers. Hay destined for the higher priced dairy and horse market must be nearly weed-free—a difficult accomplishment given the broad spectrum of weeds encountered in many seedling alfalfa fields. Trials were established in 2005 and 2006 in both fall-seeded and spring-seeded alfalfa in northern California (Siskiyou and Lassen Counties) to compare Roundup Ready weed control systems with standard conventional herbicides. Additional objectives were to evaluate different application timings, herbicide tank mix combinations and the need

for sequential treatments to maximize weed control. Glyphosate treatments caused less alfalfa injury than the conventional standards imazethapyr and imazamox, and when applied at the 3–4 trifoliolate growth stage, provided better weed control. Glyphosate treatments applied to alfalfa in the first trifoliolate-leaf growth stage did not adequately control some weed species in a fall seeding but all treatment timings (1st, 3–4 and 6–9 trifoliolate leaf stages) provided excellent weed control in a spring seeding. Except for the earliest treatment timing in a fall seeding, any treatment containing glyphosate provided better than 90 percent control of all weed species, which included a broad spectrum of both summer and winter annual grassy and broadleaf weeds. A sequential application of glyphosate was required for complete weed control in a fall seeding. The need for a sequential glyphosate application in a spring seeding appeared to depend on the frequency of irrigation. Two applications were needed in a frequently irrigated field for 100 percent weed control. Tank mixing glyphosate with imazethapyr or imazamox eliminated the need for a sequential application. Glyphosate-treated plots tended to yield more alfalfa in the first cutting than the conventionally-treated plots at most sites. Forage quality (quantified using acid detergent fiber and crude protein levels) was superior for herbicide-treated plots compared with control plots. Depending on the weed species encountered, glyphosate-treated plots had better forage quality than conventionally-treated plots at some locations. [118]

WEED CONTROL AND GLYPHOSATE-RESISTANT SUGARBEET RESPONSE TO GLYPHOSATE. Abdel O. Mesbah*, University of Wyoming Research and Extension Center, Powell; Andrew Kniss, and Stephen D. Miller, University of Wyoming, Laramie, WY.

Field experiments were conducted in 2007 at the University of Wyoming Research and Extension Center at Powell, Wyoming to evaluate weed control and glyphosate-resistant sugarbeet response (injury, stand population, root yield, and sucrose content) to glyphosate rates, number of applications as well as application timings. Glyphosate rates consisted of 22 and 32 oz/ac applied once, twice, or three times starting at 2, 4, or 6 sugarbeet leaf stages. All glyphosate treatments contained ammonium sulfate at 2% w/w and were compared to a hand weeded check, weedy check, or conventional treatment using half-rate system. Weed infestations at the experimental site varied from heavy to light, depending on the weed species; 25 redroot pigweed, 11 wild oat, 7 Venice mallow, and 3 wild buckwheat plants/10 ft. of row. Weed control with treatments containing glyphosate was good to excellent (90 to 100%) depending on the number and time of applications. Weed control with single application of glyphosate at 6 leaf stage using 22 or 32 oz/ac was similar to the conventional treatment. With double application of glyphosate at 4/8 leaf stage, weed control was 5% better than 2/6 leaf stage and similar to 6/CC (canopy closure) stage. Weed control with triple application at 2/6/CC and 4/8/CC stages was excellent and similar to double application at 4/8 or 6/CC sugarbeet stage. No sugarbeet stand reduction and no injuries were recorded with the glyphosate treatments; however, a 5 % injury was recorded with the conventional treatment. Sugarbeet root yield with single application at 6 leaf stage or double application at 6/CC stage was similar to the conventional treatment. There was no significant difference in root yield between double application at 4/8 leaf stage and triple application at 2/6/CC or 4/8/CC stages, Sugar content among all treatments including the weed free and the weedy check was similar. [119]

WESTERN FIELD DODDER REDUCES SUGAR CONTENT IN SUGAR BEETS. Joel Felix and Joey Ishida, Oregon State University/ Malheur Experiment Station, Ontario.

Abstract. A survey of grower fields planted to sugar beets (Beta vulgaris L.) was conducted during October 2007 to determine the effect of field dodder competition on harvestable root yield and sugar content of parasitized and non-parasitized plants in Eastern Oregon. Sugar beets parasitization by dodder could be related to weed management programs used by growers in Eastern Oregon, but can also be attributed to continuous emergence throughout summer. Surveyed fields were chosen randomly, and were representative of dodder infestation in the area. Weed control in sampled fields employed the micro-rate program of phenmedipham plus desmedipham plus ethofumesate + triflusulfuron methyl + dimethenamid

at 150g + 5.8 g + 35 g ai/ha, respectively, plus methylated oil at 1.5% V/V. A total of 10 samples (with 8 sugar beets each) were randomly harvested at crop maturity from two rows covering approximately 1 m2 each in areas with and without dodder parasitization. Sample weight was recorded before transporting the samples for commercial sugar content determination. Sugar beet root yield and percent sugar content were significantly reduced for parasitized samples compared to dodder-free areas. Root yield for parasitized samples ranged between 42 and 78 T/ha with an average of 65 T/ha compared to 76 and 112 T/ha with an average of 95 T/ha for non-parasitized samples. The average sugar content for parasitized samples was 13% compared to 16% for non-parasitized roots. As a consequence, the gross sugar content ha-1 was reduced 43% for parasitized areas. Grower loss from dodder parasitization is great since both root yield and percent sugar content are used to determine payments. [120]

GLYPHOSATE RESISTANT SUGARBEET IN WYOMING: A LOOK INTO THE FUTURE. Andrew R. Kniss, University of Wyoming, Laramie.

Approximately 800 ha of glyphosate-resistant sugarbeet was grown in Wyoming in 2007. This represents the largest commercial production of a biotechnolgy-derived sugar crop in the world to date. Previous research on glyphosate-resistant sugarbeet predicted that growers could afford to pay nearly $479/ha for the technology due to reductions in weed management costs and increases in production that the technology allows. However, research conducted prior to 2007 has been done in small-plots, and it is unclear how estimates derived from small-plot research would relate to commercial scale production by sugarbeet growers. A study was conducted in 2007 in Wyoming in order to quantify the economic gain or loss to sugarbeet growers who adopted this technology. In May of 2007, 20 glyphosate-resistant sugarbeet fields in commercial production were paired with nearby fields of conventional sugarbeet. Each pair of fields was managed by the same grower, had similar soil types, irrigation methods, and cropping histories. In many cases the pairs consisted of a single field where glyphosate-resistant and conventional sugarbeet cultivars were planted side by side. For each field selected for this study, data on field operations, herbicide applications, and yield data were collected. Net economic returns were then calculated for each field. On average, the glyphosate-resistant production system resulted in a $222/ha decrease in costs related to weed management, and an increase in gross return of $328/ha when compared to conventional sugarbeet. This represents a net economic gain to sugarbeet growers who adopted glyphosate-resistant sugarbeet in 2007 of $550/ha. In addition, inter-row cultivation and the number of herbicide applications was reduced by 50% and 12%, respectively, in glyphosate-resistant sugarbeet compared to conventional sugarbeet. [121]

BAS 800H: A NEW HERBICIDE FOR PREPLANT BURNDOWN AND PREEMERGENCE DICOT WEED CONTROL. Rex Liebl, Helmut Walter, Steven Bowe*, Tom Holt and Dan Westberg, BASF Corporation, Research Triangle Park, NC.

BAS 800H is new herbicide being developed by BASF for dicot weed control. BAS 800H is a protoporphyrinogen-IX-oxidase (PPO) inhibitor and belongs to the pyrimidine dione class of chemistry. BAS 800H is highly effective on dicot weeds controlling them through both contact and residual activity. BAS 800H has preemergence selectivity in multiple crops and has also demonstrated control of problem weeds in non-crop markets. BAS 800H is readily absorbed by root and shoot tissue of plants. Once absorbed, BAS 800H is predominantly translocated via the xylem, with limited movement via the phloem. Selectivity is conferred by physical placement and rapid metabolism of BAS 800H in tolerant crop species. BAS 800H has a very favorable regulatory profile. Research has indicated that BAS 800H applied at 18 to 25 g ai/ha can be used alone or mixed with glyphosate and applied preplant for rapid and complete burndown in soybeans, corn, cotton, cereals and selected legumes. BAS 800H complements glyphosate by controlling glyphosate or ALS tolerant/resistant weeds including horseweed (Conyza canadensis) or prickly lettuce (Lactuca serriola). In tree fruit and nut crops, BAS 800H as post-directed treatment controls important dicot weeds such as flaxleaf fleabane (Conyza bonariensis) and Malva spp.

Our research has shown that in corn, BAS 800H can be used preemergence at 63 to 125 g ai/ha for a complete dicot solution including control of troublesome large-seeded species such as velvetleaf (Abutilon theophrasti), common cocklebur (Xanthium strumarium), ragweed (Ambrosia spp.), common sunflower (Helianthus annuus) and morningglory (Ipomoea spp). BAS 800H does not require combination with atrazine to successfully control broadleaf weeds preemergence in corn. BAS 800H's combination of robust dicot control, complementary activity with glyphosate, and preplant crop safety makes BAS 800H the ideal partner herbicide for glyphosate in preplant burndown and residual broadleaf weed control in corn. [122]

PREPLANT WEED CONTROL AND WHEAT TOLERANCE TO BAS 800H. Brian M. Jenks*, North Dakota State University, Minot; Daniel A. Ball, Oregon State University, Pendleton; and Phillip W. Stahlman, Kansas State University Agricultural Research Center-Hays.

BAS 800H is an experimental broadleaf herbicide that has potential for use in fallow or as a preplant or preemergence herbicide in several crops. In these studies, BAS 800H was applied preplant or preemergence to evaluate spring/winter wheat tolerance and control of troublesome weeds. Studies were conducted in spring wheat at Minot, ND and Pendleton, OR in 2006 and 2007; and in winter wheat near Hays, KS in the 2005-06 growing season. At Minot and Pendleton, treatments were applied 7-10 days preplant and included BAS 800H at 25 g ai/ha; glyphosate alone; BAS 800H at 25, 37.5, and 50 g/ha tank mixed with glyphosate at 840 g ae/ha; and glyphosate plus dicamba at 770 g ae/ha. At Hays, fall treatments were applied preemergence (same day as planting) and included BAS 800H alone at 12.5, 25, 37.5, 50, and 100 g/ha; and chlorsulfuron plus metsulfuron at 26 g ai/ha. At Minot, there was no visible spring wheat injury in 2006 or 2007. In 2006, all treatments controlled emerged flixweed, kochia, and wild buckwheat. BAS 800H residual control of wild buckwheat was less than 80% by 4 weeks after treatment (WAT). No other weeds emerged after application. In 2007, all treatments provided excellent control of emerged flixweed, kochia, and lambsquarters. BAS 800H residual control of kochia and lambsquarters was less than 80% by 4 and 7 WAT, respectively. Redroot pigweed was not emerged at application time, but higher rates of BAS 800H provided as much as 63% residual control of redroot pigweed 7 WAT compared to almost no residual control from glyphosate plus dicamba. At Pendleton, there was no visible spring wheat injury in 2006 or 2007. In 2006, all treatments provided 100% control of mustard species 2 and 8 WAT. Tarweed control was near 100% at 2 WAT, but a late emerging flush was poorly controlled at 8 WAT. Treatments containing glyphosate controlled downy brome, while BAS 800H had no activity on downy brome. Treatments containing glyphosate tank mixed with BAS 800H or dicamba provided higher spring wheat yields compared to BAS 800H alone. In 2007, all treatments provided 100% control of volunteer canola, tansymustard and prickly lettuce 3, 5, and 7 WAT. Wheat yields were similar between herbicide treatments and were significantly higher than the untreated control. At Hays, no winter wheat injury was observed in BAS 800H treatments in the fall or spring. Fourteen percent injury (stunting) was observed from chlorsulfuron plus metsulfuron in November; however, injury was not evident in the spring. Chlorsulfuron plus metsulfuron provided 99-100% control of flixweed and henbit in March-June evaluations. BAS 800H treatments provided 35-48% flixweed control and 48-78% henbit control. Winter wheat yields were similar between BAS 800H rates of 25 g/ha and higher. Winter wheat yield with chlorsulfuron plus metsulfuron was slightly higher than BAS 800H treatments up to 50 g/ha, but similar to BAS 800H at 100 g/ha. [123]

FALL BURNDOWN CONTROL OF WINTER ANNUALS WITH BAS 800H AS INFLUENCED BY THE TYPE OF ADJUVANT. . Stevan Z. Knezevic, and Jon Scott, Haskell Ag. Lab., University of Nebraska, Concord; Leo Charvat, BASF Corporation, Lincoln, NE .

BAS 800H is a new herbicide under development for broadleaf weed control in various crops. Field studies were conducted in the Fall of 2005 and 2006 with the objective to describe dose-response curves of BAS 800H applied POST on 10-15 cm tall weeds. A total of six BAS-800H rates, ranging from 0 to

100 g ai/ha, were used alone or tank mixed with glyphosate (870 g ae/ha), NIS (0.25 % v/v), COC (1% v/v), or MSO (1% v/v). An effective dose (ED) that provided 90% control (e.g., ED90) was determined for each weed species using R software and drc package. In general, preliminary data suggested that MSO provided the most enhancement of BAS 800H. The ED90 values for common dandelion (Taraxacum officinale) at 14 DAT were 54, 96, 48, 40, and 99 g /ha of BAS 800H applied tank mixed with glyphosate, NIS, COC, or MSO, and BAS 800H applied alone, respectively. The ED90 values for henbit (Lamium amplexicaule) were 41, 87, 45, 32, and 95 g /ha of BAS 800H tank mixed with glyphosate, NIS, COC, MSO, and BAS 800H alone, respectively. Similar trends in ED90 values were observed for field bindweed (Convolvulus arvensis), prickly lettuce (Lactuca serriola), and shepherd's-purse (Capsella bursa-pastoris), suggesting potential use of this new compound for fall control of many broadleaf weeds. sknezevic2@unl.edu [124]

INVESTIGATION OF SUNFLOWER RESPONSE TO BAS 800H AS A PREHARVEST DESICCANT. Kirk A. Howatt*, North Dakota State University, Fargo.

Bird predation and inclement weather during plant drying can substantially reduce sunflower seed yield and quality. Chemical desiccation to speed drying may promote earlier harvest, preserving yield and quality. Experiments were conducted to evaluate sunflower desiccation with BAS 800H, saflufenacil, relative to paraquat and glyphosate and to determine the effect of desiccation timing on seed size, oil content, and germination. To evaluate desiccation effect, visible appearance of the whole plant, stalk, and receptacle was rated on a basis of percentage necrotic tissue. Moisture content of stalk, receptacle, and seed and seed yield were determined 5, 10, and 15 d after treatment (DAT). Generally, plants appeared more necrotic than was supported by moisture content. Visible desiccation of receptacles 5 DAT was 81% for paraquat and liquid formulated saflufenacil but 59 to 66% for dry formulated saflufenacil, glyphosate, or saflufenacil plus glyphosate, untreated was 29%. Moisture content of the receptacle at the same evaluation ranged from 59 to 73%, with 70% for the untreated. At this evaluation, seed moisture of sunflower seed was 4 to 6 percentage points less with herbicide treatment than for control plants. Warm weather promoted desiccation with all herbicides but inhibited separation within herbicide treatment. Sunflower moisture reached levels to allow mechanical harvest 4 to 5 d earlier with desiccation than for natural drying. Treatment did not affect yield. To evaluate desiccation timing, herbicides were applied at 46, 40, and 30% seed moisture to separate plots. Again, herbicide treatment did not affect seed yield, 2100 lb/A average across the experiment. Treatment did not affect seed size, although sunflower treated with paraquat or saflufenacil at 46% seed moisture tended to produce smaller seed than other herbicides and timings. The same result occurred for oil content, but oil content remained above 50% regardless of treatment. Saflufenacil is a viable desiccant for sunflower to promote earlier harvest than natural drying. Early application because of misidentification of crop stage or inconsistent plant development across a field should not affect sunflower yield or quality if the average seed moisture at application is 40% or less. [125]

BROADLEAF WEED CONTROL IN CHEMICAL FALLOW WITH BAS 800H . Daniel A. Ball*, Oregon State University, Columbia Basin Agricultural Research Center-Pendleton; Brian M. Jenks, North Dakota State Univeristy, North Central Research Extension Center-Minot; Phil W. Stahlman and John C. Frihauf, Kansas State University Agricultural Research Center-Hays.

In dryland cropping regions where annual precipitation limits wheat production, an extended fallow period is often alternated with wheat production. The stored soil moisture from fallowing stabilizes wheat grain yield in the alternating years of wheat production. During the fallow periods, it is increasingly common for tillage to be eliminated or reduced in order to maintain crop residues for erosion control, and to reduce the expenses associated with mechanized tillage operations. The elimination or reduction in fallow tillage necessitates a concomitant increase in herbicide use for weed control. Glyphosate is the most widely used herbicide for weed control in fallow. The heavy reliance on repeated glyphosate use in

chemical fallow increases the possibility for developing herbicide resistant weed populations and/or producing a shift in weed species composition to weeds tolerant of glyphosate. BAS 800H is a new herbicide being proposed for use in broadleaf weed control in dryland fallow systems. Field studies were conducted during 2006 and 2007 at multiple locations to evaluate BAS 800H and glyphosate applied alone and in combination for broadleaf weed control in chemical fallow. Study sites included Pendleton, OR, Minot, ND, and Hays, KS where dryland wheat production is typically rotated with an alternating year of fallow. At all locations, field studies were arranged in randomized complete block designs consisting of 8 ft by 30 ft plots with four replicates per treatment. Herbicide treatments were applied with hand-held boom sprayers equipped with flat-fan nozzles, calibrated to apply 10 to 15 gal/A at 30 to 35 psi depending on location. All treatments included a crop oil concentrate adjuvant at 1% v/v and ammonium sulfate at 17 lb/100 gal. Early and late evaluations of visible weed control were made on weeds of primary importance at each location. Early weed control evaluations were made within 2 weeks of treatment application, and late evaluations were made 4 weeks or later after application. Weeds evaluated for control included Russian thistle at the Oregon and North Dakota sites, and kochia and pigweed species (Amaranthus spp.) at the Kansas and North Dakota locations. In the Oregon trials, Russian thistle control from 25 g ai/ha BAS 800H plus 840 g ae/ha glyphosate averaged 97% over three trials when evaluated four weeks after treatment. BAS 800H applied alone at 25 g/ha controlled Russian thistle 93% four weeks after treatment while 840 g/ha glyphosate applied alone averaged 56% four weeks after treatment. In the North Dakota trials, 25 g/ha BAS 800H or 840 g/ha glyphosate applied alone or in combination in one trial controlled Russian thistle 100% four weeks after treatment. Kochia control from 25 g/ha BAS 800H plus 840 g/ha glyphosate at the Kansas sites averaged 77% over four trials within 2 weeks of treatment, but declined to 66% control four weeks after treatment. BAS 800H applied alone at 25 g/ha controlled kochia 54% after 4 weeks while 840 g/ha glyphosate applied alone averaged 56% four weeks after treatment. In the North Dakota trials, kochia control four weeks after treatment averaged 94% over four trials with 25 g/ha BAS 800H plus 840 g/ha glyphosate. BAS 800H applied alone at 25 g/ha controlled kochia 91% after 4 weeks while 840 g/ha glyphosate applied alone averaged 93% four weeks after treatment. In addition, the 25 g/ha BAS 800H plus 840 g/ha glyphosate treatment provided 95% or greater visible control of pigweed species, puncturevine, horseweed and biennial wormwood at those test sites where these species were present. Based on observed results from the multiple location and year trials summarized here, it appears that BAS 800H has potential for improving control of several broadleaf weed species of importance in chemical fallow. [126]

PRESEED APPLICATIONS WITH BAS 800H FOR BROADLEAF WEED CONTROL PRIOR TO CEREAL AND PULSE CROPS. Mark Oostlander*, Glen Forster, Lyle Drew, BASF Canada Inc., Missisauga, ON; and Siyuan Tan, BASF Corporation, Research Triangle Park, NC.

The efficacy of a new developmental herbicide, BAS 800H, was tested in combination with glyphosate as a preseed treatment prior to cereal and pulse crops, and as a chemfallow treatment. Trials were conducted from 2004 to 2007 in all the major ecozones of Western Canada, and across the cereal and pulse growing regions of the United States. BAS 800H applied at rates from 18 to 50 g ai/ha, in combination with glyphosate at 450 g ae/ha provided excellent control of broadleaf weeds, including glyphosate tolerant species, in a preseed and chemfallow use pattern. BAS 800H at the lower rate of 18 g ai/ha + glyphosate provided excellent burndown control of all broadleaf weeds. Increasing the rate to 50 g ai/ha provided residual activity on species such as wild mustard (Sinapis arvensis) and wild buckwheat (Polygonum convolvulus). Tolerance to BAS 800H was assessed at rates from 18 to 100 g ai/ha over a wide range of climates and soil conditions. Cereals (spring wheat, durum wheat, barley, oats) and pulse crops (field peas, chickpeas) showed excellent tolerance to BAS 800H at rates up to 100 g/ha. [127]

IMPACT OF GLYPHOSATE RESISTANT VOLUNTEER CORN IN IRRIGATED CORN. Randall S. Currie,Kansas State University,Garden City; Philip Westra, Colorado State University, Ft. Collins;and John Fenderson,Kiowa ,KS; Jeff Tichota Centennial CO; and Jeff Mueller Gothenburg NE ; Monsanto Technology Development Representives ..

The increasing popularity of glyphosate-resistant corn hybrids has led to concern among growers about the effect of volunteer corn on the subsequent, irrigated corn crops. To determine the economic threshold for this problem, five studies were conducted using a range of volunteer corn populations. In the early winter of 2007, naturally dropped ears were collected from a field planted with a glyphosate-resistant corn hybrid in the 2006 growing season. A portion of these ears were shelled, and the balances of these ears were broken into three pieces. In Garden City, Kansas during the first week in May 2007, corn from the shelled ears was scattered randomly by hand over 8 plots/block to simulate volunteer corn populations ranging from 5,000 to 31,000 kernels/a in a randomized complete block design with four replicates. In an additional four plots/block, broken ears were placed on the soil surface and trod in to simulate 650 dropped ears/a. These plots were then over seeded with the shelled corn to simulate corn populations of 5,000 to 36,000 kernels per/a. The entire plot area was tilled lightly, and a glyphosate-resistant corn hybrid was planted at 32,000 kernels/a. This procedure was repeated near Pratt, Kansas, and Yuma, Colorado. Similar experiments were conducted near Gothenburg, Nebraska (eight rates of volunteer corn populations ranging from 3,000 to 25,000 kernels/a and no simulated dropped ears) and Fort Collins, Colorado (four rates of volunteer corn populations ranging from 4,000 to 36,000 plants/a with and without dropped ears). At Fort Collins, volunteer corn was established with a corn planter. All locations were fertilized and irrigated for maximum yield. Plots were maintained weed free by a PRE application of acetochlor and atrazine and POST applications of glyphosate as needed. Clear yield loss trends were not observed at Gothenburg or Pratt. Data from Gothenburg suggested that volunteer corn might have elevated yield. Clear dose response relationships were seen at the Fort Collins and Yuma sites for plots with and without simulated dropped ears. Simple linear regression equations from these locations predicted 10% yield loss from volunteer corn populations of 17,700 and 22,200 kernels/a in plots without simulated dropped ears. In plots with dropped ears, simple linear regression equations predicted 10% yield loss at volunteer corn populations of 11,900 and 12,300 kernels/a. Data was much more variable at Garden City; some plots showed an increase in yield with increasing volunteer corn population, as was seen at in Gothenburg, but overall, yield decreased with increasing volunteer corn populations. Simple linear regression equations derived at this location predicted 10% yield loss at a volunteer corn population of 11,000 kernels/a. Yield response in plots with simulated dropped ears did not show a clear trend. Yield losses from glyphosate-resistant volunteer corn are greatly influenced by environment and difficult to measure at populations less than 11,000 kernels/a. Yield losses in plots without simulated dropped ears ranged from 7 to 28% at the highest populations tested. Therefore, future research should target volunteer corn populations ranging from 11,000 to more than 36,000 kernels/a. [145]

IN SEARCH FOR ANSWERS TO LIMITED CONTROL OF KOCHIA IN CORN WITH ISOXAFLUTOLE. Gustavo M. Sbatella* and Robert G. Wilson, University of Nebraska, Scottsbluff.

Kochia (Bassia scoparia) control in corn became increasingly difficult in experimental plots where isoxaflutole was used as a preemergence herbicide for the last 8 years. Studies where conducted to determine possible mechanisms that would explain poor kochia control. Weed seed from numerous plants present in the experimental plot were harvest in 2006 and 2007. At the same time seeds from plants growing in rangeland and production corn field where isoxaflutole had not been utilized for weed control were collected. A germination study was conducted to determine the dormancy levels and possible differences among populations. Germination of seed collected from plants growing in the experimental plot ranged from 1 to 20 %, depending on individual plants. Germination was always lower when compared to rangeland and production corn field populations, indicating that seeds produced in the plot treated with isoxaflutole had different dormancy levels. Differences in seed dormancy were further

substantiated by germination rates observed in different kochia populations incubated at constant temperatures of 5, 10, 15, 20, 25, 30, 35 and 40 Celsius and the response of seeds to KNO3 as a treatment to release dormancy. Several studies are currently in progress to establish potential differences in tolerance to isoxaflutole among the different populations. These preliminary results indicate that a delay in seed germination may act as an escape mechanism and therefore explain the poor kochia control observed in isoxaflutole treated plots. [146]

BAS 800H: A NEW ACTIVE INGREDIENT FOR PREEMERGENCE BROADLEAF WEED CONTROL IN FIELD CORN AND GRAIN SORGHUM. Caren A. Judge, Dan E. Westberg, Leo D. Charvat*, Troy D. Klingaman and Walter E. Thomas, BASF Corporation, Research Triangle Park, NC.

BAS 800H is a selective herbicide under development for preemergence broadleaf weed control in conventional and herbicide tolerant field corn and grain sorghum production. Field research trials have been implemented across the US to evaluate weed control and crop safety. BAS 800H has demonstrated control of many broadleaf weeds; particularly large seeded broadleaf weeds such as common cocklebur (Xanthium strumarium), giant ragweed (Ambrosia trifida), morningglory species (Ipomoea spp.), velvetleaf (Abutilon theophrasti) and common sunflower (Helianthus annuus). BAS 800H in combination with dimethenamid-P has provided full-season residual control of most broadleaf and grass weeds in field corn and grain sorghum production when applied preplant, shallow preplant incorporated or preemergence. Suitable application rates of BAS 800H have varied by soil type; coarse textured soils 63 to 84 g ai/ha, medium textured soils 94 to 108 g/ha, and fine textured soils up to 125 g/ha. BAS 800H has required adequate water for activation for optimal preemergence performance. BAS 800H has also provided burndown of emerged broadleaf weeds when applied in conservation tillage or no-till field corn and sorghum management systems. However, a suitable adjuvant system was required for favorable burndown. Negligible field corn or sorghum injury has been observed from BAS 800H applications made prior to crop emergence. [147]

IMPACT OF PRE- AND SPLIT APPLICATIONS OF FLUCARBAZONE-SODIUM ON GRASS WEED CONTROL AND SPRING WHEAT (TRITICUM AESTIVUM) YIELD. . Ken L. Sapsford*, Frederick A. Holm, University of Saskatchewan, Saskatoon, Sk and Eric N. Johnson Agriculture and AgriFood Canada, Scott, Sk.

Flucarbazone-sodium, the active ingredient in Everest® herbicide, is known to have soil residual properties when applied post emergent for grass weed control in spring wheat. A number of studies were conducted in Saskatoon and Scott, Saskatchewan in 2005, 2006 and 2007 to see if flucarbazone-sodium applied to the soil prior to crop emergence would control wild oat (Avena fatua) and green foxtail (Setaria viridis) and to see if a split application of flucarbazone-sodium would effectively control wild oat and green foxtail. Flucarbazone sodium was applied at 10, 15, 20 and 30 gai/ha pre-emergent to wheat and wild oats and pre/post applications of 10/10, 10/15, 10/20, 15/10, 15/15 and 20/10 gai/ha were also evaluated. These were compared to post emergent applications of 15, 20 and 30 gai/ha. Wild oat control averaged over 90% with all the split and post-emergent applications. With the pre-emergent applications wild oat control averaged below 80%. However, with pre-emergent application rates of 15, 20 and 30 gai/ha, wild oat control of over 80% was achieved 50%, 33% and 70% of the time respectively. It appears that pre-emergent application of flucabazone-sodium can provide adequate wild oat control approximately 50% of the time, eliminating the need for the post-emergent portion of the split application in these instances. Green foxtail was control averaged over 90% with every treatment that was applied. [148]

WILD OAT RESPONSE TO IMAZAMOX RATE IN HERBICIDE RESISTANT SPRING WHEAT. Bob Stougaard and Qingwu Xue, Montana State University, Northwestern Agricultural Research Center, Kalispell, MT.

A two-year field experiment was conducted at Kalispell, MT to determine the optimum rate of imazamox for wild oat control in spring wheat. The two-gene herbicide resistant variety 'Gunner' was planted in mid April at a seeding rate of 85 kg/ha in 15-cm row spacings. Imazamox was applied at 1X, 1/2X, 1/4X, 1/8X, and 1/16X of the labeled use rate when wild oat was at the 4 to 5 leaf stage. Wild oat populations and biomass were greater during 2006. However, the dose causing a 50 percent reduction in both response variables was similar between years. Wild oat density was less affected by imazamox rate than was wild oat biomass, and there was a strong association between wild oat biomass and percent dockage. Imazamox applied at the 1/2X rate afforded greater than 80 percent control of wild oat during both years of the study. The reduction in wild oat competition afforded by imazamox had a dramatic effect on spring wheat yield. On average, spring wheat yields increased from 1748 kg/ha in the non-treated control to 3322 kg/ha at the 1/2X rate. [149]

AXIAL XL: THE NEXT GENERATION OF GRASS CONTROL IN WHEAT AND BARLEY. Stephen M. Schraer*, Donald. J. Porter, Jason C. Sanders, Peter C. Forster, Christopher G. Clemens, and Steven L. Pyle, Syngenta Crop Protection, Inc., Greensboro, NC .

Axial XL is a new formulation of Axial Herbicide from Syngenta Crop Protection that contains the active ingredient pinoxaden, the safener cloquintocet-mexyl, and a novel built-in adjuvant system. Axial XL has shown excellent crop safety to all varieties of spring wheat, winter wheat and barley. Axial XL can be applied in the fall or spring from the 2-leaf stage up to the pre-boot stage of crops. At a use rate of 16.4 oz/A, Axial XL effectively controls wild oat, (Avena fatua), foxtails (Setaria species), Italian ryegrass (Lolium multiflorum), Persian darnel (Lolium persicum), barnyardgrass (Echinochloa crus-galli), as well as, several other annual grasses. Axial XL can be tank mixed with broadleaf herbicides for flexible one-pass grass and broadleaf weed control in wheat and barley crops. Based on its broad grass weed control spectrum, flexibility of use, excellent crop safety and convenience of a built-in spray adjuvant, Axial XL is the next generation of grass weed control in wheat and barley. [150]

HUSKIE HERBICIDE - EFFICACY IN NORTHERN PLAINS CEREALS. Dean W. Maruska*, Kevin B. Thorsness, Mary D. Paulsgrove, Michael C. Smith, George S. Simkins, Thomas Kleven, and Mark Wrucke, Bayer CropScience, Research Triangle Park, NC..

HuskieTM is a new postemergence broadleaf herbicide that has been developed by Bayer CropScience for use in spring wheat, durum wheat, winter wheat, barley and triticale. Huskie has been tested on more than 50 different weed species in numerous field experiments in the northern cereal production area of the United States. Huskie provided control of kochia, redroot pigweed, white cockle, and hempnettle that was greater than with current broadleaf treatments in northern plains cereals. Wild buckwheat, Russian thistle, and common lambsquarters control was similar between Huskie and current broadleaf treatments in northern plains cereals. Huskie has been tested on numerous spring wheat, durum wheat, and barley varieties. Crop tolerance with Huskie has been excellent on all varieties tested. In weed-free tolerance trials, excellent crop tolerance was observed in spring wheat, durum wheat, and barley. Crop yields in spring wheat, durum wheat, and barley following a Huskie application were equal to the weed-free untreated check. The excellent weed control and crop safety combined with very favorable toxicological, ecotoxicological and environmental properties makes Huskie a valuable tool for cereal grain farmers. [151]

HUSKIE HERBICIDE - USE IN PACIFIC NORTHWEST WINTER WHEAT. Monte Anderson* and Dean Christie, Bayer CropScience, Spokane WA.

Huskie herbicide containing the new active ingredient pyrasulfotole was granted full registration by EPA for use in all wheat and barley on August 9, 2007. Huskie will be formulated as an emulsifiable concentrate containing active ingredients pyrasulfotole and bromoxynil combined with the Bayer CropScience safener mefenpyr-diethyl. Huskie will be positioned in all spring wheat and barley areas as a stand alone herbicide for broadleaf weed control. In winter wheat, Huskie will require tank mixing with additional broadleaf herbicides for a number of difficult to control broadleaf weeds. This common practice in the Pacific Northwest will involve combinations with growth regulators, nitriles, or sulfonylureas for complete control of mayweed chamomile, catchweed bedstraw, Russian thistle, and several other species. Guidelines for choosing the appropriate tank mix partner and rate will be presented by weed species. The addition of Huskie with certain ALS grass herbicides has exhibited improved crop tolerance under certain environmental conditions in comparison to typical tank-mixed broadleaf EC herbicides. Guidelines on the use of adjuvants and fertilizer additions will be discussed as related to their use in PNW winter wheat. [152]

ORION™: NEW BROADLEAF HERBICIDE FOR WHEAT AND BARLEY. Christopher G Clemens*, Peter C. Forster, Donald J. Porter and Jason C. Sanders, Syngenta Crop Protection Inc., Greensboro, NC 27419.

Orion™ is a new selective postemergence herbicide being developed for the US market by Syngenta Crop Protection for the control of broadleaf weeds in wheat and barley. Orion contains two active ingredients, florasulam and MCPA ester. Florasulam is a triazolopyrimidine sulfonanilide and inhibits acetolactate synthase (ALS). Orion is absorbed primarily through leaves of treated broadleaves and is xylem and phloem mobile. Orion has excellent crop safety to wheat (including spring, winter and durum) and barley and can be applied from the 3-leaf stage up to the boot stage of crops. At the recommended use rate of 17 fl. oz/A, Orion controls wild buckwheat (Polygonum convolvulus), common lambsquarters (Chenopodium album), wild mustard (Sinapis arvensis), prickly lettuce (Lactuca serriola), redroot pigweed (Amaranthus retroflexus), smartweed (Polygonum spp.), catchweed bedstraw (Galium aparine), mayweed chamomile (Anthemis cotula) and numerous other broadleaf weeds. Orion has a short soil half-life allowing for flexible crop rotations the following growing season. Based on its broad weed control spectrum, excellent crop safety and rotational crop flexibility, Orion will become a new standard for broadleaf weed control in wheat and barley crops. [153]

WILD OAT AND BROADLEAF WEED MANAGEMENT IN ORGANIC MALT BARLEY PRODUCTION. Don W. Morishita*, J. Daniel Henningsen, and Donald L. Shouse, University of Idaho, Twin Falls.

The demand for organically grown barley for feed and for malting purposes in Idaho continues to grow. Organic growers report that weeds are the most difficult pest problem, if not the most challenging management issue in organic crop production. Two studies were conducted at the University of Idaho Research and Extension Center near Kimberly, Idaho to begin looking at non-chemical broadleaf weed and wild oat management in two-row spring malting barley (‘Moravian 69’). Barley seed was sized by passing grain through sieves and separated into the following four categories: small (>5.5/64 and <6/64), medium (>6/64 and <7/64), large (>7/64), and mixed sizes (>5.5/64) for the broadleaf study. For the wild oat study, the first three seed sizes were used. Each seed size category was planted at four seeding rates: 0.75, 1.0, 1.25, and 1.5 million seeds per acre with a cone planter. Experimental design in the broadleaf study was a four by four factorial randomized complete block with four replications. Experimental design in the wild oat study was a three by four factorial randomized complete block design with four replications. Individual plots in both studies were 8 by 30 ft. In 2006, wild oats growing in the broadleaf

study area were controlled by applying fenoxaprop at 0.0825 lb ai/A on May 17. Common lambsquarters and kochia densities averaged 39 and 1plants/ft2, respectively in 2006. In 2007, common lambsquarters and kochia densities averaged 32 and 4 plants/ft2, respectively. Weed control was evaluated visually 82 and 83 days after planting (DAP) in both years. Grain was harvested August 11, 2006 and July 27, 2007 with a small-plot combine. Samples were taken from every plot to measure barley quality parameters. In the wild oat study, broadleaf weeds were controlled in the study area by applying bromoxynil & MCPA + fluroxypyr at 0.5 + 0.188 lb ai/A May 16 and 17, 2006 and 2007, respectively. Wild oat densities in averaged 67 plants/ft2 in both years. In both years of the broadleaf study, there was no difference in barley stand count between the 0.75 and 1.0 M seeding rates or the 1.25 and 1.5 M seeding rates. However, there was a difference between the two lower and two higher seeding rates. Common lambsquarters control averaged 50 and 56% in the 1.5 million seed/A seeding rate in each year and control (41 vs 51%) was not different between the 1.0 or 1.25 M seeding rates in 2006. Only the lowest seeding rate has lower control (38%) than the two highest seeding rates. In 2007, there was no difference in common lambsquarters control between 1.25 and 1.5 million seed/A (48 vs 56%), but was between 0.75, 1.0, and 1.25 million seed/A seeding rates (17 vs 35 vs 48%). For kochia control, only the 0.75 million seed/A rate was lower (27%) than the other three seeding rates that averaged 43 to 56% kochia control. Barley yield in 2006 was lowest with the mixed seed size compared to the small, medium, and large seed sizes. No differences in yield were observed in 2007. Plump kernels in the 2006 mixed and large seed sizes were 2% higher than the medium sized seed, but were not affected in 2007. Considering all of the variables measured, barley seed size and seeding rate do not have a clear affect on barley yield and quality grown in competition with common lambsquarters and kochia. In the 2006 wild oat study, barley population was not different between the 0.75 and 1.0 M seeding rates, but was different among the 1.0, 1.25, and 1.5 M seeding rates. In 2007, barley population was only different between the 0.75 M seeding rate and the three higher rates. Wild oat control and barley yield generally increased with increasing seed size and seeding rate. No differences in plumps and thins, protein, or color were observed among the treatments. These studies indicate that spring barley was not affected much by broadleaf weeds, at least with a two row cultivar. Wild oats appear to be more competitive with barley based on the barley grain yield response. [154]

AGRONOMIC CROP RESPONSES TO KJM-44 HERBICIDE. Philip Westra, Colorado State University, Ft. Collins; Robert Wilson, Univ. of Nebraska, Scottsbluff; Mike Edwards, Dupont, Denver, CO.

KJM-44 is a new herbicide under development by Dupont for potential use in a variety of weed control settings. Initially the herbicide appears to have great potential for control of many perennial invasive weeds or shrubs in non-cropland settings. Studies were conducted in CO and NE in 2006-2007 to evaluate the plantback response of several agronomic crops to KJM-44 in the soil. Several rates of KJM-44 were applied to soil in replicated plot studies in mid 2006. In the spring of 2007, crops such as spring wheat, corn, sunflowers, alfalfa, and soybeans were planted, grown to maturity, and in some cases harvested for crop yield. Grain corn and sunflowers exhibited very good to good tolerance to KJM-44. In NE, spring wheat was most sensitive followed by alfalfa, and then soybeans. Some crops exhibited high yield losses when planted into plots treated with the highest rates of the herbicide. Crop injury to follow crops sometimes became most evident when crop yields were obtained. [155]

PROJECT 5: WETLANDS AND WILDLANDS

CONTROLLING AQUATIC WEEDS IN IRRIGATION CANALS WITH ENDOTHALL. Cody J. Gray* United Phosphorus, Inc., Peyton, CO and K. Jayne Walz, United Phosphorus, Inc., King Of Prussia, PA.

The task of controlling aquatic vegetation in irrigation canals is an extremely important venture, especially in the western United States. The waters supplied by these canals are the primary, and in some locations the only, source of water for irrigating agronomic crops. In other locations, these waters supply industrial water users as well. Therefore, the control of aquatic weeds in irrigation canals becomes extremely critical; however, the tools available to canal managers for weed control are limited. Grass carp are used in some locations, but the task of keeping the carp in the desired location is difficult, and they do not provide adequate control of some aquatic weeds. Dredging and chaining canals can be employed for weed removal; however, these tactics are dangerous, very labor intensive, expensive, and offer only a temporary solution to the problem. The final option is the use of herbicides for weed control. Herbicides currently labeled for use in irrigation canals are acrolein, xylene, and copper formulations. The copper formulations are effective in removing problematic algae infestations, but provide minimal control of vascular plants. Acrolein and xylene have label restrictions that do not allow their use in some canal locations, and they are not labeled in all states. In addition, these products are extremely hazardous to applicators and handlers. At recommended labeled rates, these products are toxic to fish and other aquatic organisms. Endothall has been used since the 1960's for controlling aquatic vegetation in ponds, lakes, and streams. In recent months, residue trials (EPA Guidelines, OPPTS 860.1500 Crop Residue Trials) have been conducted for endothall as required for an EPA approved unrestricted FIFRA Section 3 label to allow treated water to be used on irrigated crops during herbicide applications. Sago pondweed [Stuckenia pectinatus (L.) Börner] is a native aquatic perennial that forms dense troublesome infestations in irrigation canals and drainage ditches; thereby, not allowing for proper water delivery or flow. In 2007, experimental trials were conducted to evaluate endothall efficacy for sago pondweed control in irrigation canals. Treatments resulted in greater than 95% sago pondweed control for up to 8 weeks after treatment. Results from these trials indicate endothall will provide a safer, more effective tool for controlling aquatic weeds in irrigation canals compared to other alternative control methods. [128]

IMPACT OF LONG-TERM PURPLE LOOSESTRIFE MANAGEMENT IN CASCADE COUNTY, MT. D. Eric Hanson*, Jim Freeman, and Kitty Knaphus, Cascade County Weed District, Great Falls, MT.

Purple loosestrife, Lythrum salicaria, has been known to be in Cascade County, MT as an escaped ornamental and noxious weed for 20 years. In an initial survey of the County conducted in 1988, it was found on the Missouri River where it passes through Great Falls, and in a single isolated area upstream. The following year it was found in the same locations in town as well as at one site downstream and in the Sun River drainage at a site 30 miles west of the primary infestation. Since that time the number of infested locations has increased, but the acreage treated has declined from over 12 acres to less than one acre. Manual control has been discontinued due to limited effectiveness. Several chemical control treatments have been used including 2,4-D, triclopyr, and glyphosate. A 2% glyphosate solution is presently the treatment of choice. Galerucella spp. were released as biological controls in one densely infested site and has successfully established. Sustained effort will be required to maintain the progress against this noxious weed. [129]

EFFICACY AND COST ANALYSIS FOR CONTROL OF SCOTCH BROOM AND TREE TOBACCO. Joseph M. DiTomaso*, University of California, Davis; Scott R. Oneto, University of California, Davis; Guy B. Kyser, University of California, Davis.

Scotch broom (Cytisus scoparius) and tree tobacco (Nicotiana glauca) are non-native woody species native to Europe and South America, respectively. Both species have escaped cultivation to become invasive in wildland areas of California and other western states. The objective of this experiment was to develop a range of control strategies that would be effective against both these invasive species. The herbicides tested were glyphosate, imazapyr, and triclopyr ester. Each herbicide was applied at multiple rates using a number of application techniques including; foliar, drizzle, cut stump, and basal bark in both spring and fall. The two mechanical treatments included a weed wrench and lopping. For Scotch broom, glyphosate and triclopyr ester gave excellent control as a foliar spray or drizzle application in both fall and spring, whereas imazapyr was most effective in the fall. For tree tobacco, glyphosate and imazapyr were effective as a foliar, drizzle, or cut stump application in the fall or spring. Triclopyr ester showed excellent control as a foliar and drizzle application in the spring, but was slightly less effective as a fall application. Using a basal bark application, both imazapyr and triclopyr ester were effective in the fall on Scotch broom, whereas triclopyr ester was most effective in the spring. For tree tobacco, triclopyr ester also gave excellent control as a basal bark or cut stump treatment in either the fall or spring. With the mechanical treatments, the weed wrench was very effective as a fall or spring treatment with both species, whereas lopping was most effective in the spring for Scotch broom and in the fall for tree tobacco. The most economical method of control, however, was achieved with the drizzle application technique. These results demonstrate effective control of both Scotch broom and tree tobacco with mechanical methods and with several herbicides and treatment techniques in either spring or fall treatments. [130]

USING ACTIVATED CHARCOAL AS A HERBICIDE SAFENER FOR NATIVE SPECIES ESTABLISHMENT IN CALIFORNIA . Ken Lair, DOI-Bureau of Reclamation, Denver, CO and Scott J. Nissen*, Colorado State University, Ft. Collins.

Significant cropland in the western San Joaquin Valley of California has been targeted for retirement. Tapping technology commonly used for weed control in the grass seed industry, this research evaluates the use of activated charcoal to ameliorate effects of broadcast herbicides by means of banding charcoal over drilled seed rows as a safener. This tactic was evaluated under field and greenhouse conditions as a new strategy to provide selective weed control during native species establishment. Field studies conducted between 2004-2007 seeded native species into a fallowed, mustard-dominated (London rocket, Sisymbrium irio) site. Activated charcoal (GroSafe™) was applied with seed drilling by spraying a 6 cm wide slurry band over the drilled rows. Several herbicides were applied immediately following seeding and the combination of charcoal and herbicides significantly reduced non-native weed coverage, while increasing native species establishment. Greenhouse studies were designed to refine and minimize herbicide and charcoal application rates. Soil was collected from the original field study sites near Tranquillity, CA in 2007 and used to fill 30 cm by 60 cm greenhouse flats to a depth of approximately 5 cm. A single furrow 1.5 cm deep and 60 cm long was made down the middle of each flat. Alkali barley (Hordeum depressum) and fourwing saltbush (Atriplex canescens) were selected as indicator species. Each species was seeded in half the furrow and covered with soil. A single nozzle tract sprayer was used to apply a 6 cm wide activated charcoal band down the middle of the flat covering the seeded row. Approximately 12 cm of soil on both sides of the charcoal band were left untreated. Three charcoal rates were applied to approximate banded field applications of 84, 168, and 336 kg/ha. Two rates of oxyfluorfen (Goal 2XL), pendimethalin (Prowl H2O), flumioxazin (Chateau) and norflurazon (Solicam) were broadcast applied to the flats, using the same tract spray calibrated to apply the herbicides in 186 l/ha using an E8002 nozzle. Herbicides were activated/incorporated and seeded natives and weed seed germination initiated by applying 3 cm of overhead irrigation. Flats were watered as needed and plants were allowed to grow for 6 weeks. Weed control was determined, while visual injury ratings and biomass

were determined for the two native species 6 WAT. Oxyfluorfen applied at 1.8 kg/ha provided excellent broadleaf weed control, but was only safe on seeded natives when safened with 336 kg/ha charcoal. The higher oxyfluorfen rate was injurious to both natives regardless of charcoal rate. Norflurazon initially provided excellent weed control and did not appear to cause injury to the seeded natives; however, at approximately 4 WAT both alkali barley and fourwing saltbush began to show significant bleaching. The bleaching continued until harvest 6 WAT. Pendimethalin (1.7 and 3.4 kg/ha) and flumioxazon (0.21 and 0.42 kg/ha) provided excellent weed control and did not injure planted natives even when the charcoal rate was reduced from 336 to 168 kg/ha. These herbicides have other attributes that would make them suitable for native species establishment: e.g., they are relatively inexpensive, have short residual activity, and when combined as a tank mix would have a board weed spectrum controlling a number of annual broadleaf and small seed grasses. [131]

FACTORS CORRELATED WITH RECOGNITION OF PLANTS AND MAMMALS: IMPLICATIONS FOR WEED CONTROL. *Jeffrey W. Brasher, University of Wyoming, Laramie; Neil Snow, University of Northern Colorado, Greeley .

The taxonomic understanding of current and potential invasive species, and the ability to recognize or identify such pests, is vital to their control. The results of a study entitled “Species Identification Survey (SIS): Factors correlated with recognition of plants and mammals” assessed plant and mammal recognition knowledge (RK) among University of Northern Colorado students and employees. The SIS tested correlations between RK and demographic variables. In a pilot study the participants viewed 30 PowerPoint slides of common, distinctive Colorado plant genera; answers were written down where known. In a modified study the participants viewed 24 PowerPoint slides of “well-known” plants, and animals “at large.” This included six species from each of four groups: plants of Colorado, plants of the world, mammals of Colorado, and mammals of the world. In the modified study participants selected common names from multiple-choice questions. For both surveys participants answered demographic and experience-related questions. The pilot study demonstrated very low levels of Colorado plant RK, whereas in the modified study the overall mammal recognition surpassed plant recognition. Variables significantly correlated with higher RK included previous learning experiences of various types (scouting, 4-H, etc.), years resided in the region, and years of rural residence. Factor analysis loaded learning experiences questions into two components. Knowledge emerging from this study may serve to guide the methodology of weed (pest) identification training. Low levels of RK in general suggest that newly established populations of invasive species are likely to go undetected. This includes species which may inflict considerable economic damage on private agricultural lands, unless concerted efforts are made to train students in the recognition of common plant and animal species of their regions. [132]

CANADA THISTLE SPREAD IN PRAIRIE DOG AFFECTED PLANT COMMUNITIES. Luke W. Samuel, Monsanto Company, Leland, MS; and Rodney G. Lym*, North Dakota State University, Fargo.

Black-tailed prairie dogs (Cynomys ludovicianus Ord) are rodents in the squirrel family commonly found in the United States on short-grass prairies and live in large social communities known as prairie dog towns. Prairie dog towns generally have less grass species biomass, greater forb biomass, and more annual grasses relative to areas outside the colonized area. Prairie dog populations can profoundly affect plant community structure and function by indiscriminately clearing large quantities of vegetation, which can help invasive species such as Canada thistle establish and spread within and near the prairie dog towns. Canada thistle has established in many prairie dog towns within Theodore Roosevelt National Park (TRNP) and could spread from these initial infestations to native plant communities throughout the park. The purpose of this research was to evaluate the rate of Canada thistle spread in prairie dog populated compared to native plant communities. Canada thistle spread in 10 infestations, five located in native plant communities and five in plant communities impacted by black-tailed prairie dogs, was evaluated for 3 yr. The center of each Canada thistle infestation was marked with a stake, and each patch was

segmented into five equal sections. A total of 10 linear distances (two per section) were measured to the farthest Canada thistle plants within each contiguous patch for 3 yr to determine infestation size and annual rate of spread for 2 yr. In general, initial Canada thistle infestation size was greatest in prairie dog-impacted plant communities compared to native plant communities. For example, Canada thistle patch size in plant communities with prairie dogs in 2004 was 1.3 A compared to 0.4 A in native plant communities. However, Canada thistle had a greater rate of spread in native compared to prairie dog-populated sites with an average of 52% increase in size per yr compared to an average of 19% per yr in prairie dog communities. Two of the five patches evaluated in the prairie dog areas decreased in size in both 2005 and 2006, while no Canada thistle patches decreased in native areas. Consistent removal of Canada thistle topgrowth can reduce density; however, since prairie dogs do not utilize Canada thistle as a food source, infested areas were generally not clear-cut for the duration of the growing season. Native plant communities lacked the open space and bare ground that was common to the prairie dog-affected areas and the competition from established perennial plant species should have slowed Canada thistle expansion. However, since Canada thistle infestations in native areas continued to increase at a rate of about 50% each year even with other plant competition this invasive weed will likely remain in, or even expand in the plant community and may eventually exclude native species. [133]

PROJECT 6: BASIC SCIENCES

INTERSPECIFIC HYBRIDS BETWEEN SPOTTED AND DIFFUSE KNAPWEED IN NORTH AMERICA AND THE IMPLICATIONS FOR MANAGEMENT. Amy C. Blair* and Ruth A. Hufbauer, Colorado State University, Fort Collins.

Diffuse and spotted knapweed are known to hybridize in their native range. There has been confusion in the literature and field about whether or not plants with morphology matching descriptions of hybrids found in North America are indeed hybrids or simply morphological variants of diffuse knapweed. To resolve this debate, extensive field surveys in the native (Eurasian) and introduced (North America) range were conducted in 2005 and 2006. Additionally, molecular techniques were employed to determine if intermediate morphology reflects hybridization at the genetic level. Plants with hybrid morphology are present frequently in diffuse knapweed sites (40 out of 41 in western North America), but not in spotted knapweed sites. Based on molecular data, the plants with hybrid morphology are of hybrid origin. It seems unlikely, however, that hybridization took place in North America; the spotted knapweed here is likely tetraploid and the diffuse knapweed is diploid, and multiple attempts to make F1 hybrids between them via hand-pollination failed. Rather, the data suggest that individuals of hybrid origin were introduced with diffuse knapweed. Biological control agents, both seedhead feeders and root miners, do not discriminate between hybrid-type and diffuse-type plants within diffuse knapweed sites. Because hybridization between spotted and diffuse knapweed occurred prior to introduction approximately 100 years ago, and because biological control agents do not avoid hybrids, managers do not need to specifically target the hybrids they encounter in the field. [91]

LEAFY SPURGE PRAIRIE POPULATIONS AND MYCORRHIZAE. Terence McGonigle* and Cameron Nykoliation, Brandon University, Brandon, MB, Canada.

Leafy spurge (Euphorbia esula L.) was introduced from Eurasia to North America early in the 19th Century and is now a troublesome weed of more than a million ha across the continent. Infested hay fields suffer from the toxicity to livestock of the shoot latex, and rangelands suffer by this and suppression of native forb species. The herb forms perennial stands with expanding and tenacious root systems from which numerous buds emerge each season. Colony growth and local seeding combine to advance the stand of the weed across the landscape. Limited chemical control is available. Leafy spurge has become widespread at Canadian Forces Base Shilo, which is a military training base of 40,000 ha on sandy mixed-grass prairie in southern Manitoba. Policy to control noxious weeds at the base has placed

emphasis on biological control rather than herbicide use in recent decades. Aphthona flea-beetle larvae feed on the leafy spurge roots, and their introduction began at Shilo in 1984. Although the beetles are well established, spurge populations remain. A study on the biology of the weed was conducted here to build the base of knowledge for development of further control strategy. Arbuscular mycorrhizal (AM) fungi associate with plant roots and receive photosynthetic sugars in exchange for phosphate collected by the fungus from beyond the access of the roots. Initial reports of colonization of leafy spurge roots by AM fungi were the basis of the present study to explore the possible roles of mycorrhizae to either (1) suppress the weed by imposition of a carbon drain on the plant, or (2) enhance spurge growth by provision of phosphate that otherwise would limit the weed. In addition to study of the mycorrhizae, local data-collection strategies from previous studies were further developed here to continue to evaluate vigor of the populations of leafy spurge and native forbs. Leafy spurge roots at Shilo are colonized extensively by AM fungi. From late May to mid-July, 75-95% of root length contained abundant growth of hyphae and 10-15% of root length contained lipid-rich fungal vesicles, both of which suggest the mycorrhizae impose a significant carbon drain on the plant. However, 35-40% of root length was colonized by fungal arbuscules over the same period. Given that the arbuscules are the sites of phosphate transfer to the plant, the potential clearly exists for the AM fungi to contribute meaningfully to plant phosphate over the majority of the growth season. Arbuscules were reduced to 15-20% of root length in the early- and late-season, although levels of colonization by hyphae and vesicles were sustained from 1 April to 13 August. Counting stems of forbs and spurge at Shilo at a grid-scale of 0.5 m over a sampling area of 12-m by 12-m showed previously that native forbs can be found in a variety of spatial patterns within a spurge patch and that the spurge density itself varies greatly within a patch. Changing here to a grid size of 12-m within a sampling area of 60-m by 60-m revealed that discrete spurge patches vary from 10- to 50-m in diameter. Within discrete patches and on the rating scale used, spurge density was noted as high throughout most of the patch, albeit with a narrow peripheral band of moderate density. In addition to discrete patches, diffuse areas of spurge growth were also recorded frequently. Such diffuse areas typically exceeded the sampling area of 60-m by 60-m, had approximately even cover with high-density and moderate-density spurge, and contained spurge encircled islands without spurge. These diffuse areas can be interpreted either as the aggregation of formerly discrete patches or as aged single patches that are undergoing decline. [92]

IMAZAMOX ABSORPTION AND METABOLISM BY EURASIAN WATERMILFOIL (MYRIOPHYLLUM SPICATUM). Joseph Vassios*, Scott Nissen, Galen Brunk, Colorado State University, Ft. Collins.

The submersed macrophyte Eurasian watermilfoil (EWM) (Myriophyllum spicatum) is an invasive species currently infesting 45 states, including Colorado. Field experiments conducted under an Experimental Use Permit found that imazamox could provide significant EWM control. Laboratory experiments were conducted to determine imazamox behavior in EWM. Radiolabeled imazamox was used to determine; 1) herbicide absorption, 2) the influence of external herbicide concentration on internal herbicide concentration, 3) herbicide desorption when plants were transferred to clean water, and 4) herbicide metabolism. The initial absorption experiment showed that approximately 75% of total absorption occurred within the first 48 hours following treatment and reached a maximum of 1%. The external concentration did influence internal imazamox concentrations. At 200 ppb imazamox the internal concentration was approximately 0.5 µg/plant, while at 800 ppb the internal concentration was 3.0 µg/plant. Imazamox absorption, as a percent of herbicide applied, was the same regardless of the external concentration, which indicates the absorption results from simple diffusion driven by a concentration gradient. Desorption occurred rapidly and reached equilibrium 24 h after plants were transferred to clean water with approximately 43% of absorbed imazamox desorbed. Imazamox metabolism occurred rapidly with a corresponding increase in bound metabolites 24 HAT. By 48 HAT metabolism stabilized with approximately 70% of absorbed radioactivity as insoluble metabolites, 20% as soluble metabolites and

only 10% intact imazamox. Even though imazamox absorption was found to be less than 1%, this herbicide has provided excellent EWM control in whole lake studies. [93]

COMPARING AMINOPYRALID AND CLOPYRALID ABSORPTION AND TRANSLOCATION IN CANADA THISTLE. Bekir Bukun*, Scott J. Nissen, Galen Brunk and Phil Westra, Colorado State University, Ft. Collins.

Canada thistle is the most prevalent invasive perennial plant in Colorado, infesting crops and non-cropland. In riparian areas, Canada thistle is difficult to manage because of restrictions on herbicide use near water. Aminopyralid is a new herbicide developed by Dow AgroSciences that provides excellent Canada thistle control, has no groundwater restrictions, and can be applied to water's edge in riparian areas. Greenhouse and laboratory experiments were conducted comparing aminopyralid absorption, translocation and metabolism to another pyridine herbicide, clopyralid. Root segments were collected from a Canada thistle infestation near Ft. Collins, CO and used to propagate plants used in subsequent experiments. Root segments were planted in pots filled with fine washed sand and allowed to grow for several months. Plants were at the rosette growth stage at the time of herbicide application. The youngest fully expanded leaf was covered with aluminum foil and then plants were sprayed with commercial formulations of aminopyralid and clopyralid at 0.12 kg ai/ha and 0.42 kg ai/ha, respectively. The treatment solution contained 0.25% v/v non-ionic surfactant (NIS). Radio-labeled herbicide was added to 250 µl of the spray solution and the unsprayed leaf was treated with 20 0.5 µl droplets of formulated herbicide plus radio-labeled herbicide. Plants were harvested 1, 2, 4, and 8 DAT and separated into treated leaf, remaining shoot and root. Sand was washed with 250 ml of water and an aliquot was counted by liquid scintillation spectroscopy (LSS) to determine the amount of radioactivity exuded from the plant. The treated leaf was washed with a 10% MEOH solution containing 0.25% v/v NIS and all plant material was dried and then burned in a biological sample oxidizer. The resulting CO2 was trapped and radioactivity determined by liquid scintillation spectroscopy (LSS). Aminopyralid and clopyralid absorption and translocation were different. Aminopyralid absorption increased from 34% to 60% between 1 and 8 DAT, while clopyralid absorption was near or above 80% for the entire time course. More clopyralid translocated out of the treated leaf and accumulated in Canada thistle roots than aminopyralid. After eight days 2.6 times more clopyralid had translocated out of the treated leaf to the shoot compared to aminopyralid (26% compared to 10% of applied radioactivity, respectively) and nearly twice as much clopyralid reached the root (13% compared to 7% of applied radioactivity). Clopyralid and aminopyralid root exudation reached a maximum of 4.8% and 2.9% of applied radioactivity 8 DAT. Reverse phase HPLC coupled with inline radioactivity detection was used to determine clopyralid and aminopyralid metabolism over the same time course. No significant metabolism was detected. Differences in absorption, translocation and metabolism do not explain why aminopyralid provides similar or superior Canada thistle control at rates 3.5 times lower than clopyralid. Higher affinity for the site of action could explain why aminopyralid has significantly higher biological activity than clopyralid. [94]

INFLUENCE OF OTHER HERBICIDES ON BAS 800H ABSORPTION AND TRANSLOCATION IN WINTER WHEAT. John C. Frihauf*, Kansas State University, Manhattan; Phillip W. Stahlman, Kansas State University Agricultural Research Center-Hays; Kassim Al-Khatib, Kansas State University, Manhattan; and Leo D. Charvat, BASF Corporation, Lincoln, NE.

Growth chamber experiments were conducted in 2007 to evaluate the influence of 2,4-D amine and bentazon on 14C-labeled BAS 800H absorption and translocation in winter wheat. BAS 800H absorption increased over time from 1 to 14 days after treatment (DAT) when applied alone or mixed with 2,4-D amine, but not when mixed with bentazon. Less than 10% of the applied BAS 800H was absorbed when mixed with bentazon. In comparison, absorption of BAS 800H at 1, 3, 7, and 14 DAT was greatest when applied in mixture with 2,4-D amine (14, 24, 36, and 45%, respectively) and intermediate when applied

alone. At those times, 8, 16, 23, and 29% less BAS 800H was absorbed when applied alone than when mixed with 2,4-D amine. Furthermore, absorption of BAS 800H applied alone was similar to BAS 800H plus bentazon at 1 and 3 DAT. However, at 7 and 14 DAT, absorption of solo BAS 800H was 6 and 7% higher, respectively, compared to BAS 800H plus bentazon. Most of the absorbed radioactivity (≥ 89%) remained in the treated leaf at 1, 3, 7, and 14 DAT, regardless of the herbicide treatment. 2,4-D amine optimized absorption of BAS 800H compared to BAS 800H applied alone and BAS 800H mixed with bentazon. However, minimal translocation of BAS 800H occurred in winter wheat. [95]

SEED BIOLOGY OF *GALEGA OFFICIANALIS*. Michelle Oldham and Corey Ransom, Utah State University, Logan.

Galega officinalis, or goatsrue, is a perennial plant which reproduces by seed and is listed as a noxious weed on the federal and state level. Very little research has been done on its basic biology; thus several avenues of goatsrue's seed biology have been investigated. Scarification with undiluted sulfuric acid (H_2SO_4) was tested at 0, 10, 20, 30, 40, 50, and 60 minutes. A scarification time of 60 minutes resulted in 100% germination; however 50 and 40 minutes were not significantly different at 96 and 89% respectively. To determine the depth from which goatsrue seeds can emerge, scarified seeds were planted in pots at 12 depths from 0 to 14 cm with field soil. As expected, an inverse relationship between depth of burial and seedling emergence was observed. Seeds buried at depths of 0.5 to 3 cm had emergence from 93 to 87%. Emergence declined rapidly below 8 cm with no emergence at 12 and 14 cm depths. To determine quantities of goatsrue seed in the soil seed bank, five locations were sampled in Cache County, Utah. Twenty eight samples were taken per location along a 30 meter transect. After collection seeds were extracted from the soil, weighed and counted. The highest concentration of goatsrue seed was 18,649 seeds per quarter square meter; the lowest concentration was 3,708 seeds per quarter square meter. Quantities of seed found were much larger than suspected; indicating control measures must also focus on new seedling emergence once mature plants are eliminated. [95A]

MECHANISMS OF RESISTANCE AND GENE FLOW IN GLYPHOSATE RESISTANT PALMER AMARANTH. Todd A. Gaines*, Philip Westra, Sarah Ward, Jan Leach, Bekir Bukun, Scott Nissen, Stephen Chisholm, Colorado State University, Ft. Collins; Christopher Preston, University of Adelaide, Australia; Dale L. Shaner, USDA-ARS, Ft. Collins, CO; Stanley Culpepper, Timothy Grey, University of Georgia, Tifton; William Vencill, University of Georgia, Athens; Ted Webster, USDA-ARS, Tifton, GA; Patrick Tranel, University of Illinois, Urbana.

Glyphosate resistance has recently been reported in Palmer amaranth populations from Georgia. Resistant and susceptible plants were screened with an in-vivo shikimate accumulation assay. Using a range of glyphosate concentrations from 0 to 10,000 µM, susceptible plant leaf discs accumulated shikimate in 15 µM glyphosate while resistant plant leaf discs accumulated shikimate only in concentrations higher than 1,000 µM glyphosate. Resistant and susceptible leaf discs had equal uptake of 14C-labeled glyphosate at a 250 µM concentration. Putative hybrid plants between Palmer amaranth and spiny amaranth, smooth pigweed, and Powell amaranth were produced under greenhouse and field pollinating conditions and inherited the resistance trait. Candidate resistance mechanisms under investigation include mutations in the target site enzyme 5-enolpyruvylshikimate 3-phosphate synthase (EPSPS) and over-expression of EPSPS. Gene sequences have been obtained for 1,661 base pairs of EPSPS from resistant and susceptible plants. The only mutation found in all resistant plant sequences causes an amino acid change from arginine to lysine in exon 6 at position 316 of the mature EPSPS enzyme. Residues at this position in available plant EPSPS sequences include arginine, lysine, and methionine. Several species have lysine at position 316 and are not glyphosate resistant. We consider this mutation unlikely to be the cause of glyphosate resistance. Based on semi-quantitative RT-PCR using a 1 Kb EPSPS fragment and 18S rRNA as a control gene, EPSPS is expressed at an approximately three-fold higher level in resistant plants. The exact mechanism of glyphosate resistance in Palmer amaranth has not yet been determined. [134]

A LUCID INTERACTIVE KEY TO KNAPWEEDS, STARTHISTLES, AND RELATIVES (ASTERACEAE) IN THE WESTERN UNITED STATES. Jeffrey W. Brasher, University of Wyoming, Laramie.

Invasive species are the number two threat to biodiversity, second only to habitat destruction. Biological invasions are costly to agriculture and other human endeavors. Early detection - rapid response (EDRR) is a central strategy to limit biological invasions. EDRR can save tremendous amounts of labor, money, and ecological damage by preemptively discovering and eradicating small new infestations before eradication becomes unachievable. Identification of organisms is a rate-limiting factor in EDRR necessary to recognize new invaders in a geographical area. Full-service, computerized, interactive identification keys will facilitate EDRR by increasing the speed and accuracy of identifications. Though the basic purpose is the same, interactive keys are different than dichotomous keys and are much more powerful. An interactive key in development is presented here. It distinguishes between the species of knapweeds and starthistles, including the genus Centaurea and related look-alike genera. This includes a list of noxious weeds, several ornamental plants, and some native plants. The key applies to all the native and naturalized species in the Western United States. The key is currently functional but not yet in final form. The target audience ranges from junior high school students to experienced professional plant taxonomists. Thus it will be accessible and useful to students, weed control workers, land managers, horticulturalists, and scientists. This key uses Lucid 3.3 software and will also employ Fact Sheet Fusion (FSF). Lucid is arguably the best interactive key software available, especially in combination with FSF. The key's underlying data matrix is adapted from the 2006 Flora of North America Asteraceae treatments. Images for the key are being assembled from the author's photographs and other sources. Refinements are to be made before the key is released on the web as a free product. Come try the key with "mystery specimens" or play with the authoring software on my laptop during the conference: cell 307-760-3909, krynitzkia-photos [at] yahoo.com. [135]

THE FUTURE OF COMPUTERIZED INTERACTIVE IDENTIFICATION KEYS IN WEED SCIENCE. Jeffrey W. Brasher, University of Wyoming, Laramie.

Identification of species is a rate-limiting factor in EDRR. Various tools and resources are available to workers for identifying plants -- notably keys. Keys have been created in various forms, including dichotomous and matrix-based forms. Interactive keys have compelling advantages over both dichotomous keys and paper-based keys. Full-service, computerized, interactive identification keys will facilitate EDRR by increasing the speed and accuracy of identifications. Electronic interactive keys are increasingly field-portable, including certain PDA's and cellular phones. Highlights of available and upcoming software, hardware, data resources, informatics projects, and keys to weeds and plants-at-large are reviewed. Predictions are offered for the future of interactive keys in connection with weed science. [136]

SYMPOSIUM: ENHANCING WEED CONTROL THROUGH ADJUVANT TECHNOLOGY

ENHANCING WEED CONTROL THROUGH ADJUVANT TECHNOLOGY. P. McMullan, agro-TECHNOLOGY Research, Inc. Memphis.

Minimizing off-target movement of herbicide sprays is becoming of increasing importance during herbicide application. The herbicide applicator must minimize spray drift this while maintaining herbicide efficacy – these processes can counteract each other. Drift control or drift reduction additives (DCA) added to the spray mix can reduce spray drift. DCA are typically composed of either polyvinyl alcohols (PVA), polyacrylamides (PA), or guar gums (GU). The PVAs were the first products introduced but most of these products have been replaced by PA-based and GU-based products. The PVAs are susceptible to shearing when run through pumps, negating their effectiveness as the spray solution is recirculated. The PA-based and GU-based products are much more resistant to pump shear than PVA-based products.

DCAs typically work by increasing the elongational viscosity of the spray solution, which ultimately reduces the number of driftable droplets produced by the spray tip. Many of the DCA are targeted towards use with glyphosate-based herbicides as many include ammonium sulfate or alternative water conditioning agents in the formulation. Deposition agents are different from DCAs in that their primary function is to not affect off-target spray drift directly but improve spray deposition on target plants. Some DCA improve spray deposition as a secondary function through decreased off-target spray losses. Deposition agents function by reducing droplet evaporation, improving droplet velocity, and directly improving spray retention. Deposition agents are formulated as both emulsifiable concentrates and invert emulsions. They have often been overlooked in improving herbicide performance but they can improve efficacy of glyphosate and other herbicides. [137]

ADJUVANT TYPES AND USES FOR OPTIMIZING WEED CONTROL. Richard Zollinger, North Dakota State Univ., Fargo.

The U.S. EPA does not regulate adjuvants as pesticides and approximately 1000 chemicals are exempt from EPA regulation. Hence, thousands of name brand adjuvants exist today. Lack of regulation, profitability in adjuvant production and marketing, nonproprietary status of adjuvants, and complexity of the interaction between plant, herbicide, environment, water quality, and adjuvant has caused a pervasive attitude of confusion for adjuvant selection among growers. Growers use three main criteria in adjuvant selection: cost, effectiveness, and crop safety. With the exception of cost, unbiased information on effectiveness and crop safety are rarely available for most commercial adjuvants. Choosing the best adjuvant for each specific condition may be difficult. Other factors confusing growers on adjuvant selection are unfamiliarity and non-standardizing of adjuvant active ingredients, number and function of adjuvant classes, specified rate, vague and contradictory recommendations on pesticide and adjuvant labels, unsubstantiated and unguaranteed manufacturer claims, testimonials, unfamiliar adjuvant terminology in product descriptions, use of obscure adjuvants with herbicides in scientific research and publications, lack of unbiased research, and lack of adjuvant specific education in extension programs and publications. Rarely are adjuvants considered in the liability for herbicide nonperformance. Rarely do adjuvant manufacturers become involved in grower complaints of pesticide nonperformance. Advancement has been made to reduce grower confusion with adjuvant selection. Chemical companies have published approved adjuvant lists and have issued guidelines to manufacturers that set minimum requirements to qualify adjuvants for use with herbicides. Pesticide companies are increasing the study of adjuvants in discovery screens of pesticides. Registered herbicides are beginning to be marketed with an effective adjuvant either in the herbicide formulation or packaged in a different container and sold with the formulated herbicide. University adjuvant research is limited but shows variability in herbicide enhancement from adjuvants and has influenced herbicide label wording and recommendations. [138]

WATER CONDITIONING AGENTS AND AMMONIUM SULFATE SUBSTITUTES FOR GLYPHOSATE. Curtis R. Thompson, Kansas State University, Garden City; Dallas E. Peterson, Kansas State University, Manhattan; and Alan J. Schlegel, Kansas State University, Tribune.

Glyphosate labels recommend the addition of ammonium sulfate (AMS) to the spray solution. Ammonium sulfate in solution disassociates and the sulfate binds with cations in the spray solution preventing the development of glyphosate-cation complexes which tend to have lower absorption into a plant leaf. The ammonium ion also can associate with the glyphosate molecule, which helps facilitate glyphosate absorption into the leaf. AMS often improves weed control with glyphosate, especially when mixed with hard (cation rich) water. The recommended ammonium sulfate rate is 1 to 2% by weight and is available in both dry and liquid formulations. Because of the high use rate and handling issues, AMS generally is inconvenient to use. Low rate water conditioner products are available as an alternative to AMS with glyphosate. Pesticide applicator testimonials suggest that the performance with these products has been inconsistent. Field experiments were conducted at Manhattan, Garden City, and Tribune, Kansas

in 2005 through 2007 to compare the efficacy of glyphosate with ammonium sulfate and other commercial water conditioners. Each experiment consisted of a sub-lethal (0.27 or 0.38 lb ae/a) dose of glyphosate applied in combination with the recommended application rate of each adjuvant. Water hardness and species evaluated varied by experiment. Commercial products that included an AMS component at the equivalent rate of 1% (w/w) gave equal or slightly better control than glyphosate plus 1% (w/w) AMS. Commercial water conditioners that did not contain AMS, or that were applied at a much lower rate of AMS gave less control than glyphosate with 1 or 2% (w/w) AMS and were often no better than glyphosate alone. Velvetleaf control increased quadratically with an increasing rate of AMS substitute water conditioners. Glyphosate tank mixed with the low rate water conditioners evaluated did not provide the same level of control compared to the recommended rate of ammonium sulfate. [139]

DRIFT CONTROL ADDITIVES AND DEPOSITION AGENTS. Patrick McMullan, agroTECHNOLOGY Research, Inc. Memphis.

Minimizing off-target movement of herbicide sprays is becoming of increasing importance during herbicide application. The herbicide applicator must minimize spray drift this while maintaining herbicide efficacy – these processes can counteract each other. Drift control or drift reduction additives (DCA) added to the spray mix can reduce spray drift. DCA are typically composed of either polyacrylamides (PA) or guar gums (GU). Recently, some oil-based DCA have been introduced into the marketplace. The original PA-based products are susceptible to shearing when run through pumps, negating their effectiveness as the spray solution is recirculated. The newer generation PA-based and GU-based products are much more resistant to pump shear than the original PA-based products. DCAs typically work by increasing the initial elongational viscosity and decrease shear viscosity of the spray solution, which ultimately reduces the number of driftable droplets produced by the spray tip. Many of the DCA are targeted towards use with glyphosate-based herbicides as many include ammonium sulfate or alternative water conditioning agents in the formulation. Deposition agents are different from DCAs in that their primary function is to not affect off-target spray drift directly but improve spray deposition on target plants. Some DCA improve spray deposition as a secondary function through decreased off-target spray losses. Deposition agents function by reducing droplet evaporation, improving droplet velocity, and directly improving spray retention. Deposition agents are formulated as both emulsifiable concentrates and invert emulsions. They have often been overlooked in improving herbicide performance but they can improve efficacy of glyphosate and other herbicides. [140]

CPDA ADJUVANT STANDARDS. Bill Bagley, Wilbur Ellis Company, San Antonio, TX.

CPDA Adjuvant Certification is a product quality standards program administered by the Chemical Producers and Distributors Association (CPDA) for adjuvants used in agriculture. This certification initiative was undertaken to establish a specific set of guidelines that provides an indication of expectations for products recommended and used with crop protection chemistries (CPC) offered in the market by CPC producers. The criteria for certification were established such that high quality adjuvants are identified, certified and available for recommendation with CPC producers' products. To be certified under the program, adjuvant products are required to meet certain product quality standards before certification is bestowed. Well-defined product standards have been established by the CPDA. CPC producers are being encouraged to include statements to recommend CPDA certified adjuvants on their product labels. The EPA provided an exemption to producers so they are not required to pay label change fees when adding the CPDA Certification recommendation. [141]

THE ADJUVANT DISTRIBUTOR AND ADJUVANTS. Gregory Dahl, Joe Gednalske, Winfield Solutions LLC., St. Paul, MN; and Bob Herzfeld, Universal Crop Protection Alliance, Eagan, MN.

Three aspects of the agricultural adjuvant business are presented from the perspective of the distributor. The aspects are what adjuvants mean to distributors, the expectations of distributors towards basic pesticide manufacturers and adjuvant ingredient suppliers and the expectations of basic manufacturers, dealers and growers of distributors. What Adjuvants mean to Distributors Adjuvants provide an avenue for distributors to add value to product offerings to their customers. This value comes as increased performance of pesticides, solving stewardship challenges such as spray drift, tank contamination and application errors. Adjuvants also significantly differentiate manufacturer's products in the market place while differentiating themselves from competition. The adjuvant business for distributors helps them maximize the full potential of their customer's investment and their own. Distribution's Expectations of Basic Manufacturers and Adjuvant Suppliers Basic manufacturers can greatly benefit from working closer with the adjuvant business of distributors. Manufacturers must make a greater effort into understanding what distributor's adjuvant products actually can or can not do for the products they're marketing. Basic manufacturers could gain from adjuvant expertise in solving current performance challenges or assist in post-patent strategies. Support in dealing with industry regulations and cost reductions are paramount. Industry Expectations of Distributors The industry, meaning distributor customers and basic ingredient manufacturers, expectations of distributor includes integrity, market influence and economic efficiencies that neither can gain on their own. The industry should expect distributor involvement in industry challenges either that of regulatory or market shifts. It's more than just price per pound or gallon. [142]

ADJUVANT LABELING AND THE PESTICIDE MANUFACTURER. Dean W. Maruska, Bayer Cropscience, Research Triangle Park, NC.

Adjuvants and adjuvant systems can greatly impact herbicide performance and crop response of many active ingredients. Extensive research efforts are required to determine if an adjuvant is required for maximum performance and to define which adjuvants provide the greatest benefit under various conditions. When developing a commercial formulation, the decision must be made whether to include the adjuvant system in the formulation or to rely on an external adjuvant system. Screening of external adjuvants can be a time consuming and costly process. Experience has proven that not all products in an adjuvant class perform equally. Another observation is that adjuvants can change from one year to the next which may impact performance. Maintaining maximum herbicide performance with active ingredients which require adjuvants demands close cooperation between the herbicide manufacturer and the adjuvant companies. Pesticide manufacturers tend to be reluctant to change adjuvant system and recommendations when they have experience with a system that works well. Ultimate liability for a product's performance tends to remain with the manufacturer regardless the impact made by an adjuvant system. [143]

ADJUVANTS – THE EXTENSION PERSPECTIVE. M. Bernards, Univ. of Nebraska, Lincoln.

Adjuvants are critical for the proper function of many herbicides, a fact recognized by extension weed scientists and educators. However, they also professed a general lack of understanding about how adjuvants work, how adjuvant products differ, and where to obtain unbiased information on product recommendations. Both Extension educators and specialists reported receiving few questions regarding adjuvant selection. Most restricted their answers to information contained on the herbicide label, and recommended using a high quality product in whatever class of adjuvant (e.g., NIS, COC, MSO) was required. Extension specialists were generally aware of enough research to avoid recommending ineffective products. In addition, most extension specialists were aware of the "Compendium of Herbicide Adjuvants" prepared by Bryan Young of Southern Illinois University, and used it to determine the intended function of different products. Among Extension specialists, few have active research programs

on adjuvant performance. Several factors contribute to this lack of research interest, and the resulting limited amount of information to extend. First, there is a perception that most farmers don't care how or why adjuvants work, they just want to know which one to use. One possible reason for few questions to extension personnel is that many adjuvant purchases are tied to chemical purchases and there are few alternative adjuvant choices presented to them. Second, there is a perceived lack of regulation regarding adjuvant composition and a relatively short lifespan of many products. Inconsistent product composition, lack of useful labeling, or rapid product turnover discourages research because the results are quickly outdated and not easily publishable. Third, there is a perception that many adjuvants do little to enhance herbicide activity. This stems from two perspectives: "snake oil" type products and variability in adjuvant performance across different herbicides and species combinations. The variability makes specific recommendations for each adjuvant-herbicide-weed species scenario possible extremely complicated and cumbersome. Fourth, the large number of different adjuvant brands in any given adjuvant class makes a robust screening process daunting. There is a need to develop standardized protocols to make the screening process consistent and reliable and fundable. Fifth, the continued presence of "snake oil" adjuvants does little to enhance the stature of adjuvant research. Adjuvant manufacturers should demand standards or regulations that could be used to better discredit disreputable products. In conclusion, most extension personnel want to better understand how adjuvants work and parameters to guide appropriate adjuvant selection. To facilitate that, I believe it is critical to place greater emphasis on standardizing adjuvant product classes and intended uses, publishing useful information on the product labels, and establishing a university based system for adjuvant product evaluation. If that were done, there would be incentive for extension personnel to be aware of what was available in the world of adjuvants. [144]

SYMPOSIUM: ARUNDO/PHRAGMITES SESSION 1 – BIOLOGY AND ECOLOGY OF GIANT REED AND COMMON REED

BIOLOGY, ORIGIN, AND CURRENT RANGE OF GIANT REED (ARUNDO DONAX). Thomas Dudley, University of California, Santa Barbara.

Arundo donax is presumed to be native to the warm-climate temperate to sub-tropical zone from the Mediterranean Basin to the Indian sub-continent, and was introduced into the Western Hemisphere from southern Europe by the early 1800's for, in part, horticultural and construction purposes. It is now established across North America at latitudes free of sustained freezing temperatures but is recognized as noxious only in California, Nevada, Arizona and Texas, as well as parts of northern Mexico. Other sub-tropical and Mediterranean-type ecosystems are invaded worldwide. I will also describe identifying traits, other large grasses that could be confused with giant reed, its low genetic diversity and its systematic relationships within the grass family. Current uses of giant reed will be discussed, along with a brief overview of its life history, types of environments invaded and an introduction to its ecological impacts (to be detailed in later presentations). Although herbivore diversity is low associated with Arundo, there are several generalist, and introduced specialist insects, that do feed on this plant in North America and these and other potential limiting factors will be outlined. [162]

INVASION AND ESTABLISHMENT OF GIANT REED. Jodie Holt, University of California, Riverside.

Giant reed is a clonal species that has invaded riparian habitats in California and other southern coastal states. Although tolerant of a wide range of soil types it is most often found above the mean water level along freshwater streams. Giant reed relies completely on asexual vegetative propagules for dispersal; fertile seeds have not been reported. Rhizomes are the primary perennating organ and source of new ramets. Spring and summer constitute the main growing season for giant reed. Stems produced during the first growing season are unbranched and photosynthetic unless damage to shoots releases axillary meristems from dormancy; branches appear in the second season. Lower leaves senesce in the fall and

plants are dormant during fall and winter. Established clones spread belowground by extension of rhizomes and disperse downstream by rhizomes, or sometimes broken stem pieces, that are dislodged during flood events during winter in Mediterranean climates. Rhizomes establish readily in bare flood-scoured areas and exhibit greater lateral expansion in nitrogen enriched sites. Giant reed establishment is correlated with initial rhizome weight and abiotic factors and relatively unaffected by the composition of the native community. The positive response of giant reed to disturbance and high resource availability suggest that this species has broad environmental tolerance. In mixtures with natives, nitrogen can compensate for effects of competition on giant reed in some cases. As a result, this species might be able to invade some habitats without negative impacts from competing vegetation. [163]

GROWTH AND DEVELOPMENT OF GIANT REED. Scott Steinmaus, California Polytechnic State University, San Luis Obisbo.

The invasive success of giant reed may be attributable to its rhizome. The rhizome is the basal stage of its lifecycle from which successful survival, growth and spread occurs. Viable seeds are not produced because either ecoclimatic conditions do not allow the formation of an inflorescence or seed set is prevented by failure to produce viable gametes. Giant reed has been identified as a potential bioenergy crop because of its aggressive growth characteristics producing up to 46 ton DM ha-1 yr-1. Even though giant reed is most commonly associated with freshwater ecosystems, the rhizome can sprout new tillers after more than 42 days of storage in sea water. In this time, ocean currents can carry rhizomes to islands or beaches within 35 miles of an infested delta. Sprouting success is correlated with rhizome biomass to a threshold, above which success is high and constant. The large biomass insulates the rhizome from environmental fluctuations that would otherwise affect species with smaller propagules. Giant reed has a positive growth response to temperatures above 12°C. Large rhizomes are drought resistant and have a minimum soil moisture threshold of 6% volumetric water content above which sprouting and growth is high and constant. Vegetative growth of giant reed will respond to supplemental nitrogen, however, sprouting from rhizomes is unaffected. Unlike other summer grasses from Mediterranean climates, giant reed uses C3 photosynthesis, which may explain its typical proximity to a water source. Its success at attitudes exceeding 500m where temperatures drop below freezing periodically is likely attributable to large rhizomes and C3 photosynthesis. Translocation patterns, like most perennial rhizomatous grasses, are directed from rhizome to new growth in the spring and toward the rhizome in the fall in preparation for overwintering. Unlike other invaders that produce viable seeds, the rhizome of giant reed should be the focal point of its control. [164]

BIOLOGY, ORIGIN, AND CURRENT RANGE OF COMMON REED. Adam Lambert, Eastern Conneticut State University, Willimantic.

Common reed, Phragmites australis (Cav.), is among the most widespread angiosperms in the world and is found on every continent except Antarctica. Phragmites grows in all aquatic and brackish environments and spreads through both asexual and sexual structures. This grass has a high degree of geographically-based genetic structuring, with ploidy levels ranging from3x-12x; this genetic variability has enabled Phragmites to adapt to extremes of climate, hydrology and salinity. Although human disturbance was previously thought to be the driver of Phragmites expansion in North America, evidence now suggests that a cryptic invasion of European genotypes has occurred in the eastern United States, and this biotype is now spreading across the continent. In this symposium, we discuss the eminent threat and likely impacts of this weed as it colonizes wetland systems in western North America. [165]

INVASION AND ESTABLISHMENT OF COMMON REED. Jacques Brisson, University of Montreal, Quebec.

We report on a multi-scale approach to study the invasion dynamics of the exotic genotype of common reed, Phragmites australis (haplotype M), in southern Quebec, focusing on the contribution of road corridors. The exotic genotype of common reed has been present in Quebec at least since 1916. However, it only became invasive in the 1970's when highway networks were developed in the province, which provided extensive new habitats for the species. At the landscape scale, remote sensing and spatio-temporal analyses reveal high invasion rates during the last 20 years. Today, common reed dominates roadside and agricultural ditches of the southern part of the province, forming monospecific linear colonies that often alternate with cattails (Typha sp.). Earlier range expansion of common reed was entirely attributed to vegetative reproduction (e.g. rhizome fragments transported by machinery) since no seedlings had previously been reported in the field at this latitude. Both in North America and in Europe, northward decline in seed production, seed viability, and seedling establishment is thought to be related to a shorter growing season. Recent field evidence of successful common reed seedling establishment in roadside ditches of southern Quebec may have been made possible by recent climate warming. Once established, common reed shows high competitive abilities. Field observations and manipulations show that reed is faster than cattail at colonizing unvegetated sites. When two colonies meet, common reed is always gaining ground at the expense of cattail, although this progression varies annually, probably in response to weather conditions. A controlled experiment at high plant density shows that both common reed and cattail are negatively affected by competition, but the detrimental effect on biomass and density is stronger on cattail. A similar experiment under different salinity levels suggests that road de-icing may further advantage common reed invasion in roadside ditches. Because highways can provide well-connected habitat corridors that facilitate the dispersal of common reed in adjacent natural wetlands, we recommend better management practices to confine the species to roadside and prevent further establishment. [166]

GROWTH DYNAMICS OF COMMON REED. Laura Meyerson, University of Rhode Island, Kingston.

The identification of distinct native and introduced lineages of *Phragmites australis* in North America has initiated new lines of research that use biotic and abiotic factors to compare and contrast the native and introduced subspecies. Although the number of studies is rapidly increasing, these lines of investigation are relatively novel and are providing valuable data from both invasion and conservation perspectives. Nonetheless, the "bright line" that is often drawn to distinguish between the responses of native and introduced lineages may in fact be a bit duller than previously thought. [167]

GENETICS OF COMMON REED. Kristen Saltonstall, Smithsonian Tropical Research Institute, Panama City, Panama.

Phragmites australis (common reed) is one of the most successful plant invaders in marsh systems of North America. Genetic evidence suggests that three lineages of the subspecies are found today: native (P. a. subsp. americanus), introduced (P. australis of Eurasian origin), and Gulf Coast (P.a. subsp. berlandieri). An aggressive Phragmites lineage, likely introduced to the northeastern U.S. during colonial times, is presently sweeping through marshes of the Atlantic coast and can also be found in some Gulf and Pacific coast wetlands and interior parts of the continent. Although P.a. americanus can still be found throughout its historical range, its abundance has decreased, particularly along the Atlantic Coast, and it may have become locally extinct in some places. Despite their coexistence in many marshes, there appears to be little, if any, gene flow occurring between the different lineages. Introduced P. australis is thus a pure strain and does not represent a hybrid population type. [168]

SYMPOSIUM: ARUNDO/PHRAGMITES SESSION 2 – IMPACTS OF REED GRASSES ON NATURAL ECOSYSTEMS

COMMON REED IMPACTS ON NATIVE SPECIES. Erik Kiviat, Hundsonia Ltd. Annandale, NY.

Although Phragmites australis (common reed) is the most-studied environmental weed in North America its habitat functions for native species are poorly understood. Abundance and diversity of many taxa and guilds in reedbeds are similar to alternate plant communities dominated by, e.g., smooth cordgrass (Spartina alterniflora) or cattails (Typha). For example, 80 species of birds breed in reed-dominated habitats. Differences at the species level include: 1. Common muskrat (Ondatra zibethicus) eats reed to a variable degree but often prefers other plants; 2. Three species of declining, shortgrass-breeding high salt marsh birds do not breed in reedbeds on the Connecticut coast (although one breeds in reed in Rhode Island; 3. In low salinity tidal marshes, reedbeds have less breeding activity of birds but have abundant roosting by several declining or common species of swallows and blackbirds; 4. Early life stages of a killifish, the mummichog (Fundulus heteroclitus), are less abundant in reed than in smooth cordgrass in northeastern tidal marshes; 5. Reed culms in New Jersey and New York brackish marshes are less favorable habitat for epifauna than smooth cordgrass culms. Vascular plant layers are typically depauperate beneath dense reed but may be diverse and complex beneath native or introduced sparse reed, and certain rare plants seem facilitated in edges of introduced reed. Differences among studies are related to methodology, taxa, life stage, geographic area, agricultural legacies, and habitat structure. Habitat structure includes patch size, edge vs. interior, admixture of other plant species, interspersion with other communities, hydropattern, soils, and salinity. Reedbeds can be managed on a goal-directed and site-specific basis to create good habitat for breeding birds and other taxa while maintaining other ecosystem services provided by reed, e.g., nutrient removal, soil stabilization, and carbon sequestration. Future research should include diachronic studies, experimental addition and removal, extensive spatial and temporal replication, analysis of habitat features, systems other than northeastern tidal marshes, taxa other than birds and fishes, stands of identified reed subspecies, and the effects of observer disturbance on fauna. [169]

ECOSYSTEM IMPACTS OF COMMON REED IN THE EASTERN AND WESTERN U.S. Laura Meyerson, URI and Adam Lambert, ECSU.

The identification of distinct native and introduced lineages of Phragmites australis in North America has initiated new lines of research that use biotic and abiotic factors to compare and contrast the native and introduced subspecies. Although the number of studies is rapidly increasing, these lines of investigation are relatively novel and are providing valuable data from both invasion and conservation perspectives. Nonetheless, the “bright line” that is often drawn to distinguish between the responses of native and introduced lineages may in fact be a bit duller than previously thought. [170]

IMPACTS OF GIANT REED TO NATIVE FAUNA. David Kisner, URS Corporation, Santa Barbara, CA.

The giant reed, *Arundo donax*, is an invasive exotic plant dominant in many of California’s riparian areas, and is thought to offer little feeding or nesting habitats for birds. I investigated the relationship between *A. donax* and riparian bird richness and abundance within three drainages in San Diego county, California during four seasons (winter, spring, and early and late breeding) in 2001. I used aerial photographs and a stratified random block design to select 16 points per drainage with varying *A. donax* cover. Point counts were used to survey birds and photoplots were used to quantify *A. donax* cover at each point in each season. I hypothesized that the relationship between *A. donax* and bird richness and abundance would be negative and would vary by season, guilds (foraging and residency), and cover of other vegetation. Overall bird species richness and abundance decreased significantly as cover of *A. donax* increased during

all seasons and at all drainages. Species richness decreased by 16% to 25% as *A. donax* cover increased from 0 – 50%. Resident species richness declined significantly with increasing *A. donax* cover during the winter, spring, and late breeding seasons but non-significantly during the early breeding season. Migrant breeding species richness declined significantly with increasing *A. donax* cover in both early and late breeding seasons, but migrants were too sparse in winter and spring for analysis. An analysis of vegetative and physical factors showed that season and *A. donax* accounted for 52.5% of the variation in bird species richness. Willow was not a biologically significant factor in a general linear model. The results of this study suggest that removing *A. donax* from southern California riparian areas would benefit richness and abundance of birds. [172]

GIANT REED AND FLUVIAL PROCESSES. Edward Keller, University of California, Santa Barbara.

Arundo donax infestations are primarily in low-gradient reaches of Mediterranean-type Pacific floodplains, where substrates are comprised of unconsolidated sedimentary materials subject to the erosive shear forces during periodic flooding. Such conditions make these systems susceptible to invasion by fast-growing, disturbance-tolerant invasive plants that can displace native riparian vegetation, and once established can alter geomorphic processes. Unlike deep-rooted, spatially diverse mixed riparian vegetation, dense Arundo stands exhibit massive, shallow root systems that form a complex network just below the substrate surface. This vegetative replacement may lead to both entertainment of transported sediments during high flows, and enhanced bank erosion where undercutting and subsequent bank failure is prevalent. On-going research will quantify the effects of Arundo vs. native riparian vegetation at different flood frequencies on erosion and sediment discharge dynamics, bank stability, and general river platform over time using remote sensing data, in-situ field and lab controlled measurements on shear stresses, and HEC flow modeling. [173]

ECOHYDROLOGY OF GIANT REED. Georgianne W. Moore, Texas A&M University, College, Station.

Invasive plants, including giant reed, growing near water sources are often targeted for removal in part because of their likelihood for high water use. Indeed giant reed has many traits associated with high transpiration rates (e.g. high growth rates); however, actual water use is indefinite. The objectives of this giant reed ecohydrology study were to a) quantify water use, b) determine which environmental factors constrain transpiration and growth, and c) predict whether management can lessen the impact of giant reed on water resources. A novel aspect of this study is that we investigated the physiological response of giant reed to two potential host-specific biological control agents, a gall wasp and an armored scale. This study is located adjacent the Rio Grande in south Texas. Our field approach was to scale up leaf-level gas exchange to large monoclonal stands of giant reed along gradients of moisture. Then in potted replicates in a greenhouse, we measured the difference in transpiration and photosynthesis caused by wasps or scale. Stand density and leaf area is reduced along moisture gradients. Defoliation, desiccation, and deformation caused by insect damage can lessen the impact of giant reed on water resources. Wasps and scale reduce leaf-level rates of photosynthesis and transpiration, respectively, and may also lead to morphological changes. Biocontrol of giant reed potentially decreases evapotranspiration in riparian corridors, but only if the replacement native vegetation uses less water. The results from this ecohydrology study represent an important first step toward a more realistic water budget for giant reed in south Texas. [174]

RELATIONSHIP BETWEEN GIANT REED INVASION AND WILDFIRE. Gretchen Coffman, University of California, Los Angeles.

The extensive wildfires in southern California in October 2003 burned vast expanses of riparian ecosystems containing A. donax along the Santa Clara River. We investigated colonization of these areas for one year after the fire to determine the influence of wildfire on A. donax invasion. Due to its

immediate re-growth after the fire and high growth rate compared to native riparian plants, A. donax dominated these burned riparian ecosystems within a few months post-fire and reached 99% aerial cover a year later. Only a year post-fire, A. donax density was nearly 20 times higher and productivity was more than 14 times higher than for native plants. The large quantities of A. donax that have replaced native woody species after wildfire have increased susceptibility of riparian ecosystems along the Santa Clara River to subsequent fire, creating an invasive plant-fire regime cycle. Conservation efforts should prioritize removal of A. donax in mature riparian forests that are susceptible to wildfire. [175]

ECONOMIC IMPACTS OF GIANT REED. Lisa Berry, University of California, Santa Barbara, CA.

Millions of dollars are spent each year trying to eradicate or repair the damage caused by Arundo donax in Californian river systems. In contrast to biological and ecosystem impacts, the economic damages and risks of Arundo have not been thoroughly studied or documented on a statewide level. We propose that an economic cost-benefit framework can be used to fill this information gap. Drawing on existing cost-benefit data from individual watersheds and contingent valuation studies, we found that Arundo removal can yield economic benefits as well as ecological benefits for various watershed communities. We also found that management and removal costs increase dramatically in low-access, high-infestation regions, suggesting that early detection and removal is an important component for reducing the economic impacts of Arundo. Overall, we identify some ways of quantifying the overall economic costs of Arundo growth, and offer suggestions for how this economic valuation framework can be implemented in prioritizing the statewide removal of Arundo donax. [176]

GIANT REED (ARUNDO DONAX) CONTROL IN RIPARIAN HABITATS. Carl E. Bell, University of California Cooperative Extension, San Diego.

Giant reed (Arundo donax) presents many challenges with regard to managing or eradicating infestations because of the riparian habitats that it invades. Several of the more common and effective techniques; such as mechanical removal, fire, or broadcast applications of herbicides, cannot be used because of potential injury to native flora and fauna. In addition, the presence of listed threatened or endangered species limits accessibility to riparian areas, particularly during nesting seasons for listed birds. Another important issue is the close proximity to highly populated and urbanized areas adjacent to many of the river and creek systems in California. Because of the large rhizome system of giant reed, cutting the canes alone is not effective; herbicides are required to kill the whole plant. Because of the concerns listed above giant reed control programs typically utilize targeted applications of herbicides, such as cut stump or what can be referred to as “Bend and Spray”, where the canes are pulled down and away from native vegetation, sprayed with herbicide, then released. Herbicides used for giant reed control are aquatic formulations of glyphosate and imazapyr, either alone or in combination. [177]

MANAGEMENT OF COMMON REED. Jeffrey Derr, Virginia Tech, Virginia Beach.

Common reed is an invasive species that has overtaken wetland habitats in the eastern United States, along with infesting roadsides, turf, and ornamental sites. There are limited control options for this species, especially ones that are selective in upland sites. Experiments were conducted to evaluate mowing and herbicide application for management of this weed. Mowing every 2, 4 or 8 weeks during the growing season provided effective control by the end of the growing season, but only reduced regrowth by approximately 55% the following May. Glyphosate, applied by itself without mowing, or applied either one month after a mowing or two weeks prior to mowing reduced common reed regrowth the following May by approximately 90%. The selective postemergence herbicides used in nursery crops and turf, clethodim, fenoxaprop, fluazifop, sethoxydim, dithiopyr, MSMA, and quinclorac, did not control common reed. Glyphosate was more effective in preventing regrowth of common reed than glufosinate. In container trials, fosamine, glyphosate, and imazapyr all provided excellent control of common reed.

Triclopyr suppressed common reed, with increasing rates improving the growth reduction. Chlorflurenol, primisulfuron, and sulfosulfuron did not suppress common reed growth. In field trials, glyphosate and imazapyr were more effective than fosamine for common reed control. Glyphosate provided good control when applied in June or September, indicating the window for application may be wider than the common recommendation of late summer or early fall treatments. Common reed regrew in all treated field plots one year after study initiation, indicating that control treatments must be repeated if common reed is to be eradicated from a site. [178]

THE POTENTIAL FOR BIOLOGICAL CONTROL OF GIANT REED. John Goolsby, USDA-ARS, Weslaco, TX.

Arundo donax L., giant reed is an exotic and invasive weed of riparian habitats, irrigation canals and transportation drainages of the southwestern U.S. and northern Mexico. Giant reed dominates these habitats, which leads to: loss of biodiversity; catastrophic stream bank erosion; damage to bridges; increased costs for chemical and mechanical control along irrigation canals. Most importantly, this invasive weed consumes water resources in an arid region where these resources are critical to the environment, agriculture and urban users. Arundo donax is a good target for biological control because it has no close relatives in North or South America, and several insects from Mediterranean Europe and known to be monophagous. Our research program includes: 1) remote sensing and ecohydrology to determine the distribution and water use of giant reed in the Rio Grande River Basin (RGB); 2) use of microsatellites to determine the origin(s) of the invasive North American vegetative clones; 3) field studies in the native range; 4) pre-release quarantine impact studies on candidate agents, integrating ecohydrology and plant architecture to select the most promising agent(s) for full host range testing and potential release as biological control agents. Cultures of three agents, Arundo wasp, Tetramesa romana and Arundo scale, Rhizaspidiotus donacis Arundo scale, and Arundo fly, Cryptonevra sp. have been established from Mediterranean Europe in the USDA-APHIS Quarantine Facility in Edinburg, TX. We have completed testing on two candidate agents the Arundo wasp and scale. Both agents are host specific and appear to work synergistically to have a significant impact on A. donax. Genetic evaluation of the A. donax populations in Europe and N. America indicate that the origin of the RGB clone is Spain. Populations of the candidate agents from the origin have been imported, cultured and will be prioritized for release in the RGB. [179]

BIOLOGICAL CONTROL PROSPECTS FOR COMMON REED. Bernd Blossey, Cornell University, Ithaca, NY.

In 1998, a consortium of scientists from Cornell, University of Rhode Island and CABI Switzerland, began research into the possibilities to develop biological control of Phragmites australis. In the past decade we discovered that P. australis is both native and introduced, providing us with a new twist and increased challenge. Our project, with funding from many different agencies and entities has addressed three major themes: 1) Locating native and introduced Phragmites populations throughout North America (often using new morphological markers we developed) 2) Determining the identity and impact of existing insect natural enemies on native and exotic Phragmites in North America. 3) Evaluating European natural enemies for potential use in biological control in North America. This work identified several promising shoot boring moths in Europe that are the focus of our host specificity work. We are placing a particular emphasis on safety of native genotypes. Parallel to these investigations to be conducted in Switzerland and Rhode Island, we will engage in research to further assess ecological and economic ecosystem impacts of native and introduced Phragmites. In addition, we will conduct surveys to assess stakeholder attitudes towards biological control and develop and test standardized long-term monitoring protocols and mass rearing techniques. [180]

PLANNING AND IMPLEMENTING WATERSHED BASED GIANT REED ERADICATION. Jason Giessow, Santa Margarita and San Luis Rey Weed Management Area and Dendra, Inc., Falbrook, CA.

Watershed based eradication is the key to a successful and sustainable Arundo control and restoration program. Critical components of successful large scale eradication programs include: identification of a lead agency or entity to build the program (this entity holds permits, grants, implements project- partners may work with lead), completion of mapping of Arundo distribution (a Cal-IPC project though RWQCB will be distributing high resolution mapping data for most of coastal CA), completion of watershed based permitting (ACOE, FWS, DFG, SWCB, CEQA), development of funding for the program, co-ordination and education of stakeholders, and implementation of control and restoration activities. A focus on selection of appropriate Arundo treatments, biomass reduction and re-vegetation methods will be reviewed. Many grant funded programs have short time spans (three years) leading many programs to treat in the fall, reduce biomass in late winter and re-vegetate immediately. This treat, reduce, and re-vegetate restoration process has advantages over most other processes in that it achieves very high initial control (reduction of >95% in cane density), generates a mulch layer that stops other ruderal non-native vegetation from invading the site, and supports re-vegetation with container stock with no additional watering (>80% planting survival). This process re-establishes native woody structure in under five years, about the same time that the mulch layer starts to break down. The high initial efficacy of the treatment method allows work to occur between September and March, greatly simplifying permitting and potential impacts to wildlife. The treat, reduce, and re-vegetate method also allows programs to focus the bulk of field work on initiating new treatment sites each year- as opposed to having a heavy load of re-treatments that restrict the ability of the program to carryout new work. [181]

EDUCATION AND OUTREACH AIDS GIANT REED CONTROL PROGRAMS. Mark Newhouser, Sonoma Ecology Center, Eldridge, CA.

The Arundo donax Eradication and Coordination Program consists of several projects, including regional coordination of nine watershed based eradication partners, regulatory permit development, control methodology research, monitoring database development, eradication priority mapping, and educational material development and outreach. Outreach materials for this project loosely split into two categories: 1.) Standardized materials that include project planning templates, management protocols, and data collection and monitoring protocols for project coordinators and partners and 2.) Resource materials that include a listserve for information sharing, a website with a digital library of Arundo research, educational materials and searchable bibliography, eradication method comparisons, restoration contractors lists, database of weed experts, GeoWeed – a geospatial weed management database, project mapserver, and educational materials, such as brochures and landowner handbooks. [182]

EDUCATION AND REGULATORY SECTION

CORN PRODUCTION UNDER RAINFED OR LIMITED IRRIGATION. Robert N. Klein* and Jeffrey A. Golus, University of Nebraska WCREC, North Platte, NE.

Droughts are frequent in the High Plains. Nebraska records show 21 drought periods of 5 or more years in length from 1220 to 1952. Recently, drought conditions have plagued much of Nebraska, and the area is also facing a depleting aquifer that is forcing farmers to find more water efficient means to produce crops. Some land that is now irrigated may have to return to rainfed or limited irrigation. A large amount of cropland in the High Plains will always be rainfed. The winter wheat fallow system was developed to compensate for the low precipitation that normally occurred in the High Plains. Fallowing with tillage that buried most crop residue was replaced with tillage which left residue on the soil surface, helping protect the soil from wind and water erosion. This stubble mulch allows more rain and snow soak into the soil, and also reduces soil temperatures, which in turn reduces evaporation of water from the soil. The fallow period, which is from 13 to 15 months in the winter wheat fallow rotation, is only able to save 20-30 percent of the precipitation received during this period. Research to shorten the fallow period and to increase water use efficiency in both the fallow and crop growth periods led to developments such as conservation tillage, ecofallow, no till, controlled traffic and skip row. Most successful rotations for rainfed cropping systems in the High Plains begin with producing a good wheat crop. Reduced availability of water for irrigated crop production will require increased water use efficiency through systems that maintain more crop residue. [156]

STRIP-TILL VS. CONVENTIONAL TILLAGE; IMPACT ON IRRIGATED CORN PRODUCTION. Jeffrey M. Tichota, Monsanto, St Louis, MO.

Deficit irrigation was used to compare strip-till vs. conventional tillage at the Irrigation Research Foundation (IRF) near Yuma, CO during the 2007 growing season. Two DEKALB® corn hybrids DKC 52-59 VT3 and DKC 61-69 VT3 were compared in Strip-Till and conventional tillage. Three levels of irrigation, 15.75, 12 and 7.5 inches were applied to both hybrids across Strip-Till and conventionally tilled areas. May through August rainfall was 8.5 inches. Plant populations were 32,000 under the 15.75 inch irrigation and reduced to 25,000 and 20,000 plants per acre under 12.0 and 7.5 inches of irrigation. All plots were eight rows wide and duplicated to increase accuracy of the experimental procedure. Multi year yields show a benefit to maintaining crop residue on the soil surface which promotes deeper root growth in the Strip-Tilled plots and increases water infiltration which is critical in a water short environment. Strip-Till out yielded the conventional plots in each of the three irrigation levels. The value of conserving crop residue with Strip-Till shows greater yield increases as irrigation levels decrease. [157]

NEW DEVELOPMENTS IN SEED TREATMENT TECHNOLOGY. Charlie Hicks*, Jeff Daniels and Louis Holloway, Bayer CropScience, Research Triangle Park, NC.

Seed treatments have seen widespread use in many crops over the years. These products historically have been mostly broad spectrum, contact fungicides. Newer products are more highly active, and often systemic, providing improved seed and seedling protection. Advances in application technology have also allowed the treatment of multiple active ingredients to seed. Vortex, active ingredient ipconazole, is registered on field crops such as sorghum, cotton, sunflowers, field corn, and with additional registrations pending. Vortex is effective against many seed and soil-borne pathogens. Poncho Beta (clothianidin, beta-cyfluthrin) will soon be registered on sugar beets for early season protection against many insect pests. Proceed (prothiconazole, tebuconazole, and metalaxyl) is awaiting federal registration for protection against seed and seedling fungal diseases of cereal crops. Prosper FX (clothianidin, carboxin, tryfloxistrobin, metalaxyl) has been recently registered for use as a seed treatment on canola or protection

against both diseases and insects. IDOL sunflower system, with fenamidone, has shown to be effective against resistant strains of downy mildew of sunflower. Advances in application technology include direct injection of undiluted product, static mixing of chemical and water immediately before point of application and computerized metering of chemical to electronically measured quantity of seed. These advancements provide increased application accuracy of product to seed, while minimizing chemical exposure to workers. Seed treatment advancements have created a new dimension to crop protection in North America. [158]

GENETIC TOOLS USED TO BREED NEW TRAITS IN CROPS. Paul J. Isakson, Monsanto, St Louis, MO.

No abstract. [159]

WHAT INDUSTRY MAY REQUIRE FROM A GRADUATE STUDENT. Jeffrey Koscelny, Monsanto, St Louis, MO.

No abstract. [160]

TESTING DROUGHT TOLERANT CORN UNDER A USDA/APHIS PERMIT. Philip Westra* and Todd Gaines, Colorado State University; and Jeff Tichota, Monsanto, St. Louis, MO.

As a new wave of transgenes are incorporated into key crop cultivars, a lot of field testing will be required to evaluate transgene expression and effectiveness. Some of this testing will be used to evaluate whether the transgene presence has any unintended effects in crop plants. New traits such as drought tolerance, nitrogen use efficiency, salt tolerance, heat tolerance, and cold tolerance are no longer just theoretical concepts. Many of these transgene-based traits are in different stages of development and evaluation. In 2007, a large drought tolerant corn study was conducted under USDA/APHIS permit conditions. Such studies require a very high level of attention to detail, accurate electronic data entry, and lots of people power to conduct the biology aspects of such studies. Strict compliance to permit requirements must be understood by all workers. At various times, we had as many as 10 people working in the field in this project. In general, this study was far more complex than most typical weed control studies that are conducted across the country. Such research projects, however, offer a very important and crucial opportunity for weed science graduate students to work on regulatory aspects of projects that will affect the future of crop production. It is hoped that as these and other transgene events become less regulated that such research could be part of a PhD thesis project for graduate students. [161]

DEPOSITION ADJUVANTS FOR ENHANCING WILD OAT AND DOWNY BROME CONTROL. Michael H. Ostlie and Kirk A. Howatt, North Dakota State University, Fargo.

Deposition aids primarily are used to control spray particle size and to reduce the amount of spray drift. Studies were conducted with wild oat and downy brome to determine if using a deposition aid will enable increased activity under adverse conditions. To account for this, studies were established to compare the three-fourths rate of an herbicide with and without a deposition aid with the full rate of the herbicide with and without a deposition aid. Herbicides evaluated in field studies were propoxycarbazone, propoxycarbazone + mesosulfuron, and fenoxaprop for wild oat control; propoxycarbazone + mesosulfuron, and flucarbazone were used for downy brome control. Adding a deposition aid to fenoxaprop at the three-fourths rate increased wild oat control to 85% compared with 76% without the deposition aid. For downy brome control, adding a deposition aid tended to increase activity with the full rate of flucarbazone. In the greenhouse, propoxycarbazone, flucarbazone, sulfosulfuron, propoxycarbazone + mesosulfuron, imazamox, fenoxaprop (for wild oat only), and clethodim (for downy brome only) were applied to seedling grasses. Sulfosulfuron activity generally was increased by the use of a deposition aid in both wild oat and downy brome, with wild oat control improved by up to 24 percentage points. There was little difference in herbicide activity when applying at a three-fourths rate plus deposition aid versus a standard rate without deposition aid, while the three-fourths rate of herbicides with deposition aid also tended to increase activity in wild oat over three-fourths rate without deposition aid. [45]

PROJECTS 1&5: RANGE AND FORESTRY/WETLANDS AND WILDLANDS

Chairpersons: Scott Steinmaus and Lars Baker

Topic: Barriers to Invasive Plant Management at the Rangeland-Riparian Interface

This was the first year that the Range and Forestry section was combined with the Wetlands and Wildlands section. Both sections have similar challenges that enable a common discussion. This is especially true in the arid western U.S. where invasive plant problems during the summer are most common along wetlands of riparian habitat and at the same time those habitats are a common source of water and forage for range animals. Challenges for weed management along riparian habitats include differences in land ownership, funding limitations, viewpoints on weed management among individuals and land management agencies, and the availability of weed control tools. The audience included members with diverse backgrounds and experiences who provided useful insights regarding these issues.

Difference in land ownership along riparian habitats becomes a significant obstacle for controlling weeds. Land may be owned by several different private land owners, state government, or federal government land management agencies. Restrictions for entering or treating these lands often differs among types of land owners along waterways or across watersheds, thus complicating or prohibiting management of entire weed infestations. It is becoming increasingly important to develop weed management laws or policies that apply to all land (private, state, and federal). Several examples were discussed regarding challenges for controlling weed infestations near property lines where land managers differ in their weed management efforts. Examples included differing levels of weed control among land management agencies and absentee land owners. One specific example included challenges for controlling *Melaleuca quinquenervia* in southern Florida where controlled areas were soon re-infested by plants from neighboring lands. Cultural viewpoints on weed management may also change along riparian habitats. For example, people in residential areas may be concerned about the use of herbicides. Such areas may provide habitats for invasive weeds to persist and potentially re-populate locations down-stream. Weed management disputes may also cross state borders, as was observed at the Republican River where Kansas requested salt cedar (*Tamarix* spp.) control in Nebraska to reduce loss of water flowing into Kansas. Weed research, particularly long-term research, can also become complicated by ownership issues as owners may change or there may be unexpected disturbances, such as mowing, grazing, fires, or development.

More funding sources may be needed for weed management to meet the unique challenges at the wetland-range interface. In some circumstances, it is difficult to enforce current weed laws due to the financial burden on the land owner and politicians may be reluctant to expand enforcement policies as this may be viewed negatively among constituents. However, alternative programs may be created to ensure weed management in sensitive areas. Private or municipal funds may be a source of revenue to assist or encourage weed management and habitat restoration. For example, mitigation agreements may require funds for weed management along new road construction sites. One aspect of concern is that funding will be available for long-term control as there are some circumstances where short-term efforts resulted in re-infestation or unintended habitat changes. In some cases, land may be donated to a group with an endowment that may generate enough interest for annual maintenance. Group or private foundations may also have funds available for habitat restoration and weed management.

Developing comprehensive participation in organized Weed Management Areas (WMA) has been one way of bringing several different land management groups together for controlling invasive weed infestations. There are some comprehensive programs that focus on several aspects of weed management, such as control and restoration. For example, there has been a federal initiative to provide cost sharing with private land owners to control junipers in the Leon River Restoration Project in Texas. This is a multifaceted project that includes wildlife restoration and analysis of wildlife populations, economic returns, and plant biodiversity. Another example included the Team Arundo project to control *Arundo donax* along the Santa Ana River in California. This was an example where multiple agencies were able to combine efforts to control Arundo, but they were subsequently faced with a new infestation of perennial pepperweed (*Lepidium latifolium*). This example suggests weed management areas may require long-term commitments and flexibility to change targeted weed species. Also, more research may be needed to determine the potential and prevention of new invasive weeds infesting areas where a previous invasive species has been removed. It is unfortunate that weed infestations must become severe before funding can be generated for weed control, which has been a challenge for stimulating eastern red cedar (*Juniperus virginiana*) control efforts in Oklahoma.

Weed control strategies in large management areas should be well defined with goals appropriate to the circumstances. In many cases, large amounts of money are used to control concentrated weed infestations. However, there may be cases where it is more appropriate to focus on controlling several smaller satellite infestations to maximize the number of acres protected. Lars Baker, Weed and Pest Supervisor for Fremont Co., WY, mentioned that their weed management program often focuses on acres protected rather than acres controlled. Objectives should also include plans to control weeds that invade sites where another weed had been controlled. Grants are often awarded for controlling a specific invasive weed species and may not provide adequate flexibility for controlling other invasive species. Greater emphasis should also be placed on identifying the causes of the initial weed infestation and restoration goals within entire landscapes or watersheds. One comment was that there needs to be a greater focus on what is trying to be created rather than what is trying to be eliminated. In some circumstances, restoration to the native condition may be impossible, and some alternatives must be identified that are satisfactory to most stakeholders. The Healthy Lands Initiative sponsored by the Bureau of Land Management is one example of a program that units several agencies and provides weed management funding for habitat restorations on a landscape-level. Another potential objective may be to gain more information regarding the effects of invasive weed species on important natural resources and wildlife. Such information could improve the justification for additional investments in weed management.

Weed management in aquatic and riparian areas may also be limited by equipment needs, access, and the use of herbicides. More information may be needed regarding alternative methods for weed management that may minimize damage to non-target organisms and physical damage to riparian landscapes. Herbicide use is also limited in aquatic and riparian habitats, particularly in residential areas, which minimizes weed control options. Perhaps more information and education is needed regarding the effect of EPA-approved pesticides on the environment.

It may become increasingly important to define acceptable weed control in the future considering current limitations in funding and tools. Land management agencies have expressed a desire for a better definition of acceptable control of invasive weed species. Definitions should identify the most economically and environmentally sustainable management goals, which may

include eradication, suppression, or containment to prevent further spread. In many regions, it seems that invasive weed populations continue to expand in spite of tremendous management efforts. However, it is recognized that there would likely be many more infested acres without these weed management efforts.

In summary, several obstacles to weed management along the rangeland-riparian interface were identified and potential solutions were discussed. Many of these challenges will likely continue. However, we hope this discussion provided useful insight into identifying weed management goals, uniting large groups with a common interest in invasive weed management, and identifying needs for future directions in weed management and research.

Mike Moechnig will be the Chair for the Range and Forestry section in 2009 and Jim Harbour is the Chair-Elect for 2010. Jim Harbour will Chair the Wetlands and Wildlands section in 2009 and Cody Gray is the Chair-Elect for 2010.

Contact information for the 2009 Chairs:

Project 1: Range and Forestry
Mike Moechnig
South Dakota State University
229 Ag Hall, Box 2207A
Brookings, SD 57007
Phone: 605-688-4591

Project 5: Wetlands and Wildlands
Jim Harbour
3913 22nd St. S
Fargo, ND 58104
Phone: 701-476-0676

PROJECT 2: WEEDS OF HORTICULTURAL CROPS

Chairperson: Tim Miller

Topic: The Problem of Off-Label Herbicide Recommendations in Horticultural Crops.

The meeting started by relating an incident in Oregon during 2006/2007, where a false and misleading label for a product was somehow circulated, published, or disseminated to growers as an approved supplemental use label on onions. The label quickly attracted the attention of Oregon Department of Agriculture (ODA) officials who promptly posted a warning on their website warning growers, distributors, consultants, and retailers that the product was NOT registered for use on onions.

The discussion began with a question "How do we handle reporting of experimental results in annual reports or presentations, especially when the products in question are currently available to farmers and applicators? Should they be coded, omitted or excluded?"

The consensus was that product names should be used because of joint funding by commodity groups. And with proposed labels for Section 18's, the more growers that know about the proposed use the more interest in the product is generated. Commodity groups need to know about possible uses to support the registration in minor crops through the IR-4 program.

Then the issue of Oregon not granting recertification credits for the portion of a presentation covering unregistered products was discussed. Currently in Oregon, researchers can discuss unregistered products being evaluated for possible supplemental label, but the ODA has

implemented a new rule that no recertification credits will be awarded for these presentations. PCA credits were mentioned for Oregon, Washington, California, Arizona, and Idaho. Cross border presentations with experimental product discussions being acceptable in one state and not others.

Should researchers code the materials in their presentations? What constitutes a recommendation? Are disclaimers in presentations sufficient in case of a lawsuit? Some of these were determined to be legal questions that should be answered by the state's Attorney General's office.

Is reporting on an experimental evaluation a recommendation? What about participants to field days seeing different unregistered products being evaluated?

Reports on researcher's website could also become problems too. Would a disclaimer that is watermarked through the web pages be enough to deter those contemplating use of unregistered products?

There is a need for disclaimers or policies on reporting results on unregistered pesticides.

Currently there are two universities with policies in place, Cornell and University of California at Davis. It is believed that Oregon's rules were adopted from California's. Washington State University researchers should have all presentations and papers reviewed by the Pesticide Coordinator for the university. California has a document that determines what you can and cannot do. Need to keep records for 3 years. This document maybe viewed at their website. Their definition of a recommendation is something "in writing".

Interpreting labels for use also have discrepancies or difference of opinions.

The non-registered uses on food and feed crops brings up food safety issues and concerns. Detectable levels of products on crops was discussed.

Substantial fines for illegal use of products may prevent off label applications by growers. The fines for such uses are as high $10,000 in Oregon plus a possibility for crop embargo if the levels happen to be very high in harvested product.

The general consensus of the group was that results from research projects should not be cryptic in reporting and researchers should report their findings with disclaimers.

Curtis Rainbolt was elected to serve as chair for Project 2 in 2010.

2009 Chair
Joel Felix
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541-889-2174

Joel.Felix@oregonstate.edu

2010 Chair
Curtis Rainbolt
BASF Corporation
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Fresno, CA 93720
559-430-4418
curtis.rainbolt@basf.com

PROJECT 3: WEEDS OF AGRONOMIC CROPS

Chairperson: Steve King

Topic: Growing crops for biofuels and the potential effects on cropping systems and weeds in western agriculture

The discussion section was well attended and the majority of the discussion revolved around the economic limitations associated with many of the potential crops being evaluated as fuel sources.

The group discussed the probable inability of US agriculture to meet the biofuel goals described by several acts that congress approved. For instance, the energy independence and security act of 2007 mandated the use of 36-billion gallons of biofuel by 2022.

Current crops that are used for ethanol production include corn, switchgrass, and poplar trees. Crops used to produce biodiesel include soybeans, canola, mustard, camelina, sunflower, and safflower.

Safflower was discussed as a possible fuel source for state vehicles in Utah. The Utah department of transportation has interest in growing safflower along rights-of-way in order to produce biodiesel.

Other topics included the risks associated with growing or using invasive species for biofuel production. Camelina production was discussed and the limitations associated with this particular crop.

Chair 2009
Ian C. Burke
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Assistant Professor/Assistant Scientist
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Chair-elect 2010
Brian Olson
bolson@ksu.edu
Assistant Professor
Kansas State University
(785) 462-6281

PROJECT 4: TEACHING AND TECHNOLOGY TRANSFER

Chairperson: Anita Dille

People in attendance:

1. Anita Dille (Chair), Kansas State University, dieleman@ksu.edu
2. Anil Shrestha (Vice-Chair), University of California, anil@uckac.edu
3. Stevan Knezevic, University of Nebraska, sknezevic2@unl.edu
4. Andy Kniss, University of Wyoming, akniss@uwyo.edu
5. Mark Bernards, University of Nebraska, mbernards2@unl.edu
6. Tracy Sterling, New Mexico State University, tsterlin@nmsu.edu
7. Scott Nissen, Colorado State University, snissen@lamar.colostate.edu
8. Todd Gaines, Graduate Student, Colorado State University
9. Joe Vassios, Graduate Student, Colorado State University

Andy Kniss was elected as the chair for 2010.

Discussion Topic: *Learning about E-learning: Reflections on providing education courses*.
A round-table discussion was held in which each participant introduced themselves and provided information on their involvement with e-learning.

Anita Dille teaches a course Integrated Weed Management. Some of her courses are on-line on distance mode. In the first year, she provided video-tapes of each lecture and mailed the DVDs to each student. In the second year, the lecture was a narrated PowerPoint presentation. She also organized chat rooms where students could interact with her and each other on materials related to the course. The course was offered through the Division of Continuing Education of Kansas State University. Students got together 2-3 times during the beginning of the course.

Anil Shrestha highlighted the website of University of California's Statewide IPM Program http://ipm.ucdavis.edu the website contains information on weed identification, weed management guideline, and year-round IPM program. Growers, Pest Control Advisers, and students use this website extensively to obtain information on weeds and weed management in California.

Stevan Knezevic offers an online graduate-level course on Integrated Weed Management. He first introduced the course in 1991 and has been offering it in alternate years. The course has been approved by the University of Nebraska's graduate education committee. All his lectures are video-taped and placed on the web and can be downloaded. He also provides a binder which

includes all the course materials and lecture notes. Every year he has had 6-12 graduate students of which 2-3 are from out-of-State. He has had very positive experience with this course and mentioned that student enrollment on-campus has been dropping while distance education has been attracting students and helping maintain student population. The on-line course included some students who were interested in organic farming and were interested in learning about various concepts of integrated weed management, such as thresholds. One PhD student took several classes on-line and conducted research on-station at Lincoln.

Tracy Sterling along with Scott Nissen and several others have been offering an on-line course on Herbicides. The course is offered through Montana State University, using course modules developed at University of Nebraska, and can be accessed on-line at the Western Society of Weed Science website under 'Crop Technology Lessons at: http://www.wsweedscience.org/lessons/lessons.asp
The course is 14 weeks long and contains information of types of herbicides, how herbicides get into plants, how herbicides kill plants, and herbicide-resistance in weed and crop species. A question bank is created for exam purposes. Information about this course was published in the Journal of Natural Resources and Life Sciences Education. Each internet lesson has modules and lesson assignments. Spanish translation of the course has also been made available. The motivation to develop this course was due to the lack of on-campus students. The internet module is also reaching a wide variety of students. Scott Nissen also provided further information on the course.

Graduate students from Colorado State University Todd and Joseph had taken the on-line course and saw great value in this mode of education. They felt that course was well organized and very engaging than compared to sitting in class and listening to a lecture. They mentioned that the conference call with each student participating was of great value. They thought this method put more pressure of the students to learn. They also suggested that the papers to review should be updated. Andrew Kniss mentioned that he liked the idea of all the students getting together at least once to put a face to a name. He suggested that there is a need for Turfgrass and Horticulture on-line classes.

Mark Bernards offers spray and sprayer technology class, herbicide class, and a pesticide resistance management class. The pesticide resistance management class is offered for 2 credits. It also contains a 2 day workshop and a 12-lesson module.

The group also suggested that students in Weed Science should take all classes related to Weed Science as there are several Weed Ecologists who have very little knowledge of Herbicide Management or vice versa. Such courses to make Weed Scientist well-versed in weed biology, ecology, and herbicides could be organized on-line.

PROJECT 6: BASIC SCIENCES SECTION

Chairperson: Lynn Fandrich

Topic: The Genetics of Invasion

Approximately 15-20 people in attendance.

I. Characterization of genes that make plants invasive on a macro or whole plant level was discussed.
   A. What traits predispose a plant to be invasive?
      1. Shattering of a seed
      2. All traits that aid seed dispersion
      3. The degree of diversity to allow it to find a nitch when it gets there. Although it was pointed out many invasive come from a very narrow genetic base as if from a single individual or small group of individuals.
   B. Single sequence repeats (SSR) markers were discussed as a way to track traits.
      1. These are selection pressure neutral
      2. Can these be correlated with invasiveness?
      3. Would selection pressure driven markers have draw backs?
   C. Genes can't be considered independent of their environment.
      1. Environment is a moving target. How do you know if the genes changed or the environment?
      2. Lag time from initial invasion to establishment of the population further complicates this.
         a. Factors that effect dispersion can come into play
         b. Is there a bridge to allow it to move i.e.? Down a road ditch or waterway or other disturbed environment.
      3. Removal or addition of fire to ecosystem
      4. The first introduction may not take? Is that the first or third time invasive plant X was introduced.
   D. The invasive plant is affected by the genes of the native plants.
      1. Are the native plants lazy or complacent?
      2. Does the native environment or the disruption of a native environment leave an unexploited nitch. To reestablish native plant communities sometimes need to put a place holder in the system to suck up this nitch till the native community establishes. Sterile wheat can be planted as a genetic dead end to temporarily occupy a nitch till the native takes over.

II. Micro movement of genes or the introgression of genes from a non-native into an interbreeding native population
   A. Diecious versus monecious populations have an impact. Is it an obligate out crosser?
   B. Is there negative positive or neutral selection pressure?
   C. The degree of chromosome pairing dictates how fast or if there is introgression.
      1. When Ploidy level is different.
         a. When Ploidy level is the same this is much easier. But still there is a spectrum of homology in chromosome pairing.
         b. Is there a bridge sp. I.e. one that is closer to the introgressing sp. Allowing exchange while it becomes established
         c. It was discussed that Plants with many small chromosomes often do not have a static number of chromosomes. Different researchers get different numbers because they are so small a

difficult to count. Seasoned veterans who study such difficult sp. Except this as a reality they have to live with. Purple nut sedge is tough to count. Further it is possible that the chromosome number is changing over time. For example If you cross 2n=20 sorghum with 2n=40 Johnsongrass you often get 2n=30 hybrids with different levels of fertility. If it is ZERO the game is up. If the 2n=30 can back cross with 2n=20 it will slough off the unpaired chromosomes with progressive back crosses on its way back to 2n=20. It must survive each round of selection to make this happen.

d. Ploidy level can help If you have polyploidy bridge with good fertility a negative neutral or lethal trait on one genome can be covered by a the "natural state of the gene" on the other genome.

2. When ploidy level is the same this process is much simpler.
    a. Is it really a separate sp?? If chromosome number is the same and it interbreeds. Not clear agreement here. May come back to how successfully it interbreeds and how fast introgression occurs
    b. Is there a neg, positive of neutral selection pressure? Is it fertile or does it have reduced fertility?

III. NON sexual changes that may affect invasiveness
    A. Transposon can change genetic make up with out standard chromosomal cross overs.
        1. Can insert a copy of some thing into a "good or bad gene" and knock it out.
        2. Can increase the copy number of a gene.
        3. Can be neutral.
    B. Sometimes there is no good sexual explanation? Some entomologists believe there are no male l Russian wheat aphids in North America. However the degree of genetic variation is too great to support this? How does it happen? Like plants is there some Transposon like mechanism?
    Is this an example of multiple introductions and lag time to establishment?

Business section

1. The discussion topic for 2008 was well-received. Many students attended, which suggests that this research area has a lot of potential.
2. New chair elect is Kassim Al-Khatib, Kansas State University (khatib@ksu.edu). Chair for 2009 meeting is Randall (Randy) Currie, Kansas State University (rscurrie@ksu.edu). Lynn Fandrich is outgoing chair (lynn.fandrich@gmail.com).
3. Ideas for 2009 meeting include inviting a guest speaker from New Mexico State University.

Attendees who signed in:

Amy Blair	CSU	amblair@lamar.colstate.edu
Dilpreet Singh	WSU	dilpreet_singh@wsu.edu
Phil Westra	CSU	pwestra@coloradostate.edu
Lillian Kiehl	WSU	Kuehll@reed.edu
Kira Zhzvorva	TEXAS A&M	kzhavrov@tamu.edu
Bob Zemetra	UNIV. Idaho	rzemetra@uidaho.edu
Joan Campbell	UNIV. Idaho	jcampbel@undaho.edu
John Gaskins	USDA-ARS	john.gaskin@ars.usda.gov
Todd Gaines	CSU	todd.gaines@coloradostate.edu
Randall Currie	KSU	rscurrie@ksu.edu
Cheryl Fiore	N M State	cfiore@nmsu.edu
Carol Mallory-Smith	OSU	carol.mallory-smith@oregonstate.edu
Cheryl Wilen	U of CA	cawilen@ucdavis.edu
Jill Schroeder	N M State	jischroe@nmsu.edu
Lynn Fandrich	CSU	lynn.fandrich@gmail.com

WSWS SUMMER BOARD MEETING
July 27-28, 2007
Hyatt Regency-Valencia Room
Anaheim, California

Friday, July 27

Call to Order and Approval of Agenda – Ron Crockett
The meeting was called to order by Ron Crockett who then asked the Board if changes to the agenda were needed.
MOTION*: A motion was made and seconded to make a few changes to the meeting agenda.* **The motion passed unanimously.**

Present at the meeting: Kassim Al-Khatib, Dan Ball, Dirk Baker, Phil Banks, Rick Boydston, Bill Cobb, Ron Crockett, Pamela Hutchinson, Nelroy Jackson, Carol Mallory-Smith, Vanelle Peterson, Phil Stahlman, Kai Umeda, Tony White, and Joe Yenish.

Secretary Report - Pamela Hutchinson
Minutes of the Board action via email taken since the last Board meeting March 15, 2007 were presented to the board. These minutes will be included as an addendum to the first Board meeting March 2008 before the annual meeting begins.

Business Manager Report – Phil Banks
The Budget for 2007-2008 was presented (see below). *The Board discussed Weeds of the West including actual cost to WSWS and current inventory; unpaid liabilities; and estimated 2008 budget. The 2007 meeting estimated costs were based on the 2006 Reno meeting which Phil said was the cheapest he's encountered in the last 10 yrs, so the 2007 costs were underestimated. Also contributing to the underestimation was that a lot more people signed up for the Symposium on the day it started, so costs could not be predicted accurately until that day. Registration money was received from those people which helped pay for the costs of having more people for functions involving food, etc.*

Phil said that the overall WSWS finances have continued to improve. Registration fees now allow WSWS to break even for the meeting costs. WSWS continues to sell Weeds of the West through our website which at about 240 or so copies per yr, for a profit of approximately $8 to $9/book, and sales through the University of Wyoming for a $2/book profit. Other books have been offered on our website successfully. Phil bought a 6 mo CD w/ 5% interest and told us they we stand to hopefully make $2K per yr from CD investments. *The Board agreed that the CD was better than the approximate 0.5% interest we were getting in a savings account.*

Western Society of Weed Science: Budget for 2006-2007 (April 1, 2006-March 31 Final)

	Estimate	Actual	Estimate 2007-08
Income (annual meeting)			
Registrations and dues	$52,000.00	$ 65552.45*	$ 65000.00*
Proceedings	$4,500.00		
Research Progress Rep	$3,400.00		
	$59,900.00	**$ 65552.45***	**$ 65000.00***
Expenses			
Postage	$2,000.00	$2,156.86	$1,600.00
Website	$270.00	$270.00	$300.00
Accountant	$363.00	$363.00	$380.00
Insurance	$530.00	$530.00	$550.00
CAST dues	$600.00	$629.00	$629.00
WSSA Dir. Sci. Policy	$15,000.00	$15,000.00	$15,000.00
Allen Marketing site selec.	$1,500.00	$0.00	$0.00
Printing (all)	$7,172.00	$7,011.19	$7,000.00
Student awards	$1,000.00	$875.00	$1,000.00
Travel	$2,750.00	$4,586.67	$9,500.00
Annual meeting	$15,000.00	$27,253.71	$25,000.00
Business manager	$19,500.00	$19,500.00	$19,500.00
	$65,685.00	**$78,175.43**	**$80,459.00**
	($5,785.00)	($12,622.98)	($15,459.00)

* Includes RPR & Proceedings Income.
Budget does not include Weeds of the West, Noxious Weed Shortcourse, Bio Control of Invasive Weeds book, or non-reoccuring items.

Financial Report – Phil Banks
April 1, 2006 through March 31, 2007
CAPITAL

2005-2006 Balance Forward	$349,802.78
Current Income (loss) for 2006-2007	(38,758.58)*
	$311,044.20
DISTRIBUTION OF CAPITAL	
RBC Dain Rauscher Funds	$208,782.93
Money Market (Bank of the West)	15,092.33
Checking (Bank of the West)	37,168.94
Certificate of Deposit (Bank of the West)	50,000.00
	$311,044.20

*Does not include the investment income ($ 5507.90) from the 1st Quarter of 2006 that was not accounted for in the previous Financial Statement.

WSWS Financial Report – April 1, 2006 through March 31, 2007
INCOME

Registration & Membership Dues (includes Proceeding and Research Progress Report income)	$ 67,137.56
Noxious Weed Control Short Course	23,953.10

Weeds of the West		80,458.09
Bio Control of Invasive Weeds book		299.12
California Weeds Books		3186.92
Bank interest & Investment income		22,930.87
2007 Sustaining Membership Dues		5,978.39
Misc. Income		107.66
		$ 204,051.71
EXPENSES		
Annual Meeting Expenses (includes cost of Proceedings, Research Progress Report, & programs printing and mailing)		35,139.90
Website (Host Fees)		276.00
Tax Accountant		363.80
Franchise Tax Board filing fee		10.00
Liability Insurance		530.00
CAST Membership Dues (2007)		629.00
CAST Representative Travel		1425.53
WSSA Director of Science Policy		15,000.00
Service Contract for business management		19,500.00
Noxious Weed Control Short Course		18,997.90
Shared Leadership Workshop		4180.67
Weed Science On-line lessons		1286.93
Honorarium to Website Editor		2500.00
Honorarium to General Session Speaker (2006)		500.00
Newsletters (printing and postage)		2079.47
Invasive Plants Books		141.92
Travel to meeting for editors, student rep, and speakers for Knotweed Symposium.		4596.67
Website transaction fee		287.00
Book handling charges		142.50
Misc. Expenses		567.46
Weeds of the West (includes cost of reprinting 12,000 plus postage, etc.)		129,147.64
	$	237,302.39

Net Worth Report

WSWS-Net Worth Report
(Includes unrealized gains)
As of 7/16/07

7/16/07 Page 1

Account	7/16/07 Balance
ASSETS	
Cash and Bank Accounts	
Certificate of Deposit from Money Market	50,000.00
Checking	18,795.40
Money Market	29,102.32
TOTAL Cash and Bank Accounts	97,897.72
Other Assets	
Asset-Money due	175,801.00
TOTAL Other Assets	175,801.00
Investments	
RBC Dain Rauscher Acnt 1101-5709-9272	48,053.45
RBC Dain Rauscher Acnt 1101-5709-9275	171,914.89
TOTAL Investments	219,968.34
TOTAL ASSETS	493,667.06
LIABILITIES	
Other Liabilities	
Liability-Payments soon due.	24,750.00
TOTAL Other Liabilities	24,750.00
TOTAL LIABILITIES	24,750.00
OVERALL TOTAL	468,917.06

Phil [illegible] pped the ball," prompting a switch to Allen Marketing for assistance in hotel contract negotiation, etc. Allen Marketing also did not perform as needed due to personnel changes, so Phil assumed that task. The Board had previously recommended pursuing Hawaii as the 2010 meeting site and that the Marriot Waikoloa on the big island where we met a few yrs ago seemed favorable. A subsequent report was sent to site selection committee who recommended this hotel. The agreement has been negotiated and the contract needs to be signed by August 29th. *Idaho and Washington meeting possibilities were discussed e.g. the Coeur d' Alene Resort and a few Spokane hotels.*

Some of the Board members had questions about the DoubleTree in Spokane since it is located next to convention center. Phil strongly recommended having the meeting and sleeping rooms all under one roof. Phil said that he will send the Board info about this site. The Site Selection Committee recommended the Coeur d' Alene Resort, however. Members discussed formalizing in the Operating Manual that the Business Manager will coordinate with the Site Selection Committee and ask hotels at the possible sites for bids, put together updated proposals, and eventually conduct the hotel negotiations. Phil said he would "facilitate" the ultimate decision that the Board makes with recommendations from Site Selection and Business Manager recommendations/reports.

MOTION: *A motion was made and seconded that the Business Manager activities per this discussion be added to the Operating guide*. **The motion was passed unanimously.**

- Phil's office coordinated the abstracts for Proceedings printing thinking it would speed up the process, but he feels that this did not help speed things up. So he withdraws that from his report recommendations for action. *Carol said that the biggest challenge is getting everyone's report as soon after the annual meeting as possible and that the abstracts are not causing the delay. Carol said that if Joan Campbell received all the things to be included in the Proceedings before the end of April then it could get out before field season begins. Phil says we need to figure out a way to get the Proceedings out earlier than in the past. Dan said that he would be giving Joan*

Campbell's report and that he had comments, so asked the Board to wait with a discussion until this report time on the agenda.

The Board discussed meeting fees. Phil recommended that the special symposia committee set the registration fee as early as possible so that it all can be efficiently set up on the website far enough ahead of time. *Tony told the Board that registration for WSWS meeting will open Oct. 1, 2007.* Phil mentioned that if meeting costs go down, then the Board could possibly reduce the registration fees. *Kassim pointed out the compared with other societies, our registration fees are low/very reasonable e.g. NCWCA was $225. Carol agreed but stated that the registration fees should be set so that the Society breaks even on the costs of the meeting. Vanelle reminded us that the costs will be higher for the 2008 Anaheim, CA site. Phil S. commented that we made a "substantial" increase in registration fees only a few yrs ago, so another one too soon would probably not be acceptable to the members. Nelroy stated that the food/breaks costs will be much higher than usual. Carol reminded the Board that we did not break even last year at the 2006 Portland meeting because food costs were high. Carol and Nelroy recommended raising Registration fees incrementally rather than in big amounts all at once. Nelroy reminded the Board that the Anaheim hotel room rates were relatively good. Kassim pointed out that there are "practitioner" State attendees who may not be able to pay a high registration fee. Others said that it probably depends more on the program, that these members will come if they are interested.*

Tony asked about keeping registration fees low but charging for the lunch. Board members said that many people would not pay for and attend this important lunch so it would be better if luncheon costs were kept as part of the registration fee. There was discussion about keeping the fee below $200 at $195 but that it will need to be raised for the 2010 Hawaii meeting. Vanelle said that if we keep the Symposia registration fee relatively low, then people will attend the symposia and get exposed to WSWS. Phil B. spoke of local people who attend and postulated that 33% of attendees are close enough to drive to the site, which saves them overall meeting costs. He told the Board that many first-time attendees came for the symposia but registered for the entire WSWS meeting, so the $150 registration fee seemingly did not deter them.

Kassim proposed that early registration fees be set at $195 and late registration at $240, but that student registration fees should be kept at $75 no matter what. This scenario would generate approximately $15K. MOTION: Dan Ball moved and Jeff seconded to set the fees for the upcoming annual meeting as proposed. **The motion was unanimously passed**.

Phil mentioned that the new member and new Board member Orientation sessions he conducted this year were successful and that he will work with Dan to coordinate a similar 2008 session. Ten people attended the new member session and most new Board members attended their orientation session. Phil suggested that these orientations not be done during the meeting but during the Board meeting time instead.

Phil handed out a Board member Summer-meeting travel expense sheet to apply for up to $500 reimbursement. He said that claims should be turned in to him and that he will send back the reimbursement.

Phil informed the Board that the Marathon Ag Business Manager contract with WSWS will expire by the end of the 2008 meeting. He gave the Board a new proposal with the only major change from the previous arrangement being two rather than one Marathon Ag employee to be reimbursed for their travel costs. He felt this was justifiable because this second employee ends up working the last day of the WSWS meeting at the symposia registration desk, contrary to the past when the WSWS registration desk was closed by that time. The original Marathon Ag contract was for 2 yrs starting 2006 and ending 2008, and this new proposed contract also is for another two yrs. Phil told the Board that he prefers a contract lasting not longer than two yrs, not any longer. Phil and Nelroy were asked to leave the room so that the Board could

discuss this new proposal, and if possible, vote to approve/disapprove. No minutes of this discussion were recorded as per standard procedure.
MOTION: A motion was made, seconded, and **passed unanimously** to go to an Executive Session
MOTION: A motion was made and seconded to renew the Marathon Ag WSWS Business Manager contract as proposed by Phil at a cost of $19,500 and reimburse travel expenses for a second Marathon Ag employee not to exceed $2K/meeting. **The vote to approve was unanimous**.

Immediate Past President's Report – Kassim Al-Khatib
Kassim told the Board that he views his role in this position as supportive and that he did not have a specific, "special" project. He said that he had written and sent congratulation letters to the 2007 student contest winners, other awarded members, and outgoing board members. Kassim will host the past president reception for the March 2008 meeting.

Program Committee Report – Dan Ball
Dan said that he is still in the process of developing the 2008 program. As far as the general session, he wants to have someone from the convention center to give a welcome speech, is looking for one or two more guest speakers, and is visiting with California WSWS members to get suggestions for someone who could talk about invasive species in these different ecosystems. *A Board member mentioned a possible speaker from a marine systems institute heard at a past meeting. There was discussion about not necessarily having someone speak about weeds but other types of invaders because the ecology would still be of interest. Also suggested was a 10 to 15 min presentation about the new journal.*

Other suggestions were for a political speaker e.g. Diane Feinstein, CA, Secretary of Ag Dirk Kempthorne. Carol said that a charismatic speaker having nothing to do with weed science helps build excitement and interest in the general session and gets the meeting off to a good start. Phil S. said that there has been complaints when then general session speaker is internal because members want to hear someone outside the society. Nelroy said that we should not rule out some speakers thought to be impossible to get. Kassim suggested having someone speak about biofuels and mentioned Joe D's CAST white paper. Dan said he will visit more about this with Nelroy, and thought that getting a motivating/captivating speaker would be great. Jeff asked if we could have someone speak at the general session about the California crop diversity. A few names were suggested. Dan asked if WSWS pays an honorarium to reimburse invited general session speakers and was told that we probably could pay for two general session speakers. He also asked if we would have an invocation. *Some thought it had been voted out but according to operating guide, it can be included if desired.*

The symposia choices were mentioned and a general discussion ensued. Jeff Tichota's proposed symposium could be included in Mike Edward's section rather than being separate. Phil suggested that we need to include symposium proceedings in the WSWS proceedings – i.e. make it part of our meeting. Kassim said there was some confusion last yr because only the Thursday morning symposium agenda and not the Friday part was in the WSWS program sent out before the meeting. People told him that if they had known the symposium was more than what was printed in the WSWS program, they would have registered and stayed for the symposium. Vanelle suggested that the timeline for the symposium agenda should change so that it will get into the WSWS regular meeting program printed in January.

Nelroy was asked if the traditional ag tours would be conducted and he said no since there are so many attractions e.g. Disneyland, Knot's Berry Farm, etc.

MOTION: A motion was made and seconded and **passed unanimously** to have the adjuvant symposium as part of the regular program.

BREAK and HOTEL TOUR

***Arundo donax* and *Phragmites australis* Symposium - Carl Bell**
A hard copy handout about the proposed symposium was given to the Board. Carl wants to get an idea of what we want for this symposium i.e. our budget, ideas for the symposium, etc. so he can move forward with getting speakers, etc. He proposed that the symposium will last 6 hr total with four 1.5 hr sessions all in one day. Carl would specifically like to have a speaker give info on cultural aspects of *Arundo* e.g. how it was brought from Mexico, etc. Carl went over the list of possible speakers to give us an idea of what each speaker could cover.

Board discussion ensued on what is a reasonable amount of travel budget. Vanelle was asked how the travel costs were handled at last yr's symposium and told us that the budget needed was met by the registration fees collected. Board members reiterated that the idea is to break even. Vanelle said that they struggled with what amount to set the registration fee because they didn't want to discourage state employee, etc. participation. 2007 registration was $75 for symposium alone but if attendees registered for the WSWS meeting, then fees only were $50 for symposium.

Carl said there'd only be one break and no reception. *Vanelle commented that they ran the 2008 yrs symposium two days so that there would be chance for networking Thursday evening. WSWS members were impressed with how many people were there the 2nd day for the Knotweed symposium. The Board was told that 168 registered for symposium. The Board agreed that the Arundo symposium is topical and would be popular. Space needed for the symposium was discussed and someone said that the Royal C holds 170 comfortably.*

Carl asked about the general cost of a reception and Phil said ~ $3K with a cash bar + food. Carol recommended having a reception Wednesday night if the symposium ran all day Thursday so there could be a chance for networking. Vanelle encouraged Carl to not have the symposium all one day because regular WSWS attendees come from as far as NE, TX, etc. so it would not be important for them to get home right after 5 pm as Carl is thinking for the local/CA people who might like to go all day go home and not have to come back for a 2nd day.

Carl asked for a deadline to get mention of the Symposium into the WSWS newsletter and was told mid-August. Tony said Sept. 1st to get it on the website. There was a discussion about again giving discounts to those who registered for regular WSWS meeting = that of last yr. Kassim suggested charging what Carl said is not unusual for a symposium = $100-150, then it would be a better deal for them to sign up for the whole meeting + symposium.

Carl said that having the WSWS as a "host" would put the symposium into a different arena = basic science/scientific vs applied research/field application-oriented. Kassim reminded us that we are trying to reach out to an audience not normally attending WSWS meeting, so we would not want to deter application- oriented people. Nelroy was worried that we will not get 150 people. He said that the audience we will have are people who are out in the field/ interested in applied research. Phil says that there were 2007 symposium attendees who worked for the city, etc. who had never been to a scientific society meeting before.

Discussion ensued about the typical person doing this kind of work in CA having a degree in biology, ecology, etc. but not Ag oriented-weed control. Case stories are presented at meetings rather than replicated trial results, says Carl, and people are more interested in "trading recipes."

Carl wanted a travel budget now so he can go back to the symposium committee members with the numbers. They'd have to decide whether or not to use that money on a lot of people or more per person for fewer speakers. Vanelle asked Carl for an overall budget first before we would give him a travel

budget. Last yr travel budget was $2500 but only for two international speakers and $9K total for the symposium = breaks, reception (~$3K), AV, breaks. All presenters other than the two invited speakers were ones who submitted titles to Tim after a Call for Papers, registered, and paid their own way for travel and hotel. Phil suggested using that model to pick 2 or 3 "all stars" and have the other speakers do the same as last yr. Nelroy mentioned that bringing East coast speakers might not work because a Phragmites meeting will be there this fall. Carl said he would give the board more solid meeting costs, so we can assess what we could spend for speaker travel before giving him our budget.

RESEARCH COMMITTEE REPORT – Rick Boydston
Date of Preparation: 7/17/07
Committee Activities during the Year: Following the March meeting, all section chairs sent their reports to Joe DiTomaso and he passed them along to the Proceedings Editor. Research project chairs and chair-elects have been contacted via email and phone and their contact information is included in this report. Chair and chair-elects were sent the list of responsibilities from the WSWS Operating Guide and I encouraged all chairs to provide input on possible symposium ideas for the March meeting in Anaheim. Project 1 (Weeds of Range and Forest) and Project 5 (Wetlands & Wildlands) are considering a joint discussion session to avoid overlap of the two sections. Those project chairs have begun dialog on developing a joint discussion. Implementation of invasive species control including mapping, application technology, and extension outreach are potential topics. Steve King reported that he may focus the discussion in project 3 around weed issues related to biofuels and oilseed crops.

Chairs and chair-elects will be contacted in August and in October to encourage development of discussion section topics. Additional contacts will be made as needed to complete the research section program.

Recommendations for Board Action: None
Budget Needs: None
Suggestions for the Future: None
Suggested Changes in Operating Guide: Clarify duties of *outgoing* Research Chair to collect Project reports following the meeting in March. Eliminate the placement committee (and research chair as the board contact).
Current Committee Members: Kirk Howatt
Name of Person Preparing This Report: Rick Boydston

2007 WSWS Research Project Chairs and Chairs-Elect

Project Section	Chair	Chair-Elect
1. Weeds of Range and Forest	Lars Baker Fremont County Weed & Pest County Courthouse/ Room 315 Lander, WY 82520 307.332.1052 larsbaker@wyoming.com	Mike Moechnig Department of Plant Sciences South Dakota State University Box 2207A Brookings, SD 57007 michael.moechnig@ces.sdstate.edu
2. Weeds of Horticultural Crops	Tim Miller Washington State University 16650 State Route 536 Mt. Vernon, WA 98273 360.848.6138 twmiller@wsu.edu	Joel Felix Oregon St. Univ. 595 Onion Ave. Ontario, OR 97914 541.889.2174 joel.felix@oregonstate.edu

3. Weeds of Agronomic Crops	Steve King Assistant Professor Montana State University Southern Agricultural Research Center 748 RR Hwy Huntley, MT 59037 406.348.3400 Email: sking@montana.edu	Ian Burke Washington State University Dept. Crop and Soil Sciences P.O. Box 646420 / Johnson Hall 201 Washington St. Univ. Pullman, WA 99164-6420 509. 335.2858 Email: icburke@wsu.edu
4. Teaching & Technology Transfer	Dr. J.A. "Anita" Dille Department of Agronomy – Weed Ecology 3701 Throckmorton Plant Sciences Center Kansas State University Manhattan, KS 66506-5501 785.532.7240 dieleman@ksu.edu	Anil Shrestha IPM Weed Ecologist Univ. California Statewide IPM Program Kearney Agricultural Center Parlier, CA 93648 559.646.6534 anil@uckac.edu
5. Wetlands & Wildlands	Scott Steinmaus Biological Sciences Dept. California Polytechnic St. Univ. San Luis Obispo, CA 93407 805.756.5142 ssteinma@calpoly.edu	James D Harbour 3913 22nd St. S Fargo, ND 58104 701-476-0676 FAX 413-618-9444 James.D.Harbour@usa.dupont.com
6. Basic Sciences	Lynn Fandrich Weed Research Lab Colorado State University Ft. Collins, CO 80523 970.491.5667 fandricl@lamar.colostate.edu	Randall (Randy) Currie SW Research-Extension Center Kansas State University 4500 E Mary St. Garden City, KS 67846 316.276.8286 rscurrie@ksu.edu.

Rick asked if we could combine the Wetlands and Wildlands and Weeds of Range and Forest discussion session (not the program just the discussion sessions) *and the general consensus was that this should be done. There was interest in a Distance Education discussion session. Dan said the last time that occurred was at Colorado Springs.* Rick will send around emails to get discussion session topics from the chairs. He wants clarification about who collects the minutes from the discussion session - outgoing or chair-elect? *Outgoing chair has been doing it and the consensus was that this procedure should continue. Vanelle asked to make sure that it is a true discussion session not prepared presentations and there was strong Board member agreement.*

Education and Regulatory Section Report – Mike Edwards (Dan Ball)
Mike sent Dan an email. Mike told him that he did not have any actions to discuss and had not been copied on the Education and Regulatory committee report. Mike says that he will take Jeff Tichota's symposium idea and make it the section topic and is in the process of working with Jeff. Mike wanted us to begin discussion on a symposium designed to gauge interest of the membership in expanding the topics discussed at our annual meeting and finding a place in one of our projects to discuss those topics. This

will give the WSWS the opportunity to draw participants from a wider field of agronomy. He suggested the following:
1. Title - Integrated Cropping Systems
Discussion: Corn Production Under Limited or Dry land
Conditions: Speakers: Bob Klein - UNL - North Platte - Skip
Row Corn; Jeff Tichota, Monsanto, Strip-Till vs. Conventional Tillage and Impact on Irrigated Corn Production.
Discussion: DuPont - Seed Treatments in corn, Speakers: Mike Edwards to find speaker
Discussion: Genetic Tools Used to breed new traits in crops i.e. drought tolerance, N utilization etc. Speaker: Jeff Tichota will search for speaker
Discussion: What Industry May Require From a Graduate Student, Speaker: Jeff Koscelny - A Weed Scientist's Journey from Weeds to Seeds
Discussion: Drought Tolerant Corn, Speaker: Phil Westra - Testing Drought Tolerant Corn under a USDA / APHIS Permit
Discussion: Syngenta topic?

Member At-Large Report – Carol Mallory-Smith, Jeff Koscelny
Carol had no report other than what she already had mentioned from speaking with Joan. Jeff discussed how he sees his job as a person to which members can bring issues. He sent an email to a few longtime members asking for ideas.

CAST Report – Phil Stahlman
1st meeting March 21-23 in D.C.
Office or Committee Name: CAST Representative

Officer or Chairperson Name: Phil Stahlman

Date of Preparation (include year): July 21, 2007

Committee Activities during the Year:

The annual Spring Board Meeting was held in Washington D.C., March 21-23, 2007. I replaced Rod Lym as WSWS representative and was appointed to the Plant Protection Work Group and the National Concerns Committee. Weed Science has a strong presence in CAST with representatives from each of the regional societies as well as WSSA. Kassim Al-Khatib serves on the Executive Committee as President-Elect and will succeed to President at the fall Board Meeting October 24-26, in Ames, IA – birthplace of CAST, where activities will include celebrating CAST's 35th Anniversary.

As part of our 35th Anniversary celebration and in an attempt to reduce inventory, CAST is offering full-box quantities of several earlier publications for a $5.00 handling fee plus cost of shipping. For a list of available publications, contact Associate Editor Lynette Allen at lallen@cast-science.org or by phone at 515-292-2125, ext. 22. Some of the available publications would be great classroom resource materials.

Phil S. mentioned how these publications could be useful in the classroom and for IPM coordinators, etc.

CAST has regained forward momentum and is once-again being increasingly recognized for its quality publications and activities. There is high media and policymaker usage of CAST publications and information, and evidence of greater visibility and reach to more a diversified audience, including international. Several CAST Commentary and Issue Papers have been translated into Spanish in response to demand and to facilitate exposure.

Concerted effort has been made to increase individual, corporate, and nonprofit organization membership. Thirty-eight professional societies are now members of CAST and three new corporations and nonprofit

associations have joined in recent months. To promote CAST among young scientists, U.S. agricultural universities/college have been invited to join CAST's Educational Program, which allows graduate students of member institutions who are majoring in the agricultural sciences to receive weekly e-mail issues of CAST's "Friday Notes," nonmember website access including free downloads of CAST Commentaries, and the opportunity to order Issue Papers, Task Force Reports, and Special Publications at regular pricing. Currently, seven land grant universities and one veterinary medicine college have joined. The National Association of State Universities and Land Grant Colleges is helping increase CAST's visibility and effectiveness with graduate students.

Phil emphasized how great this feature is especially for grad students.

The major activity in Washington D.C. as it relates to agriculture is the writing of the 2007 Farm Bill, which assuredly will be expanded to include biofuels and is being touted as a "Bioenergy Bill".

Phil mentioned that specialty crops at the expense of major crops may be emphasized in the bill.

Dr. Gale Buchanan, Under Secretary of Agriculture for Research, Education, and Economics and Former CAST President, spoke at the Spring Board Meeting and stated that, "The new paradigm for agriculture now encompasses food, feed, fiber, **and fuel**." Recent and forthcoming CAST publications have and will address issues associated with the increasing demand for ethanol and biodiesel production to help guide the decisions of policymakers. In November 2006, CAST released the first of several planned Commentary's related to biofuels: *Convergence of Agriculture and Energy: Implications for Research and Policy*.

Phil mentioned that this Commentary has gotten much "notice press."

A second Commentary titled *Convergence of Agriculture and Energy: II. Producing Cellulosic Biomass for Biofuels* is planned for release this fall. And a third Commentary titled *Biofuel Feedstocks: The Risk of Future Invasions* is in the early stages of preparation. As the title suggests, this Commentary will address the potential invasiveness of biofuel feedstocks and their possible impact on endangered species (both plant and animal).

Phil Stahlman said that the 3rd paper headed by Kassim is actually well on its way and Kassim said that it will probably be the 2nd not the 3rd paper. Phil also mentioned that it has been proposed to send an additional paper on which Kai is working.

Recommendations for Board Action: None
Budget Needs: WSWS pays reasonable travel and lodging costs not covered by CAST upon receipt. The Fall Board meeting will be held in Ames, IA October 24-26, 2007. Society dues are based on membership.
Suggestions for the Future: Continue membership in CAST.
Suggested Changes in Operating Guide: Adopt language stating CAST reports are to be distributed to members via the WSWS Newsletter in addition to oral and written reports at Board meetings and the annual meeting.
Name of Person Preparing This Report: Phil Stahlman

Constitution and Operating Procedures Report – Kai Umeda

Office or Committee Name: Constitution and Operations Representative
Officer or Chairperson Name: Kai Umeda
Date of Preparation (include year): July 2007

Committee Activities during the Year:

1) Constitution and By-Laws updated on the website (articles X thru IX were omitted)
2) Operations guide being revised and updated for:
    a. President
    b. President-Elect
    c. Research Section Chairperson
    d. CAST representative
    e. Members-at-large
    f. Finance committee
    g. Nominations committee
    h. Fellows/Honorary Member committee
    i. Site selection committee

Recommendations for Board Action:

1) Student liaison position to be voted by membership in March 2008

Budget Needs: None

Suggestions for the Future:

All Board Members and Committee Chairpersons should review and provide comments about operations guide revisions.

Will welcome all suggestions for more efficient operations

Current Committee Members:

Name of Person Preparing This Report: Kai Umeda

Kai mentioned that the members will vote on including the student liaisons as non-voting board members and changing the Constitution and Bylaws to reflect this change.
Phil Banks said that someone would have to draft this motion/proposal and the general membership will need to be notified that a vote will be taken at the breakfast business meeting. We also need to vote on the website mgr as a non-voting member of the Board.

WSSA Representative Report – Vanelle Peterson

Office: Weed Science of America (WSSA) representative

Officer Name: Vanelle Peterson

Date of Preparation: July 26, 2007

Special dates:

1- WSSA meeting February 4-7, 2008 in Chicago, Hilton Hotel, downtown
2- Separate USDA-ARS meeting after the WSSA annual meeting with invitation to WSSA members to attend.
3- International Weed Science Society meeting June 23-27, 2008 in Vancouver, BC. There will be grant funding available for young scientist/graduate student travel, WSSA contributed $10,000.

Activities during the Year:

1- Represented WSWS with the WSSA board at meetings in February and July 2007
2- Co-chair WSSA ad-hoc committee on new journal (Invasive Plant Science and Management), continuing with this committee under the direction of the Publications Board/Committee

Recommendations for Board consideration:

1- WSSA revenues are in good standing.
2- Joint WSSA and SWSS meeting to be held in 2009 in Orlando.

Kassim asked about the fee for this combined meeting and Vanelle said it had not been set yet but it would probably have to be higher than normal for WSSA because the Southerns needs to make operating costs. Carol said that the WSSA discussions were that it would have to be something more

than what the topic interest is for the Southerns. Questions arose about Southern Society making money from this joint meeting but they pay an executive director and they don't have a source of income such as WOTW.

3- A Memorandum of Understanding was signed between WSSA and the Society of Range Management (SRM) in Denver at the Adams Mark Hotel for a joint meeting in 2010. Rod Lym is the chair of the WSSA/SRM program committee.
4- Strategic plans for WSSA include excellent projects that will benefit WSWS members:
    a. creating a new journal (Invasive Plant Science and Management) for which Janet Clark was hired as Project Manager and Joe DiTomaso was hired as editor;

Vanelle says that Joe D already has 28 manuscripts and has reviewers, Assoc editors lined up. We will get gratis journal the first yr it is published. Vanelle pointed out that many WSWS members are playing important roles in WSSA.

    b. support for the 2 year appointment of Steve Dewey as a "subject matter expert" Weed Scientist to work as a liaison at EPA; and

Vanelle said that Steve discussed the use of diesel fuel for weed control that is still allowed in some states. It was suggested that this person be an overall weed science rep to EPA not just invasives. So that is Steve's role.

    c. hiring a public awareness contractor to produce more popular press articles on the importance of weed science.

Tony told the Board that he and Carol are on the Public awareness committee so they get to see the articles before they go out. Have been in on discussions about what we want, what are the topics, website direction, etc.

5- WSSA continues to support NIWAW and Nelroy Jackson will continue as chair through 2009.
6- The Terminology Committee, chaired by Corey Ransom, is attempting to standardize nomenclature around "invasive weeds".
7- The Herbicide Handbook is in final draft form and with input from the Terminology Committee should be ready for printing soon.

Budget Needs: Funds for Chicago Hilton from summer WSSA meeting (Dow will fund airfare).
Suggestions for the Future: Recommendation that WSWS fully support WSSA's strategic planning.
Suggested Changes in Operating Guide: None
Name of Person Preparing This Report: Vanelle Peterson

Vanelle encouraged us to encourage our university libraries to carry the new journal, she said it would be part of BioOne. Phil B. said that he would have examples at the WSWS meeting in March.

Local Arrangements Report by Carl Bell

MOTION: *A motion was made and accepted to adjourn for the day.* **The motion passed with a unanimous vote**.
Saturday, July 28

Finance Committee Report (Phil Banks for Phil Munger)
Office or Committee Name: Finance Committee
Officer or Chairperson Name: Phil Munger

Date of Preparation (include year): July 16, 2007
Committee Activities during the Year:
The Finance Committee met at the annual WSWS Meeting in March 2007 to review investment reports and audit the Business Manager's records and accounting files. It is the Finance Committee's opinion that both the Business Manager and the Society's Investment Advisor are operating in accordance with the WSWS Investment Policy Guidelines and Objectives.

As of June 30, 2007, the value of the RBC Dain Rauscher account was $225,403 which represented $167,442 in stocks, $50,561 in bonds, and $7,400 in cash. These amounts reflect a current asset allocation of 74% stocks, 22% bonds, and 3% cash. The year-to-date return on investment is 7.48%, which follows an annual return rate of 14.41% in 2006. According to Stanley Cooper, WSWS Investment Advisor, market conditions are expected to remain favorable over the next few years.

Information concerning expenses and other WSWS investments is presented in the Business Manager's 2007 Summer Report to the Board.

Recommendations for Board Action – Finance Committee:
1. To reduce the impact of a short down-turn in the market, reallocate WSWS assets to reflect the Society's guideline allocation of 65% stocks and 35% bonds.

2. Reposition funds in the RBC Dain-Rauscher cash account into stocks or bonds.

Ron Crockett will go ahead and tell the Committee to do 1 and 2 because they do not need approval or a vote from the Board

Nominations Committee Report (Kassim Al-Khatib)
MOTION: A motion was made, seconded and **passed unanimously** to accept the slate as proposed.

Site Selection (Ron Crockett)
Identified priorities and will finalize Hawaii contract within the next few weeks. Ron will sign the contract. Committee recommended Coeur d' Alene (CDA) for 2011 because when looking for a 2010 hotel/location, CDA had put together the best package besides Hawaii so the committee pursued them + Spokane hotels for 2011. The shuttle to CDA is $49 so the advantage may be for Spokane at $129-150/room. People who've been there said that the DoubleTree could handle the meeting very well. The Board then recommended the Doubletree. Some concerns were expressed about Hawaii prices. Nelroy reminded us that we subsidized grad rooms.
MOTION: *A motion was made and seconded to recommend Spokane to the Site Selection Committee for 2011 and that someone from that committee go to the possible hotels to see which could handle the meeting*. **The motion passed unanimously.**

The Operating Guide dictates that Ron get someone from the Local arrangements to help with the Hawaii sites. Someone had contacted Kassim so he will get back to that person. Discussion about 2012 ensued.

Education (ad hoc) Distance Education (Mike Edwards)
Office or Committee Name: Education (Ad hoc) Committee – Distance Education Sub-Group
Officer or Chairperson Name: Tracy Sterling
Date of Preparation (include year): July 16, 2007
Committee Activities during the Year: The Education subgroup for Distance Education has met its long-term goal of developing web-based Weed Science educational materials for multiple type learners. Many lessons have been developed (see WSWS web site). Ten of these lessons have been published in the peer-reviewed, on-line journal, *Journal of Natural Resources and Life Science Education*

(JNRLSE). Additional lessons are being written to submit for consideration of publication (i.e. Herbicide Discovery, Cellular Absorption of Herbicides; Herbicides that Inhibit Fatty Acid Biosynthesis; Phloem Transport). The funding provided by WSWS was used to set up the WSWS website as a sibling site to the http://plantandsoil.unl.edu website and showcase those lessons specific to Weed Science.

Using these materials, Bill Dyer, Scott Nissen, and Tracy Sterling partnered will offer a graduate-level Herbicide Physiology course via Distance Education from Montana State University for the second time during Fall 2007 (http://eu.montana.edu/credit/courses/PSPP546.htm; see attached course description. The first offering was in Fall 2006 and nine students from across the western U.S. and Canada enrolled and two dropped because of time constraints. Student reviews were generally quite favorable, emphasizing knowledge gained, practical applications, and in-depth coverage of topics. Suggestions for future improvement included better organization, clearer grading expectations, and better predictions of student time required for the course. These changes are being addressed prior to offering the course this summer. This 14-week course (PSPP 546 Herbicide Physiology) will be offered every Fall semester. The course will be advertised in WSSA and WSWS newsletters for the 2007 offering.

Recommendations for Board Action:
Budget Needs: None
Suggestions for the Future: Continue to seek funding to create additional lessons and animations relevant to Weed Science.
Suggested Changes in Operating Guide: none
Current Committee Members:
Tracy Sterling, Chair, Distance Education
Carol Mallory-Smith, Distance Education
Scott Nissen, Distance Education
Bill Dyer, Distance Education
Kassim Al-Khatib, Distance Education
Name of Person Preparing This Report: Tracy Sterling

http://eu.montana.edu/credit/courses/PSPP546.htm

PSPP 546-01: Herbicide Physiology

Online
September 5 – December 8, 2006
3 graduate credits
Tuition: $675
Instructors: Professors William Dyer, Montana State University; Tracy Sterling, New Mexico State University; and Scott Nissen, Colorado State University

Register Online
Course Description: Herbicide Physiology is a new online graduate level course that will cover topics in herbicide classification, herbicide mode of action, and resistance mechanisms. In addition to providing basic information about herbicide physiology and plant responses, students will be challenged with applied problems that may be encountered in field situations. Students will thus learn to hone their diagnostic and problem-solving skills that will be required in a number of employment opportunities.

Instructors: Professors William Dyer, Montana State University; Tracy Sterling, New Mexico State University; and Scott Nissen, Colorado State University

Cost: Tuition is $675. This should be paid to the Office of Continuing Education at Montana State University at the time of registration.

Credit: 3 graduate credits

Prerequisites: Upper division courses in biochemistry (BCHM 340 General Biochemistry or equivalent) and plant physiology (PS 450 Plant Physiology or equivalent), or consent of the instructors. Contact Dr. William Dyer at wdyer@montana.edu for more information.

Time Commitment: 9 to 12 hours per week over 14 weeks. If you are unfamiliar with this field of study and/or with telecommunications, this course may require more of your time.

Target Audience: Students from Weed Science, Plant Physiology, Plant Biology, Land Reclamation, Ecology, Range Science, Agronomy, Integrated Pest Management, and Conservation Biology will be served by this course. The course is designed for students without traditional access to this course material, and is not designed to replace existing, on-campus courses at other institutions.

Course Materials: This course has no textbook as all readings and activities take place online.

For more information: Contact Dr. William Dyer at wdyer@montana.edu

Note: This course will be delivered using WebCT. WebCT is an online course delivery tool. You will receive more information about how to login closer to the course start date.

Publication (Dan Ball)
Office or Committee Name: Publications Committee
Officer or Chairperson Name: Dan Ball, Chair
Traci Rauch – Research Progress Report
Joan Campbell – Proceedings
Cheryl Fiore - Newsletter
Website – Tony White
Weeds of the West – Tom Whitson
Date of Preparation (include year): July 24, 2007
Recommendations for Board Action: Traci Rauch and Joan Campbell made the following suggestions for discussion at the Summer meeting:
A few things you may want to discuss. The minutes were quite lengthy. I think inclusive minutes are good, but there were entire letters from hotels that had detailed info. that could have been pared down (in my opinion, the photos and logo weren't necessary). The board approved the minutes so maybe that is what is desired. I think long is better than too short so no problem there if that is what we want.

Also, I spent some time trying to fix typos and take out extra lines, spaces, reduce graphics, etc, but it was taking a lot of time so I just printed the minutes as I received them. I guess I don't really have authority to make changes anyway.

Mainly, as I stated in the report, timely approval of the minutes and forwarding to the Proceedings editors will allow for us to get it to the printer quicker. Also, there would be more time for fixing typos and sprucing up the look of the minutes (margins that are not matched, indentations, etc.)
Budget Needs:
$2,500 for RPR printing + travel cost (airfare $300 + 3 night lodging) = $3,100 – Traci Rauch
$3585 for 2007, about the same expected for 2008 – Joan Campbell
Suggestions for the Future:

Expedite the approval of minutes and arrival to the Proceedings Editors – Joan Campbell.
Suggested Changes in Operating Guide: The operating guidelines are ok, they just aren't followed. It is difficult to obtain all the information in a timely manner – Joan Campbell.
Name of Persons Preparing This Report: Dan Ball, Traci Rauch (RPR), Cheryl Fiore, Joan Campbell (Proceedings), Tom Whitson.

Office or Committee Name: Proceedings
Officer or Chairperson Name: Joan Campbell/Traci Rauch, Co-editors
Date of Preparation (include year): July 13, 2007
Committee Activities during the Year:
Proceedings has 288 pages, more than in previous years. This is due to larger margins and font used on the abstract pages and much more detailed minutes. Omnipress is printing the Proceedings as in past years. The cost is $3585.00 for 250 books or $14.32 each. The books will be shipped to Las Cruces, NM due to arrive on August 6. Shipping to NM is included in the total price. The cover will be digitally printed in full color on one side. Omnipress has new equipment which actually cost us $10.00 less for color compared to black and white.
Recommendations for Board Action:
Approve budget
Budget Needs:
$3585 for 2007, about the same expected for 2008
Suggestions for the Future: Expedite the approval of minutes and arrival to the Proceedings Editors.
Suggested Changes in Operating Guide: The operating guidelines are ok, they just aren't followed. It is difficult to obtain all the information in a timely manner.
Current Committee Members: Joan Campbell and Traci Rauch
Name of Person Preparing This Report: Joan Campbell

Newsletter - Cheryl Fiore (7/13/2007):
The last Newsletter went out to the membership in May.
A request for submissions to the August newsletter went out this morning.

Weeds of the West - Tom Whitson (7/17/2007):
Currently we have 8,144 WEEDS OF THE WEST in inventory at UW plus whatever Phil Banks has. We will know more after this summer about reprinting, but should be down to about 5,000 in inventory by October, 2007. Perhaps we will need to reprint by late summer or fall, 2008.

We've already agreed to cover editor costs so we don't need to vote.

Office or Committee Name: Research Progress Report
Officer or Chairperson Name: Joan Campbell and Traci Rauch
Date of Preparation (include year): July 17, 2007
Committee Activities during the Year:

Currently, the 2008 Call for Research Progress Reports is being updated. Changes will be made to clarify directions that may have caused problems. One change to the directions will be to ask that the reports be submitted electronically by e-mail in Microsoft Word .doc format (not 2007 .docx) or as a .pdf file type (Acrobat) in addition to paper copies. This will allow the editors to make minor changes (margins, typos, full justification, etc) without needing to contact the authors. The Call will be included in September Newsletter and be posted online. To continue encouraging submissions to the Research Progress Report, we will also include a note in the September newsletter and on the website.

Recommendations for Board Action: None

Budget Needs: Budget request: $2,500 for printing + travel cost (airfare $300 + 3 night lodging) = $3,100

Suggestions for the Future: None
Suggested Changes in Operating Guide: None
Current Committee Members: Traci Rauch and Joan Campbell
Name of Person Preparing This Report: Traci Rauch

Office or Committee Name: Publications (Website/Webmaster)
Officer or Chairperson Name: Tony White
Date of Preparation (include year): July 2007
Committee Activities during the Year:

Only minor changes regarding the online registration and title/abstract submission are slated to be implemented for the 2008 Annual Meeting. Suggested online title and abstract submission changes for 2008 include:

1. Updating the instructions to make submission easier.
2. Restructure some of the text boxes on the submission page to make the process easier and clearer to new members.
3. Make the overall page layout easier to follow.

Other Website Activity.

1. The credit card payment system through PayPal is currently functioning well. To further utilize this new online payment tool, additional books and other items related to the WSWS will go on sale when available.
2. More economical options of accepting credit card transactions are being pursued. More detailed options will be discussed in greater detail during the summer board meeting.

Tony said that we can save a few $100's to go to our own website payment $460 to stay with PayPal - not a lot of difference but some people don't like to have to go out to another website (PayPal) we'd purchase a shopping cart and it'd all be on our website.

3. At the board meeting in March, the option of adding a searchable proceedings database to the website was mentioned. At this time I do not see the value or widespread utilization of such a system considering the enormous amount of programming and testing time required to set up such a database. I believe that various online library sites already provide adequate search options of the WSWS proceedings and that developing such a system on the WSWS site will be of limited value as no one outside the board meeting has requested this feature to date. However, I wish to consult the Board members during the meeting to receive a more broad based opinion on this issue.
4. Still working on using the WSWS website as a registration platform for the NDSU Annual Weed Science Meeting.

Recommendations for Board Action: None at this time.
Budget Needs: None at this time.
Suggestions for the Future: As usual...provide more feedback regarding the site (positive or negative).
Name of Person Preparing This Report: Tony White

Tony said that he will implement suggested changes prior to launching the registration site and that the PayPal systems has worked extremely well.

Phil Banks said we added two more publications to our online store before next meeting. Jody Holt revised weed ecology book 30% discount we can buy and sell for $15 approx Southern weed ID will be published by U Georgia Press- we'd get 40% discount then offer it for sale on our website. Phil says that they can negotiate with anyone who might desire to sell publications. Tony says that "Hits and Visits" is a real challenge to track because of our server. It is important info to him and others, however, so we should keep track of the visitors coming to the site.

Kassim's recommendation for the future: Look at costs of printing. If we move to CD we can reduce the costs. Many of other societies give reports in a CD. Printing would be a $4,000 savings perhaps. Dan asked about searchable on the web site. Tony said that people want the abstracts as soon as possible and since we already have the abstracts before the meeting so he said it would be do-able. Only look at searching the abstracts he said it would be "pretty easy" Having the whole proceedings searchable would be a challenge. Tony suggested not having the minutes in the hard copy of minutes and reports. They are our record though people reminded. We could have a hard copy but we would have the minutes and reports up on the website much faster than waiting for them and delaying publication of hard copy. We would eventually have a hard copy each yr the same yr for each meeting that yr. Phil keeps hard copy as record and the get sent to IOWA STATE who don't take electronic copies. Discussion ensued about splitting out the minutes. There was further discussion about permanent record for discussion session minutes. The general consensus was that it would be good to have the abstracts hard copy at the meeting in the "package."There was discussion about archiving necessities needs and questions about record for IRS, etc.

As far as re-directing where we archive the info- Tony says part goes online and abstracts go our as hard copies to members. Tony doesn't recommend CD format now but maybe in the future. Phil says we have only charged $20 and approximately only 200 out of 380 members who attend order. Phil S. agreed with NCWSS model that it is included in the registration fee and all attendees automatically get it. Carol said that WSSA is only offered online not even on a CD but she doesn't know what WSSA will do this year. WSSA abstracts are searchable online and you can print out ahead of the meeting if you want. Tony says that you have about 3 wks before the meeting to update your abstract. He asked if we would want a CD at the meeting or hard copies and the Board members preferred one or the other. What time would Joan need the abstracts was asked and Tony says the cut-off for changes would have to be at mid-Jan. in order to print by meeting time. Vanelle thought we should have the abstracts website accessible but not on CD for now- not even hard copies. We'd have to have the full membership vote to change the format and not include the minutes and reports which are called for at the business meeting. Vanelle read through the appropriate section in the Bylaws. Phil S. said that the Members–at-large could go to the Membership Committee to ask members what they want and then make recommendations for the abstract delivery system as a hard copy and/or CD. Phil S. thought that we could include a note about this in an upcoming newsletter.

Nelroy says that the minutes used to be just a record of the decisions i.e. motions votes. If you go back though the minutes, you look for the "business" not the discussion. He says that since we've gotten laptops instead of hand writing that the minutes have expanded since we can capture it better at the Board meetings. There was discussion about including background discussion along with motions and voting outcome in the minutes. Kai says that the Operations Guideline is very specific about timeline. Vanelle reminded us that the reason why there is unhappiness about the delay is that people want the abstracts as soon as possible.

MOTION: *There was a motion and second to have 2008 abstracts available on the website before the meeting. There was a discussion about having problems with people not ordering proceedings but the general consensus was that people order or don't order proceedings with their registration. Tony asked if*

these should only be available to paying members who can log in and the Board said yes. **The motion passed unanimously.**

Dan said he and the Publications committee could sit down with secretaries/chairs to see how we could streamline especially minutes and streamline timeline. There was a blurb in the newsletters and will be in the program that abstracts available on line so can look/print out before the meeting.

Student Paper Contest - (Dan Ball)
Office or Committee Name: Student Paper Judging
Officer or Chairperson Name: Brad Ramsdale; Jim Harbour (2007-08)
Date of Preparation (include year): July 23, 2007
Committee Activities during the Year:
The contest went very smoothly this year. Members were very supportive in serving as judges for the 4 contests. The committee would again like to thank the following individuals for serving as judges: Lars Baker, Oleg Daugovish, Patricia Dysart, Greg Endres, Joel Felix, Pat Geier, Jim Harbour, Jeff Herman, Kirk Howatt, Andy Hulting, Pam Hutchinson, Sandra McDonald, Drew Lyon, Tim Miller, Doug Ryerson, Marty Schraer, Lee Van Wychen, Sarah Ward, Brenda Waters, Tony White.

A third committee member still needs to be confirmed for the 2007-08 meeting.

Recommendations for Board Action: none
Budget Needs: none
Note: $675 in total was given as awards; 8 plaques were given at $393.20 total
Suggestions for the Future: none
Suggested Changes in Operating Guide: none
Current Committee Members: Jim Harbour, Chair (07-08)
Brad Ramsdale, Past Chair (06-07)

Name of Person Preparing This Report: Brad Ramsdale
Some Judges say that they are getting maxed out so he encourages the committee to not ask people too many times. Kassim says he made a list of all judges in the past so that if there are not enough volunteers then they start asking people. Dan says that he will follow up and make sure the list keeps getting updated and passed along to the chairs.
Kai asked if didn't they used to get a gift certificate to buy something from WSSA pubs. Maybe we should give certificate to buy something from our website pubs. Hasn't happened for a long time though so people weren't interested in doing it again. Nelroy pointed out that this committee spent money but did not have a budget in this report. Kassim says that the spring report asks for the budget because by then they have numbers for how many papers will be given so will know how many rewards to give, etc.

Student Liaison Report - (Angela Kazmierczak)
Office or Committee Name: Student Liaison
Officer or Chairperson Name: Angela Kazmierczak
Date of Preparation (include year): July 2007
Committee Activities during the Year: The committee worked on finishing the wording for the constitution and duties so the general membership can vote on the student liaison positions at the 2008 WSWS Annual meeting. There was also discussion at the student meeting in Portland about changing the two breakfasts to a breakfast and a lunch. It was decided that for Anaheim it would remain two breakfasts with discussion at the next student meeting. The reason for the proposed change is due to low student attendance at the breakfasts. The companies that sponsor these breakfasts are gracious enough to do so, so we hope that by maybe changing one to a lunch they might be better attended.
Budget Needs:

None.

Suggestions for the Future:

Submit final proposal to the membership at the 2008 Annual Meeting for a vote to add the student liaison as a non-voting member of the WSWS Board to the WSWS constitution.

Suggested Changes in Operating Guide:

Current Committee Members:

Angela Kazmierczak
Todd Gaines
Kai Umeda
Jeff Koscelny

Name of Person Preparing This Report:

Angela Kazmierczak

Proposed changes and additions to WSWS Constitution and By-laws to add student liaisons:

Constitution

Article IV – Officers and Board of Directors

Section 2. The Board of Directors shall be composed of:

Non-voting Board members:

(14) Student President (new)
(15) Student Vice-President (new)

Section 11. (new)
The Student Liaisons, a Student President and a Student Vice-President, shall be elected at a students' meeting during the Annual meeting and begin to serve a one-year term at the close of the business meeting when they become Student Liaisons. The Student Liaisons must be a graduate or undergraduate student for the full duration of the term.

By-laws

Article X – Duties of Student Liaisons (new)

The Student President and Vice-President shall represent the student members of WSWS to the Board of Directors and to the WSSA Graduate Student Organization. The Student Liaisons shall promote graduate and undergraduate student activity and participation in the Society. The Student Liaisons shall perform duties delegated by the President and the Board of Directors.

Kai says that they will continue working on having student liaison work on the student night out.

When the ballots go out Phil says sometimes it is in the Nov newsletter mailing. A separate mailing this yr increased ballots by 50% Dec deadline for return. WSSA had online only and return was not good. Either or not both was the rec.

DSP report - (Carol Mallory-Smith)

Farm bill was approved in the house this week.

Science Policy Update: July 20, 2007
Lee Van Wychen
National and Regional Weed Science Societies

WEEDS/INVASIVE PLANT LEGISATION IN THE 110th CONGRESS

H.R. 658 / S. 241 – Natural Resource Protection Cooperative Agreement Act

This bill would authorize the Secretary of the Interior to enter into cooperative agreements to protect natural resources of units of the National Park System through collaborative efforts on land inside and outside of units of the National Park System.

This was one of three NIWAW positions that we advocated for in February. The House bill is sponsored by Rep Jon Porter from Nevada. H.R. 658 passed the House on March 19 by a vote of 390-10.

The Senate version, S.241, was introduced by Sen. Ron Wyden, Oregon. On June 26, 2007, the Senate Committee on Energy and Natural Resources, chaired by Sen. Bingaman (NM) reported this bill without amendment after a favorable report from the Department of Interior and the Congressional Budget Office (Senate report 110-105). This bill is awaiting action on the Senate Legislative Calendar and has a very good chance to be signed into law by President Bush by this fall.

S. 1160 - Specialty Crops Competition Act of 2007 introduced by Sen. Debbie Stabenow (MI) on April 19 with 18 co-sponsors. This bill establishes an invasive pest threat identification and mitigation program (including noxious weeds) authorized at $40 million per year. It would implement an integrated pest management initiative and amend the Homeland Security Act of 2002 to restore import and entry agricultural inspection functions to USDA Animal and Plant Health Inspection Service (APHIS).

S. 1242 - A bill to amend the Federal Crop Insurance Act and 2002 Farm Bill to establish a biofuel pilot program to offer crop insurance to producers of experimental biofuel crops. Introduced by Sen. Jon Tester (MT) on April 26. This bill defines the terms and conditions for an "experimental biofuel crop" to include a determination by USDA demonstrating that there are sufficient safeguards to prevent the spread of the crop as a noxious weed

H.R. 1600 - Equitable Agriculture Today for a Healthy America Act introduced by Rep. Dennis Cardoza (CA) on March 20 and now has 115 co-sponsors. This bill includes many similar provisions as in S. 1160 above as well as a section titled "Invasive Pests and Diseases". It authorizes $50 million per year for an "Early Pest Detection and Surveillance Improvement Program". However, they define "pest" according to the legal definition given "plant pest" in the Plant Protection Act (7 U.S.C. 7702(14)) – just a few lines of text below the definition for "noxious weed". For the record, the legal term 'plant pest' means any living stage of any of the following that can directly or indirectly injure, cause damage to, or cause disease in any plant or plant product: (A) A protozoan; (B) A nonhuman animal; (C) A parasitic plant; (D) A bacterium; (E) A fungus; (F) A virus or viroid; (G) An infectious agent or other pathogen; (H) Any article similar to or allied with any of the articles specified in the preceding subparagraphs.

H.R. 620 - Rep. Olver (MA), S. 280 – Sen. Lieberman (CT), and S. 317 – Sen. Feinstein (CA) – Three related bills with a goal to reduce greenhouse gas emissions in the U.S. by establishing a market-driven system of greenhouse gas tradeable allowances. Sen. Feinstein's bill, S. 317, is more specific than the other two bills and is the only one to mention invasive species and noxious weeds. Invasive species in S. 317 is defined as a species (including pathogens, seeds, spores, or any other biological material relating to a species) introduction of which causes or is likely to cause economic or environmental harm or harm to human health. In Sen. Feinstein's bill, greenhouse gas reductions projects from agricultural, forestry, wetlands, and other land use-related sequestration projects may only receive offset credits if native plant materials are given primary consideration and Federal- or State-designated noxious weeds or use of a species listed by a regional or State invasive plant councils within the applicable region or State are prohibited.

S. 725 - National Aquatic Invasive Species Act of 2007 introduced by Sen. Carl Levin (MI) on March 1. This bill would amend the Non-indigenous Aquatic Nuisance Prevention and Control Act of 1990 to establish aquatic invasive species reduction and prevention requirements for vessels (including towed

vessels and structures) operating in U.S. waters. Some of the main priorities listed in S. 725 include: Requires the National Invasive Species Council (NISC) to establish a federal rapid response team for each of the ten federal regions; Directs the Aquatic Nuisance Species Task Force (ANSTF) to establish a priority pathway management program that identifies those pathways that pose the highest risk for the introduction of aquatic invasive species; and requires the National Science Foundation (NSF) to establish a grant program for researchers at institutions of higher education and museums to carry out research in systematics and taxonomy. The bill would cost about $150 million per year if the authorized funding was fully appropriated.

2007 FARM BILL

Last night (July 19), the House Agriculture Committee passed their version of the 2007 Farm Bill. Over the last 3 days, they managed to get through over 100 amendments in committee. Next stop is for consideration and amendments on the House Floor. Even if the House passes their version of the Farm Bill before August recess, the Senate is not likely to get to it until September. That being said, the "big hitters" driving the Farm Bill want to see the current 2002 Farm Bill extended as is. There is a high probability that the current 2002 Farm Bill will be extended given the pending 2008 Presidential election, the Doha Round of WTO talks, and of course the influence from the "big hitters". However, 2008 election politics may drive the passage of the next Farm Bill given the swing votes at stake between the Democrats and Republicans and the level of interest in this bill from the highest levels (Pelosi, Reid, Johanns).

The Research Title in the 2007 Farm Bill is a potpourri of the various proposals (The Administration, CREATE-21 and NIFA) that have been introduced up to this point. The bad news is that there is no mention of doubling agricultural research funding. This was a primary goal of the CREATE-21 and NIFA proposals. However, the good news is that the House version of the Farm Bill proposal adopted the Administration's proposal that includes $50 million per year for the agricultural bioenergy and bio-based products research initiative and $100 million per year for the specialty crops research initiative. Unlike the Administration's or the CREATE-21 proposal, there would be no merger of the Research Education and Economics Agencies (CSREES, ARS, ERS or FS R&D) in the House Farm Bill proposal.

The National Agricultural Research, Extension, Education, and Economics (NAREEE) Advisory Board would be retained as the principal vehicle for stakeholder input, while also adding the Agricultural Research Institute concept being championed in the CREATE-21 proposal. In the House Farm Bill proposal, the Agricultural Research Institute will coordinate the programs and activities of the research agencies through the following six institutes:

1) Renewable energy, resources, and environment
2) Food safety, nutrition, and health
3) Plant health and production
1) Animal health and production
2) Agriculture systems and technology
3) Agriculture economics and rural communities

Each research institute will have a Director appointed by the Under Secretary, and will formulate programs, develop strategic planning and priorities for department-wide research, education, extension and related activities. The Under Secretary, along with the Directors and in consultation with the NAREEE Advisory Board, will direct research, education, extension, and related programs for relevant departmental agencies, and ensure that strategies and funds are coordinated throughout.

Finally, the a National Institute of Food and Agriculture (NIFA) would be established, but only under CSREES, to administer **all** competitive grants including the National Research Initiative (NRI), which is re-authorized at $500 million per year.

In the **Conservation Title** passed by the House Agriculture Committee a couple of brief **invasive species** highlights include:

- a provision that would allow a producer to conduct prescribed grazing for the control of **invasive species** on Conservation Reserve Program (CRP) lands.
- Amending the Environmental Quality Incentives Program (EQIP) to include the promotion of forest management and energy conservation. Forest management practices are defined as activities that may be needed to improve water quality, increase in-stream flows, restore forest biodiversity, or control **invasive species**.

$425 million for Secure Rural Schools and Community Self-Determination Act

The Secure Rural Schools and Community Self-Determination Act (P.L. 106-393), signed into law in 2000, provides an alternative source of funding for schools and other purposes in counties that were once dependent on timber sales from federal lands. At the time the law was passed, it was estimated to provide assistance to 700 counties in 39 states. The Act also provides funding for (A) road, trail, and infrastructure maintenance or obliteration; (B) soil productivity improvement; (C) improvements in forest ecosystem health; (D) watershed restoration and maintenance; (E) restoration, maintenance and improvement of wildlife and fish habitat; (F) control of **noxious and exotic weeds**; and (G) re-establishment of native species.

The $425 million provides funding for a one-year extension of the Secure Rural Schools Act and gives Congress time to find a long-term solution for counties with a high percentage of national forests or federal land. The $425 million appropriation was part of the much larger Emergency War Funding bill ($120 billion) that was wrangled over during much of May by the House, Senate and President. Also included in that bill (P.L. 110-28) was $3 billion for agriculture disaster relief and $465 million for wildfire suppression.

Standardization of Nomenclature for Weed Definitions

(NOTE: The next 2 pages are background info that is in my Washington Report in the July 2007 WSSA Newsletter- please skip this if you have already read it there).

Recently, I have been dealing with a number of increasing issues concerning the classification of weeds that may greatly impact the mission of the National and Regional Weed Science Societies. The mission of the WSSA (www.wssa.net) is to:

1) Promote research, education, and extension outreach activities related to weeds;
2) Provide science-based information to the public and policy makers;
3) Foster awareness of weeds and their impacts on managed and natural ecosystems.

As a weed scientist, I sometimes struggle with the various classifications of weeds such as noxious, exotic, invasive, alien, nonnative, non-indigenous, volunteer crop and my favorite- plant out of place (no acronym necessary). However, I believe there is a very important role for the weed science societies to help standardize science-based classifications for the public and policy makers as we foster the awareness of weeds and their impacts on both managed and natural ecosystems through research, education, and extension outreach activities.

*Of all the classifications of weeds above, a **"noxious"** weed is the most straightforward because it's a legal term (7 U.S.C. 7702(10)) defined in the Plant Protection Act (Public Law 106-224). The term 'noxious weed' means any plant or plant product that can directly or indirectly injure or cause damage to crops (including nursery stock or plant products), livestock, poultry, or other interests of agriculture, irrigation, navigation, the natural resources of the United States, the public health, or the environment. In other words, a **noxious weed** is any plant designated by a Federal, State or county government as injurious to public health, agriculture, recreation, wildlife or property. There is a well defined federal process for both listing and delisting plants as federal noxious weeds that is conducted through USDA APHIS. For more info see: http://www.aphis.usda.gov/plant_health/plant_pest_info/weeds/index.shtml*

*The word **"invasive"** is at the forefront of this discussion. What is an invasive weed or invasive plant? There is no mention of "invasive" or "exotic" or "alien" in the Plant Protection Act. Yet, the term invasive weed is increasingly popular in new federal legislation being introduced in the House and Senate (see below). The WSSA will be issuing a new journal during the first quarter of 2008 titled "Invasive Plant Science and Management". The WSSA is also a major stakeholder in conducting the National Invasive Weeds Awareness Week (NIWAW). Certainly, people seem to "get" the invasive species message because the "message" has been out there much longer thanks to our fellow pest control colleagues working in entomology and plant pathology. Mission statement #2 above is a much easier to convey when I talk to people in Washington DC about "invasive plants" vs. "weeds".*

*In the 2002 National Research Council report titled "Predicting Invasions of Non-indigenous Plants and Plant Pests" (http://www.nap.edu/catalog/10259.html), a biological **invasion** is defined as a phenomenon in which a nonindigenous species arrives in a new range in which it establishes, proliferates, spreads, and causes broadly-defined detrimental consequences in the environment.*

*Executive Order 13112, signed by President Clinton in 1999, defines an **invasive species** as "an alien species whose introduction does or is likely to cause economic or environmental harm or harm to human health."*

The Invasive Species Advisory Committee (ISAC) to the National Invasive Species Council (NISC) issued an excellent white paper on invasive species definition clarifications last year. This paper can be found at: http://www.invasivespeciesinfo.gov/docs/council/isacdef.pdf

*The ISAC definitions white paper was intended to provide a non-regulatory policy interpretation of the term **invasive species** by identifying **what is meant**, and just as important, **what is not meant** by the term. Some of the key conclusions of this paper are:*

4) *Invasive species are those that are not native to the ecosystem under consideration and that cause or are likely to cause economic or environmental harm or harm to human, animal, or plant health.*

5) *Plant and animal species under domestication or cultivation and under human control are **not** invasive species.*

6) *Furthermore for policy purposes, to be considered invasive, the negative impacts caused by a non-native species will be **deemed to outweigh** the beneficial effects it provides.*

This leads me to my last point, or rather question: Do the National and Regional Weed Science Societies need to adopt a standard definition or criteria for an "invasive plant"?

1) *Are all weeds invasive plants?*
2) *Are all invasive plants weeds?*
3) *Are all noxious weeds invasive plants?*

As I mentioned at the beginning of this article, there can be confusion associated with all the various terms used to describe a weed. What is most troubling is that many people in our discipline would have no trouble stating a definitive "yes or no" answer to the above three questions, yet the general public is exposed to many different definitions and classifications. For example, you can go to the USDA Natural Resource Conservation Service (NRCS) Plants Database (http://plants.usda.gov/index.html) and look up "Invasive and Noxious Weeds" (http://plants.usda.gov/java/noxiousDriver).

*As you scroll down the "Invasive and Noxious Weeds" page and start searching for different weeds, you also find that crops like corn, soybeans, cotton, rice, wheat, and alfalfa are listed with the description "This plant can be **weedy** or **invasive** according to the authoritative sources noted below." Can a **volunteer crop** be **weedy**? Can a **volunteer crop** be **invasive**?*

Whether or not a species is considered an invasive species depends largely on human values. Do the National and Regional Weed Science Societies need to make a distinction between an "invasive plant" and a "weed"?

The WSSA Science Policy Committee has agreed that we should attempt to define and standardize the nomenclature surrounding the major classifications of weeds. Many thanks to Jill Schroeder, WSSA President, who has initiated this process by enlisting the help of the Terminology Committee (P22) chaired by Corey Ransom and coordinated by Linda Nelson and the Federal Noxious and Invasive Weeds Committee (E4) chaired by Charles Bryson and coordinated by John Jachetta.

> **ACTION ITEM:** Should each weed science society simply ratify the Invasive Species Advisory Committee (ISAC) white paper on invasive species definition clarifications (found at: http://www.invasivespeciesinfo.gov/docs/council/isacdef.pdf)? Or, if the WSSA Federal Noxious and Invasive Weeds Committee and the Terminology Committee can draft definitions, how can we make this an official declaration of the National and Regional Weed Science Societies? Should the APMS, NCWSS, NEWSS, SWSS, WSWS and other affiliate weed science societies also adopt standardized definitions? Lastly, should this be a resolution to be voted upon by all members and what is the timeline for accomplishing this?

WSSA Members Organize 2nd Glyphosate Stewardship Forum in St. Louis

On March 20-21, a broad array of stakeholders from University Weed Scientists, Commodity Groups, Industry Representatives, Farmers, and Federal Policy and Regulatory Officials attended the 2nd National Glyphosate Stewardship Forum (NGSF) in St. Louis, Missouri. I would like commend the principal coordinators, Mike Owen from Iowa State and Chris Boerboom from the University of Wisconsin for their time and effort in organizing this event. Other WSSA members who actively participated in this forum include: Christy Sprague- Michigan State; Bill Johnson- Purdue; Stanley Culpepper- Georgia; Alan York and John Wilcut- North Carolina State; Larry Steckel- Tennessee; Andrew Kniss- Wyoming; Harold Coble- USDA; Bill Chism- EPA; Janis McFarland and Chuck Foresman- Syngenta; Jennifer Ralston- Monsanto; Raymond Forney- DuPont; Mike DeFelice- Pioneer Hi-Bred; and Bob Nichols-

Cotton Incorporated. I have undoubtedly missed some WSSA members so I send my apologies in advance.

The first NGSF was conducted in St. Louis in November 2004 and was organized as a result of discussions among several university weed scientists about the potential evolution of glyphosate-resistant weeds and the management challenges they may pose for growers. This group of weed scientists included: Mike Owen, Iowa State; Chris Boerboom, Wisconsin; Stanley Culpepper, Georgia; Mark Loux, Ohio State; Tom Mueller, Tennessee; David Shaw, Mississippi State; Christy Sprague, Michigan State; and John Wilcut, North Carolina State. A summary of presentations and stakeholder comments from the 1st NGSF can be found at: http://www.weeds.iastate.edu/weednews/2006/NGSF%20final%20report.pdf

The executive summary and stakeholder discussion comments from the 2nd NGSF are forthcoming. Some personal observations from 2nd NGSF include:

1) Any glyphosate stewardship program should be voluntary and not mandated by regulatory action.
2) A consistent glyphosate stewardship message needs to be adopted by all stakeholders for managing the potential evolution of glyphosate-resistant weeds.
3) Financial incentives should be provided to crop consultants and herbicide retailers for disseminating a consistent herbicide stewardship message to end-users.

On a separate, but related event, Dr. Stephen Powles from Australia presented a talk at the U.S. EPA on April 4 in Washington DC following the American Chemical Society meeting in Chicago. Thanks to Rick Keigwin, Director of BEAD at EPA for helping to organize the seminar. The topic for Dr. Powles talk was evolved glyphosate resistant weeds around the world. Dr. Powles felt that the current status of glyphosate stewardship was "lamentable" and that much more could be done prevent further weed resistance because glyphosate is "1 in a 100 year herbicide discovery". A particular point he emphasized was not to cut glyphosate application rates.

Herbicide stewardship and resistance management is not a new concept to the WSSA. However, with glyphosate now being applied on over 110 million acres across the U.S., the National and Regional Weed Science Societies need to provide consistent, science-based glyphosate stewardship information to the public and policy makers.

NIWAW 9 Scheduled for February 24-29, 2008 in DC

Planning for the 9th Annual National Invasive Weed Awareness Week (NIWAW 9) is underway in Washington DC. Dr. Nelroy Jackson will be leading the Invasive Weed Awareness Coalition (IWAC) to help plan and coordinate the week long activities. The WSSA has once again received a $15,000 Pulling Together Initiative grant from the National Fish and Wildlife Federation in April to help organize NIWAW 9. The slogan for NIWAW 9 is "***Weeds won't wait: Don't hesitate***". The six **invasive weeds** that will be featured on this year's poster are:

Yellow starthistle
Cheatgrass
Beach vitex
Japanese stiltgrass
Russian olive
Giant salvinia

It is interesting to note that only 1 of 6 of the aforementioned NIWAW 9 poster weeds are a federally listed **noxious weed**. Yet all 6 weeds are listed as a **noxious** weed in at least one or more states.

Does everyone in the National and Regional Weed Science Societies consider these 6 weeds to be **invasive**?

Sustaining Members (Kassim Al-Khatib)

Jeff Tichota has a list of sustaining members and will send out solicitation in the fall. They can pay with credit card on the website.

Membership Development Committee (Phil Stahlman)
Phil S. had resigned as chair but no new chair instated so he volunteered to serve again just one more year. There were no activities to report. There was discussion earlier about if membership should have to pay separate for the proceedings/abstracts.

Office or Committee Name: Membership
Officer or Chairperson Name: Phil Stahlman
Date of Preparation (include year): 21 July 2007
Committee Activities during the Year: I resigned from chair of the committee at the annual meeting in Portland and only recently learned a new chair had not been named. Thus, there are no known activities to report.
Recommendations for Board Action: None
Budget Needs: None
Suggestions for the Future: None
Suggested Changes in Operating Guide: None
Current Committee Members: Lisa Boggs, Vanelle Peterson, Jeff Koscelny, John Baker, Brenda Waters, Ralph Whitesides, Steve Fennimore, Randy Smith Dirk Baker, James Olivarez, Eric Coombs, Kai Umeda, Dudley Smith, Phil Banks, ad hoc
Name of Person Preparing This Report: Phil Stahlman

Public Relations (Phil Banks for Mike Edwards)
Brad Hanson sent a report
Vanelle says to stay in touch with Janice McFarland who is in charge of public relations for WSSA so they coordinate press releases with WSSA venues

Awards (Ron Crockett)
No formal report. The committee continues to focus on who should be recognized by the society. All award levels contribute significantly to the society so the committee continues to recommend and put together packages. Members earn the opportunity to be recognized both in the public and private sector. Ron asked for comments and recommendations for the awards committee. Phil says they need to get their announcement in the Newsletter about the Call for nominations. There are six possible awards every year and many years we don't give all awards out. Kai stated all six for the Board.

Legislative Committee (Vanelle Petersen)
No formal report was sent.
Nelroy says that WSWS member is not in on conference calls currently so we need that interface.

Carol recommends that a Board member be that contact person. Vanelle says that when Charlotte was President she asked Vanelle to set it up as a formal committee because it had been ad hoc. Vanelle suggested the immediate past president head this committee. Kassim said that the communication/connection should be strengthened. There was a suggestion that the WSSA rep help facilitate the connection between WSWS and WSSA. This is an important responsibility so the Board wants to give strong recommendation to this committee to make the connections to WSSA committee. The directive needs to come from the president/incoming president. Give the committee a list of

responsibilities and tell them that as the President tenure they will be working together, Tony says that currently there's no link between Committee names members and a link to the operating Guideline online, so he will make that link. They can cut and paste the duties for themselves. This committee should be in contact with Steve Dewey, etc. and someone needs to be thinking in more than a 1 yr period. Vanelle says the chair is a 3 yr term. Some thought it had been changing every yr. Kai says it is a 2 yr term. Kassim said this person should be a member of CAST so they get the Friday email of everything go on legislatively.

There was a suggestion that WSWS pay for CAST membership. Others said no because $60 is not that much and you get so much from being a member. The committee has told the Board that the committee needs help. Board members again recommended that either the chair be a Board member or a Board member be on the committee. Kassim said that the President can ask the chair to make sure they connect. Jeff said that he will follow up with the chair and see what the connection problem is, that as a Member at Large he will make this a special project.

Herbicide Resistant Plants Committee (Jeff Koscelny)
Office or Committee Name: Herbicide Resistance Committee
Officer or Chairperson Name: Steven R. King
Date of Preparation (include year): 7-18-07
Committee Activities during the Year:
The committee will be preparing a poster "Herbicide Resistance in the West" for the 2008 WSWS meeting.
Recommendations for Board Action: At this time, the committee does not have any recommendations
Budget Needs: $0
Suggestions for the Future:
Current Committee Members: Steve Seefeldt, Monte Anderson, Craig Alford, Steve King John O'Barr
Name of Person Preparing This Report: Steve King

Dan would like to see a one page fact sheet available online

Fellow & Honorary Members (Vanelle Peterson)
Vanelle says that in the 2004 report there's no public and private sector separate Fellow but since then there has been a separate award. The revised guideline has no private public sector split. Someone asked if a change was made by the board. Rod says that unless he is asked by the Board he will not nominate two. Vanelle thinks that at the Summer 2003 meeting was when decisions were made to have both. Pam says that she would look at the minute records and Kai says that he will look through the procedures. Nelroy says that in 2003 they went intensely through Constitution and Bylaws to make it all clearer. Vanelle says that this is constraining to pick one of each. We'd have to see if the Constitution supports it or not. Unless we voted on it to be separate, it shouldn't be separate. The entire membership would have had to vote on it so everyone was sure that it didn't get taken to the general membership. Phil Banks says that if it is just a rule in the operating guide then the general membership doesn't vote. Nelroy says we are operating with 2004 Constitution By Laws and it does not say we have separate awards. Rod says that he should be able to choose two fellows and one doesn't have to be from private one from public – that they can both be from one or the other.

Noxious Weed Short Course Report (Carol Mallory-Smith)
Office or Committee Name: Noxious Weed Short Course
Officer or Chairperson Name: Celestine Duncan
Date of Preparation (include year):7/ 2007
Committee Activities during the Year:

The Noxious Weed Short Course sponsored by the WSWS was held at Chico Hot Springs Resort located in Pray, MT, April 23th through 26th, 2007. We offered one session again in 2007 due to year because of conflicts with instructor and conference center schedules. There were 41 people that attended in 2007 with 15 people on a waiting list. Registrations for the 2007 session were filled to capacity by October, 2006. Participants include USFS, BLM, National Park Service, Fish and Wildlife Service, Dept. of Transportation, and County Weed Coordinators. The course continues to be highly recommended to weed managers within agencies.

Instructors include: Dr. Rod Lym, Dr. Steven Enloe, Dr. Steve Dewey, Dr. Jim Jacobs, and Celestine Duncan representing the Western Society of Weed Science. Gary Adams, USDA APHIS, Mary Mayer USDA, ARS, Melissa Brown, consultant, will also assist with the course.

Registration fees were increased from $450 per person in 2006 to $500 for the 2007 session to cover PayPal fees and additional facility costs. Balance in the NWSC budget is $33270. The course for 2008 is filled with early "informal" registration.
Recommendations for Board Action: Continue the course
Budget Needs: None- funded by registration.
Suggestions for the Future: Continue the course
Suggested Changes in Operating Guide: none; continue to modify program based on student evaluations and needs.
Current Committee Members: Celestine Duncan with expert guidance/advice from Stephen Enloe, Rod Lym, and Steve Dewey!
Name of Person Preparing This Report: Celestine Duncan

Poster *(Dan Ball)*
Office or Committee Name: Poster Committee
Officer or Chairperson Name: David Belles
Date of Preparation (include year): 23 July 2007
Committee Activities during the Year:
Period: March to July, 2007

We coordinated and managed poster setup and take down at the Portland meeting.
We borrowed 15 easels from the hotel in Portland **at no cost. DAVE WANTED TO EMPHASIZE THIS COURTESY**
We coordinated WSWS easels return to UC Davis with Joe DiTomaso for storage and transport to the Anaheim meeting in 2008.
We discarded all the foam poster boards at the conclusion of the Portland meeting and the Knotweed Symposium.
We appointed new poster committee member, Carl Libbey (e-mail. libbey@wsu.edu, phone. 360-848-6139).
Recommendations for Board Action: The board needs to purchase all new poster boards for this year (est. cost $5 ea.). The number of posters presented is expected to average about 73; however, we had only 62 posters last year. We currently have 50 easels. We recommend the board consider purchasing new easels or to rent additional easels from the facility in Anaheim or elsewhere.
Budget Needs: None at this time
Suggestions for the Future: None at this time.
Suggested Changes in Operating Guide: None at this time.
Current Committee Members:
Linda Wilson (2007)
David Belles, Chair (2008)
Carl Libbey (2009)

Name of Person Preparing This Report: David Belles

Discussion about if we need more easels troubles with adding more if that is all transportable. Phil S. says that cost is inhibitory and renting would be much cheaper. Nelroy says that he will look into what the costs are renting from hotel. Joe D. will bring 50 easels Nelroy will ask Joe if he can bring an extra 20 from UC Davis.
When the program is completed and if more than 50 posters will be presented, then some will have to be oral presentations instead. Poster boards will be bought locally and easels rented.

Necrology: (Pam Hutchinson)
No formal report. Pam said she will contact the Chair to make sure they follow up on the two we know about, Orvil Lee and Bill Fertig. Arnold Appleby already has written the obituary. The Chair should make sure notice gets out in newsletter and request for info goes out before meeting to make sure we get names for the meeting

Old Business: *The Business Manger contract already was approved.*
Question about who handles food contacts. Mike Edwards is the liaison to the companies sponsoring the food events (breaks, receptions, etc.) Mike has been doing a great job and was acknowledged. Vanelle says that the Sponsors can be told that registration fees have raised maybe we could cover some ourselves so they need to make the hard sell so they can be sponsors. Last yr one break was shared by two companies because of direction from their superiors about the costs. Emphasized making sure that the president writes a letter to the company management that it is very important to sponsor and that a big sign is posted so that they are recognized. Kassim says that he wrote letters to the companies thanking them for their support. Phil says that some companies asked for list of attendees and he has given it to them. Recommendation that not only the reps get the thank-you letter but the management person who authorized the expenditure gets a copy, too. Kassim said that since Mike had been doing a great job that he should be recognized in some way.

New Business: New items to discuss

Consent Agenda:
- Membership Development Committee
- Public Relations
- Awards
- Legislative Committee

Herbicide Resistant Plants Committee
Fellow & Honorary Members
Noxious Weed Short Course Report
Poster
Necrology

The reports will be placed on the consent agenda and approved in total with one vote. Any Board member can request the removal of any report from the consent agenda to be added to the regular agenda for discussion.

Discussion about making sure that all Board members get the reports somehow before the Board meeting. The Board general consensus was that the President send them out in a bundle to members just before the meeting.

MOTION: A motion was made, seconded and ***passed unanimously to adjourn.***

Respectfully submitted – Pamela J.S. Hutchinson WSWS Executive Board Secretary – March 10, 2008

ADDENDUM

Executive Board business conducted by E-mail between the March 15, 2007 Board lunch meeting and the July 27-28, 2007 Summer Board meeting:

May 22, 2007
Secretary Pamela Hutchinson attached the following to emails sent to Ron Crockett, Dan Ball, Kassim Al-Khatib, Phil Banks and copied Joan Campbell:
Previously approved: Executive Board Summer 2006 business meeting minutes and addendum with Board e-mail correspondence/business between the March 15, 2006 Board lunch meeting and the summer 2006 meeting
To be approved:
1) March 12, 2007 Executive Board business meeting minutes
2) Addendum to the March 12 meeting of e-mail business since the Summer 2006 Board meeting
3) March 15, 2007 WSWS breakfast business meeting minutes
4) March 15, 2007 Board lunch meeting minutes

May 25, 2007
After a few corrections and edits from suggestions were made, Pam sent the minutes to be approved to all Board members for further corrections/edit suggestions.

June 01, 2007
Ron Crockett sent the following to the Board members:
I would like to ask for a motion and have a second to approve the minutes from Pam.

June 04, 2007
MOTION:
Kirk Howatt sent the following to the Board members:
I move to approve the following WSWS meeting minutes:
1) March 12 Board meeting
2) Addendum to the March 12 meeting with e-mail business since the
Summer Board meeting.
3) March 15 Breakfast Business meeting
4) March 15 Board lunch meeting

June 06, 2007
Kassim Al-Khatib /Vanelle Peterson seconded the motion to approve the minutes.

June 12, 2007
Phil Banks sent a reminder of the approved procedure for conducting WSWS Executive Board business via email to Ron Crockett, Dan Ball, Kassim Al-Khatib, Pamela Hutchinson, Joan Campbell, Kai Umeda, and Tony White.

June 17, 2007
Ron Crockett called for the vote to approve the aforementioned minutes.

June 19, 2007

After a query from Phil Stahlman, Kai Umeda sent the following to the Board members:
The voting Board of Directors are:
President
President-elect
Secretary
Immediate past president
WSSA representative
Research Section Chairperson
Ed and Regulatory Section Chairperson
Members-at Large

June 21, 2007
Phil Banks reported to the Board members that the aforementioned **minutes were approved by all but two members who did not vote.**

June 21, 2007
Pamela Hutchinson sent the approved Board minutes to Joan Campbell and copied the voting Board members.

Respectfully submitted, March 10, 2010 Pamela J.S. Hutchinson, WSWS Executive Board Secretary

WSWS EXECUTIVE BOARD MEETING
Monday March 10, 2008
Hyatt Regency-Valencia Room
Anaheim, California

Call to Order – President Ron P. Crockett
Present at the meeting were Ron Crockett, Dan Ball, Phil Banks, Rick Boydston, Bill Cobb, Mike Edwards, Todd Gaines, Kirk Howatt, Pamela Hutchinson, Nelroy Jackson, Angela Kazmierczak, Rod Lym, Carol Mallory-Smith, Vanelle Peterson, Jesse Richardson, Phil Stahlman, Kai Umeda, and Tony White.

Approval of Agenda
MOTION: Several changes were requested. A motion was made, seconded and passed unanimously to make those changes.

Secretary – Pamela Hutchinson
Hard copies of the 2007 Summer Business meeting minutes and addendum to the minutes containing the email business conducted between the March 2007 and Summer 2007 meeting were given to the Board members to read, make corrections, and approve at the Thursday Board Lunch meeting or by email after the meetings.

Business Manager's Report - Phil Banks
Electronic copies of the 2007-08 Budge and the 2007-08 Budget and Net Worth Reports are on file at the WSWS website.
Phil told us that several bids were received from Hawaii hotels and many of them were expensive. The Spokane DoubleTree hotel contract for the 2011 meeting was received, signed, and sent back.

New member and officers orientation sessions will be Wednesday March 12th.
Phil started scanning old WSWS Proceedings. He has hardcopies of almost all the proceedings as far back as1938. He also has Research Progress Reports, Programs, Secretary files, etc. Iowa State only holds hard copies – no electronic versions. The paper in Phil's copies is beginning to deteriorate. He has completed scanning through 1980. He would like to put them in a format which could be searched electronically. Phil is requesting $1500 for cost of scanning the remaing reports and proceedings.

Discussion ensued about charging people for copies. Vanelle said she would like to see all scanned from now on and possibly have at least the author index searchable so anyone can find the year of the paper of interest then open that year – not have to read through all the copies. NSWCCA only has the corresponding author referenced for searchability.

MOTION: Vanelle made a motion which was seconded by Dan Ball to scan all proceedings – costs to not exceed $2000.
Discussion ensued. Tony told the Board he would make a searchable author index. Phil S. asked how much time it took to do the scanning. Joan has electronic copies of Proceedings from a certain date, but Phil B. did not know how far back, so hopefully he won't have to scan from recent times. Rod Lym did not keep electronic copies since they were on "big" floppies. Phil S. and Carol mentioned that this task was not really something that the Business Mgr had done in the past. Phil B. said he was willing to do this since it was so valuable to the society. He can get an NMSU student to do the scanning. Vanelle thought that a deadline was not needed, but it was good the process has been started. The general consensus was that WSWS members could access these after logging into the WSWS website. Anyone else could get them by becoming a member with payment of the non-meeting $25 member fee.

The question was called and **the motion passed unanimously**.

Phil reminded the Board that the Operating Guide states that approval is needed for any Business Manager expenditures over $500. Phil says that $2500 would be a more appropriate limit before Board approval is needed. All checks written for more than that amount are usually already approved.

MOTION: Vanelle moved, Carol seconded, and the Board **unanimously approved** amending the operating guide so that the Business Manager can make expenditures up to $2500 without explicit Board approval.

Phil asked the Board to read through his reports and then he could break down costs for anyone interested. The 2007-08 budget was presented at the Summer Board meeting. Phil mentioned that the society will probably will have a loss in the operating Budget as presented – because it does not include non reoccurring items.

Question arose about the California Weed Book fee listed on the report. Phil said that WSWS has a financial agreement to sell the books on our website and pay them a fee which we have built into our website price. The sum of those fees to a given date are paid all at once so it seems as if we are in the red but we are not.

Program Committee Report - Dan Ball
An electronic copy of the Program Committee Report is on file at the WSWS website.

There was discussion about the speaker costs for the *Arundo donax* and *Phragmites australis* Symposium and mention made of the email vote earlier this spring to approve the symposium budget.

MOTION: Moved, seconded, and **passed unanimously** that we go to an Executive Session to discuss this and future Symposia (no minutes).

MOTION *during the Executive Session*: Carol moved and Vanelle seconded to change the Symposia Organization Committee from Ad-Hoc to Standing and that the Immediate Past President would be an ex-officio on the committee.

Discussion ensued about having the past president on the committee for continuity and that the Program Chairs would work closely with this committee as the symposia is being developed. As discussed in the past, the symposia topics should pertain to the given meeting location and should be discussed and chosen in conjunction with formal approval of the upcoming meeting sites.

The question was called and the motion was **unanimously passed**.

MOTION during the Executive Session: A motion was made, seconded and **passed unanimously** to end the Executive Session and return to the regular Board meeting agenda.

Finance (Phil Munger)
An electronic copy of the Finance Committee Report is on file at the WSWS website.

A WSWS Portfolio Review was presented by Stan Cooper from Dain Rauscher. He handed out a hard copy of how the portfolio was doing and recommended going to a more a conservative approach than the current 65/35% investment policy i.e. moving towards 100% rather than staying at 35% Bonds. He also recommended that he give a bi-annual rather than an annual report since keeping current will be

especially critical in the coming years. *Discussion ensued about whether or not the policy was in the operating guide. Jesse said that it was not formalized. We are currently have 35% in fixed allocations e.g. bonds. Stan recommended we have a written policy rather than guidelines. Vanelle agreed and said that we need to step up as a Board and make this formal.*

MOTION: Vanelle made and Carol seconded a motion that the Board request that the Finance Committee change the WSWS investment policy guidelines to allow our portfolio manager to invest as much as 100% in bonds/cash and no more than 65% in stocks. **The motion was approved with a unanimous vote**.

Research Section Report - Rick Boydston
An electronic copy of the Research Section Report is on file at the WSWS website.

Rick was asked if any .ppt presentation files for the 2008 meeting were incompatible. Board members suggested that the next Research Chair request the Windows 2007 version be used for creating these files. The Board also recommended keeping a before-meeting deadline for sending .ppt presentation files to the Research Section Chair. Rick said that it was good to have each section Chair get the presentations rather than the overall chair getting them first then sending them to the various section chairs.

Education & Regulatory Section Report - Mike Edwards
An electronic copy of the Regulatory Section Report is on file at the WSWS website.

Mike said that the section is lined up with "internal" speakers so there were no extra costs.

Immediate Past-President's Report – (Phil Banks presented for Kassim Al-Khatib)
An electronic copy of the Immediate Past President's Report is on file at the WSWS website.

Kassim received 7 names of retirees two of which will be recognized/honored at the reception. As CAST President, Kassim is in Washington D.C. this week for the CAST meeting. Phil will conduct the recognition.

Member-at-Large (Public Sector) - Carol Mallory-Smith
No formal report was given.

Member-at-Large (Private Sector) - Jeff Koscelny
An electronic copy of the Member-at-Large Report is on file at the WSWS website.

WSSA Representative Report - Vanelle Peterson
An electronic copy of the WSSA Representative Report is on file at the WSWS website.

Vanelle specifically mentioned the following: a WSSA member access to 3 years Weed Science /Weed Technology papers on JSTOR is now available; the WSSA Public Awareness Committee is asking for draft press releases. *Dan Ball told the Board about the letter he sent in support of hiring a weed scientist into the USDA-ARS position formerly filled by Ernest Delfosse. The new Herbicide Handbook format was discussed.* Vanelle reminded the Board that her "replacement" would be needed at the end of the February 2009 WSSA meeting.

CAST Representative Report - Phil Stahlman
An electronic copy of the CAST Representative Report is on file at the WSWS website.

Phil S. said that a hilite last year was the 35th anniversary of CAST in Ames, IA, the "birthplace" of CAST. Phil S. mentioned that the tone of papers has been changing e.g. run-off from turfgrass, biofuels. A way to provide greater visibility to CAST and make resources available to students is just getting started. Phil S. reminded us to come to him with any ideas, needs, etc. He will be leaving this WSWS meeting early to attend the CAST meeting. Phil S. hopes that future CAST meetings will not again conflict with the annual WSWS meeting date.

Constitution and By-Laws Representative Report - Kai Umeda
An electronic copy of the Constitution and By-Laws Representative Report is on file at the WSWS website.

Kai gave a hardcopy of the WSWS Constitution and by-laws revisions which will be voted on by the general membership at the March 13th breakfast business meeting.

Local Arrangements Committee - Nelroy Jackson
An electronic copy of the Program Committee Report is on file at the WSWS website.

Nominations – (Vint Hicks for Kassim Al-Khatib)
An electronic copy of the Nominations Committee Report is on file at the WSWS website.

The Board talked about how voting online has been easy on our website thanks to Tony. Tony was asked if he could give access to information online about the Board member candidates and award nominees before voting and he said yes. Phil reminded us that approximately 30 people do not access WSWS by website (roughly 8% of the membership). Tony suggested asking at the Breakfast meeting what people prefer – online or paper ballot voting.

Fellows and Honorary Members – (Rod Lym for Kassim Al-Khatib)
An electronic copy of the Fellows and Honorary Members Committee Report is on file at the WSWS website.

Phil B. gave the names of the Fellows and Honorary Members for 2008. Phil S. said that the nominees were outstanding.

Awards – (Ron Crockett for Roland Schirman)
An electronic copy of the Award Program Committee Report is on file at the WSWS website.

Ron named the 2008 award recipients.

Poster Committee – (Dan Ball for David Belles)
An electronic copy of the Poster Committee Report is on file at the WSWS website.

Dan told the Board that there will be 6 graduate and 4 undergraduate posters presented at the meeting this year.

Student Paper Contest – (Dan Ball for Jim Harbour)
An electronic copy of the Student Paper Committee Report is on file at the WSWS website.

Dan told the Board that there will be 16 papers presented at the meeting this year.

Sustaining Membership – (Jeff Tichota for Kassim Al-Khatib)
An electronic copy of the Poster Committee Report is on file at the WSWS website.

The only recommendation from the committee is to continue policy that only Sustaining Members may participate in "What's New in Industry" session. *Board members had questions about writing the policy into the operating guide. Dan said he asked Doug Ryerson to organize the "What's New in Industry" and neither knew that participation in this session was to be confined to Sustaining members, only. Discussion ensued about the Sustaining Member Committee giving the Program Chair a list of who's eligible.*

Necrology – (Phil Stahlman for Brad Hanson)
An electronic copy of the Necrology Committee Report is on file at the WSWS website.

Brad Hanson will give the report and obituaries at the business meeting.

Public Relations - (Mike Edwards for Brad Hanson)
An electronic copy of the Public Relations Committee Report is on file at the WSWS website.

Mike said that not included in the formal report is the continuing effort by the committee to create/include a WSWS brochure to help promote the meeting and the WSWS. Mike felt that early 4th quarter would be the best time to have the brochure available. He said that the one created last year was very good. *Bill C. thought that it would be good to invite the Capital Press, a PNW ag newspaper, to report about the meeting. Other popular press outlets also were mentioned by Board members.*

Kai said that one thing expanded upon in the Operations Guideline was to get news to State/Federal venues and publications. The guidelines used to just state "Extension." There was discussion about how and what to include in press releases. Bill C. suggested that the awardees provide information about their own local newspaper/press outlets. Lee mentioned how he has a "Google Group" for legislative information and that maybe the same could be used for WSWS PR. Vanelle asked the Board if our and the WSSA's Public Relations committee could be linked more closely. Members agreed that it is of value to us as weed scientists to get more awareness of our issues. Tony said that WSWS is looking outside to get more authors, etc. Mike said he would mention these ideas to the WSSA Public Relations committee.

Education – (**ad Hoc)** - **Distance Education** (Mike Edwards for Tracy Sterling)
An electronic copy of the Education Adhoc Distance Education Committee Report is on file at the WSWS website.

Mike reported that the online course taught be Bill Dyer, Scott Nissen, and Tracy Sterling as a shared, graduate-level Herbicide Physiology course (PSPP 546 Herbicide Physiology) via Distance Education from Montana State University in Fall 2006 and 2007 has been successful. A recommendation was made by the ad hoc committee to change the Operations Guideline to include the Distance Education subgroup as part of the formal standing committee but the Board was reminded that there was no formal Education Committee. Carol said that the group would be asked to submit a proposal to have a standing Education Committee.

Legislative - (Vanelle Peterson for Case Medlin)
No formal report was given.

Lee VanWychen, Director of Science Policy (DSP) for the National and Regional Weed Science Societies was present after lunch and mention was made about trying to make a better connection between WSWS and WSSA legislative committees. Lee suggested that the WSWS Legislative Committee Chair should serve for a longer period so that more continuity could be gained. There had been confusion apparently about who was the Chair because of the 2-yr appointment to this committee. This has been cleared up

now, so communications are improved. Kai said that WSWS needs to state that the Legislative Committee Chair is liaison to the Science Policy Committee so the Chair should interact directly/formally with Lee. Lee gave an example of the upcoming "Weeds Across Borders" meeting. He was asked by the Board to determine who WSWS should have attend the meeting. Board members agreed that having a good, active liaison, would help give Lee valuable input. Kai said one of the Legislative Chair's duties is to keep the WSWS President and Board informed, and to also inform general membership about topical issues.

The Board had a discussion as to what needs to be done about this issue. Vanelle said that even though the WSSA Representative is appointed for 3 years to provide continuity, the duties of this position already are great, so asking the WSSA Representative to provide this liaison would maybe not be wise. Vanelle suggested that the WSWS president appoint someone other than the WSSA Representative to be this liaison. Suggestions were made to have a formal WSWS DSP Representative. Lee agreed that this was a good idea. Phil S. said that we need to speak with Case Medlin about this, but that Case is not attending this WSWS annual meeting because of illness. Lee said that every regional society has different policies for liaison to the DSP. Vanelle said that she felt overwhelmed on her first phone conference about legislative issues so continuity between reps/liaison is very important. Kai said that he will work with Case on this issue, Vanelle agreed to help, and Lee said he would give his input.

Herbicide Resistant Plants – (Jeff Koscelny for Steve King)
An electronic copy of the Herbicide Resistant Plants Committee Report is on file at the WSWS website.

A poster about herbicide resistance will be presented at this meeting. Ron Crockett encouraged everyone to visit that poster.

Site Selection – (Ron Crockett for Brian Olson)
An electronic copy of the Site Selection Committee Report is on file at the WSWS website.

Membership Development - Phil Stahlman
No formal report was given. Phil S. volunteered to be the Membership Development Committee Chair at the Summer 2008 Board meeting since no one had been appointed after his term ended.

Student Liaison - Angela Kazmierczak and Todd Gaines
An electronic copy of the Student Liaison Committee Report is on file at the WSWS website.

Todd said he attended the WSSA graduate student meeting where a WSSA grad student contest was discussed. Angela said that the WSWS grad student group wants to come up with a formal election process for the Student Liaison position. She also mentioned that grad student meeting attendance might be improved if one of the sponsored meetings was a luncheon rather than a breakfast meeting. Dan asked Angela and Todd if they would advocate still having two sponsored activities or would rather roll efforts into one. Mike said that he could work with the students about what could be done. A lunch time grad student meeting would have to be held Tuesday since the WSWS awards luncheon is on Wednesday during the meeting week.

Director of Science Policy - Lee Van Wychen
No formal report was given. Lee told the Board more details about the ARS position opening since the ARS Crop Protection and Quarantine program is "customer driven" so they need us, their customers, to give them input. An upcoming workshop will be conducted in Florida to give ARS input on this program. Lee said that anyone interested in attending this workshop should contact him. He said that the Department of Interior does not have a research branch so weed science issues are lumped in with many other interests. Lee said that he as the DSP has been assured that anyone with interest could attend the Florida workshop. *Ron asked the Board if anyone was interested and to ask the general membership if*

they were interested. The last review was in 2000, so Lee said that this workshop is very important. Rick said that ARS needs stakeholder input. Vanelle asked Lee if he knew how many will be attending and was told that the initial invitation list was 50 and Lee feels that if 25 people attend, then the meeting would be considered a success. Lee said that ARS has made assurances that the position would most likely be filled with a multi-disciplined scientist. He said that this would be a great opportunity for weed science and that he could help put together recommendation letters, etc. The position might be advertised this June at the earliest since the description is currently being written. Lee encouraged letter writing to congress and said he would send out some language which could be helpful in those letters.

Education – (ad Hoc) - Noxious Weed Short Course - Celestine Duncan
An electronic copy of the Site Selection Committee Report is on file at the WSWS website. The Board was reminded that the WSWS Noxious Weed Management Short Course will be held this year April 21-24.

Invasive Weeds Awareness Week (NIWAW) - Nelroy Jackson
No formal report was given. Nelroy told that Board that the Ninth Annual National Invasive Weeds Awareness Week (NIWAW 9) held in Washington, D.C. the week of February 24 to February 29, 2008 was a success and included events such as exhibits/posters on view and a Kid's Day at the U.S. Botanical Garden and meetings with USDA, EPA, Department of Interior, and the U.S. Army Corp of Engineers.

Special Symposium Committee (ad Hoc) - April Fletcher
April gave a hard copy report to the Board. She asked that an announcement be made at the general session asking people who are interested in helping with special symposia to come forward and give their names to the Board. April said that a preliminary topic of interest discussed for a 2009 meeting symposia is Invasive Grasses. *Dan informed April that earlier today the Board approved a motion to make the Special Symposium Committee a standing committee. Pam read the motion for April. April asked if she could have a copy of the motion to be read to the committee at Tuesday's meeting. Vanelle suggested that Kai attend this meeting if possible to help with developing committee operating guidelines. Dan said that he would attend as well. April emphasized that we should have WSWS member involvement in this committee and future symposia presentations. Phil B. said that he would give April the 2007 symposium expenses information as well as the projected costs for the 2008 symposium.* April thought that the current ad hoc committee has been communicating well with by email but that they could communicate via phone conference in the future.

Publications - Dan Ball
An electronic copy of the Publications Committee Report including the Proceedings, Research Progress Reports, and Newsletter Reports are on file at the WSWS website.

Website and Web Editor- Tony White
An electronic copy of the Website and Web Editor Report is on file at the WSWS website.
Tony reminded the Board that the Committee and Board of Directors Reports for the 2008 WSWS meeting can be seen and/or downloaded from the website.

After Tony presented a hard copy of his report, discussion ensued about having a point person from the Special Symposium Committee communicate with the Board and especially Tony (webmaster) for clarity about whether or not guest speakers would have to register for the symposium and/or WSWS meeting, submit abstracts online, etc. and if they would be given a complementary registration fee. Board members strongly suggested that the Section Chairs should know the status of speaker registration/abstract submission. Mike said that he didn't know when or whether or not the abstracts had been submitted for the 2008 symposium. He felt that the Board didn't need to take formal action but that everyone just needs to figure out the logistics more carefully.

Tony asked if a group would be needed to meet and think about ways to make additional money via the website. *The Board's general consensus was for Tony to go ahead and ask Board members and/or general members to participate in said group.*

Tony asked for feedback on the current design and functionality of the website. He said that we've had the same design for about 3 years. *Vanelle mentioned that during the WSSA board meeting, there was discussion about setting the design to accommodate the wider screens that people are now using. Tony said that he will look into the possibility. Kirk thought that changing the design would not be good because people are used to where everything is located and they would not be able to easily find things such as where/how to submit abstracts and titles. Tony said that changes could be made if website meetings are conducted in the future. The general consensus of the Board was that no complete changes/upgrades were needed, but that Tony could continue to improve the site as needed.*

Old Business
Dan reminded Board that the WSWS supported the Invasive Species of Natural Areas conference in Missoula since a motion, second, and unanimous vote via Board of Director email was made to contribute $2000 for this meeting. Dan received a thank-you letter from Celestine Duncan for the monetary support.

New Business:

Al Hamil and the International Weed Science Society (IWSS) request for support of the 2008 International Weed Science Congress. The congress is being held in Vancouver B.C. on June 23-26th. *Dan Ball started a discussion about the request for support with some meeting costs Al had provided. Carol is on the organizing committee and said that they are asking all regional societies for support. Kirk asked if the reason for soliciting support was that there were no corporate sponsorships. Carol said that no, but a lot of international participation was hoped for including people from developing countries, so funding will be a challenge. Carol said that they had approximately 700 abstracts and that the WSSA will provide $10K for student travel from developing countries. A student presentation contest will be held. Phil reminded the Board that we are the only regional society to have a members directly involved in this meeting. Carol thought that perhaps we could share the cost of a break with another Regional Society = $8K total. The Board decided to table the discussion until the Thursday lunch meeting and to try to find out if there could be an opportunity to share cost with other regions. Board members volunteered to contact other society members before the Thursday lunch meeting.*

MOTION: Dan Ball moved and Carol seconded to table this discussion and action until the Thursday luncheon meeting. **The motion passed unanimously**.

South Dakota request to become an official state member of WSWS. Ron Crockett gave the Board members a copy of a letter from South Dakota State University requesting they become an official member of the WSWS. Comments were made that with all the member states in the WSWS, annual meetings may not take place in every possible location. The general consensus was that having an annual meeting in a state is not the reason why a state wanted to become a WSWS member state.

MOTION: Vanelle made a motion that the Board invite South Dakota to become a WSWS member. Dan Ball seconded. *Discussion ensued about whether or not this should be voted on by the general membership*. A friendly amendment was made and accepted by Vanelle, who originated the initial motion, to give notice to the general membership at the General Session Tuesday that South Dakota has requested to be made an official WSWS member, and that a vote by the general membership would be called for at the Breakfast meeting Thursday. **The motion passed unanimously**.

MOTION: A motion to adjourn was made, seconded, and ***unanimously approved to adjourn***.

Respectfully submitted – Pamela J.S. Hutchinson WSWS Executive Board Secretary – June 9, 2008.

WSWS Annual Business Meeting
Thursday, March 13, 2008
Hyatt Regency Orange County, Anaheim, CA
Garden 1-3, North Tower

Call to Order – President Ron Crockett

Approval of Minutes – Pamela Hutchinson, Secretary
Pam reported that the Board members are reviewing the minutes from the summer business meeting and those minutes will be approved at the Board lunch meeting today if possible or by email.

Treasurer-Business Manager Report – Phil Banks
Phil thanked the hotel management for the good job they've done for us at this meeting and also thanked his employees who helped run the registration desk. Phil let the members know that the Board of Directors renewed his contract. WSWS has an inventory of Weeds of the West but may be reprinting sometime this year. Phil invited the members to come by the registration desk with any questions about the WSWS finances. He also told them that the Business Manager and Site Selection Committee will be coordinating hotel contacts and contract negations in the future. Phil talked about the Proceedings and Research Report archive from 1938 to now has been/is being scanned and that a search system will be set up eventually on the WSWS website for members.

Program Committee Report – Dan Ball
Dan thanked the paper and poster presenters and authors and said it was a real help to get the paper .ppt files submitted to Rick Boydston and also thanked Tony White for getting all Titel and Abstract submission done online. As far as he knew we didn't any glitches. Dan asked the members for suggestions to improve and reminded them that Jesse Richardson, President Elect, is the Program Chair for 2009. Dan thanked Nelroy Jackson for local arrangements and Jim Harbour and Dave Belles Paper and Poster Committee Chairs for their hard work. Presentations at the 2008 meeting totaled 56 posters, 89 volunteer oral papers, 35 invited papers for symposium, and 5 invited general session presentations for a total oral presentation count of 129.

Local Arrangements – Nelroy Jackson
Nelroy thanked the hotel management staff and thanked the members for attending this meeting. Nelroy mentioned the National Invasive Weeds Awareness Week (NIWAW) held each year in Washington D.C.

Immediate Past-President's Report – (Phil Banks for Kassim Al-Khatib)
Kassim could not attend WSWS meetings this year because he was performing his President duties at the annual CAST meeting. Phil reported that although he had hosted the Monday Past President's reception, Kassim made all the arrangements.

Member-at-Large Report (Public Sector) –Carol Mallory-Smith
Carol invited members to contact her with concerns and issue she can take to the Board. She told the members that there was no specific special project this year. Carol reminded the members that Jeff Koscelny terms as Member-at-Large Private Sector ended this year and Phil Munger is the new representative. Carol mentioned the 2008 International Weed Science Congress is being held in

Vancouver B.C. June 23-27, 2008 and that since the meeting is held only every 4 years, WSWS members should take the opportunity to attend.

WSSA Representative Report – Vanelle Peterson
Vanelle mentioned the 2009 joint WSSA and Southern Weed Science Society Conference in Orlando, Florida February 9-12th, Society for Range Management meetings in Albequerque in 2008 and Denver in 2009. She told the WSWS members that WSSA members could now access 3 years of Weed Science /Weed Technology papers on JSTOR. Vanelle also mentioned the new Invasive Plant Science and Management journal and WSWS members could receive all 4 of the 2008 issues free. Vanelle asked for help increasing public awareness about weeds by contributing one page press releases to the WSSA Public Awareness Committee. She reminded the members that the 9th edition of the Herbicide Handbook had been published.

CAST Representative Report – (Don Morishita for Phil Stahlman)
Don told the members about the 35th anniversary of Council for Ag Science and Technology (CAST) held this past year in Ames, IA and talked about Issue Papers which have come out recently relative to Weed Science which can be viewed on the cast website,
http://www.cast-science.org/.

Constitution and Operating Procedures Report – Kai Umeda
Kai called himself the "Guard Dog" of the WSWS and told the members that the updated Board position guidelines are now posted on the WSWS web site. Also on the web site are other updated position descriptions such as the ones for the WSWS Business Manager. Kai told the members that he had worked with Student Liaisons Committee members to develop wording for Constitution / By-laws and Operating Guide for Student Liaisons and with Tony White for the Website Editor wording.

Director of Science Policy – Lee Van Wychen
Lee talked about how his position is a true opportunity for him and anyone who holds it in the future. The WSSA Board has secured funds for a DSP intern, Kevin Barry, who was currently sitting in on a House appropriations subcommittee meeting.

<u>Committee Reports</u>:
Poster Section – David Belles
David reported that 4 undergraduate and 6 graduate student posters were presented this year. New poster materials had been purchased and the boards and easels will be stored in AZ for next year's meeting

Finance – Phil Munger
Phil reported that both the Business Manager and Finance Committee operated within guidelines and that WSWS investments current at of 39% Bonds 61% stocks had returns better than the S&P. Phil told the members the Board had given approval to the Finance Committee and WSWS investment advisor to adjust investments if necessary and that they could take a much more conservative approach if needed.

Nominations – Vint Hicks
Vint thanked his committee and said WSWS had an excellent slate of candidates. Out of 456 ballots sent, 150 were returned. The new Officers are Jesse Richardson, President-elect; Ian Burke, Secretary; Research Section and Education and Regulatory Section Chair-elect, Ed Peachy and Pat Clay, respectively.

Fellows and Honorary Members – Rod Lym
Rod clarified for the members that all nominees each year can be from either the Public or Private sector, not one from each sector every year. He asked the members to please continue nominating for this award.

Awards – Roland Schirman
Roland reminded the members that the award winners this year were the following: Outstanding Weed Scientist (Public), Bob Wilson; Outstanding Weed Scientist (Private), Leo Charvet; Outstanding Weed Scientist - Early Career Pat Clay; Weed Manager, Lars Baker; Professional Staff, Delores Howlett.

Proceedings – Joan Campbell
Joan told the members that in 2007, 250 copies printed and shipped for a cost of $3,585. She asked for all 2008 reports to be submitted for publication in a timely manner.

Research Progress Reports – Traci Rauch
The most recent Report was 175 pages long and 150 copies were printed. Of these, 100 were sent to the Anaheim meeting site and the remainder to the Business Manager for a cost of $2100. Traci also mentioned that 82 reports were submitted which is 6 more than last year.

Web Site and Web Manager – Tony White
Tony thanked everyone for following the online directions for submission and voting. He'll continue to look at different things to improve the site. He has investigated a payment system other than PayPal in order to cut the costs and since Corporate Cards don't always function well on the PayPal site. However, PayPal is currently the best pay site available. Tony is forming a small group to look into selling other things on the web site and asked that anyone interested please contact him.

Newsletter – Cheryl Fiore
Members were reminded that April 1st is the deadline for next newsletter.

Site Selection – Brian Olson
Brian told the members about outgoing and incoming committee members and that the 2010 and 2011 meetings will be held in Hawaii and Spokane, respectively.

Education – (ad Hoc) - Distance Education – (Scott Nissen for Tracy Sterling)
Scott told the members that many online lessons developed in part by several members of the Western Society of Weed Science, are available through the Plant and Soil Sciences eLibrary and University of Nebraska websites,
http://plantandsoil.unl.edu/croptechnology2005/pages/index.jsp http://croptechnology.unl.edu/
or a links on the WSWS web site.

Scott reminded the members of the online, 14-week graduate level mode of action course, Herbicide Physiology (PSPP 546 Herbicide Physiology) offered every Fall semester via Distance Education from Montana State University and said that the 2006 and 2007 class registration had been 8 to 9 students per semester. Scott said that WSWS members could get information about the class on the WSWS website (Education link and in the posted Committee report).

Education – (ad Hoc) - Noxious Weed Short Course – Celestine Duncan
Celestine reminded the members that the Course is financed by the course registration fees. The 2008 instructors include: Dr. Rod Lym, Dr.Scott Nissen, Dr. Steve Dewey, Dr. Jim Jacobs, and Celestine Duncan representing the Western Society of Weed Science. Gary Adams and Larry Skillestad, USDA APHIS, Mary Mayer USDA, ARS, Melissa Brown, consultant, will also assist with the course. The 2008 course is already filled.

Public Relations – Brad Hanson

POST 2007 and PRE 2008 press releases for the meetings were sent to print, radio, and electronic media contacts. There was a communication breakdown with Idaho and Nevada so no pesticide reregistration credits from them this year.

Legislative – Case Medlin
No report

Sustaining Members – Jeff Tichota
Jeff told the members that there are 19 total Sustaining Members this year including the 3 new members. He thanked the Sustaining Members for their contributions.

Necrology – Brad Hanson
Brad read the obituaries for our lost collegues: Robert E. Wilson, Bill Furtig, John Wilcut, and W. Orvid Lee. These obituaries are available in the Committee report at the WSWS web site.

Herbicide Resistance Plants – Steve King
Steve told the members about the poster presented at this meeting and mentioned that the number of resistant weed populations reported from a state seems to be a function of how many weed scientists are located in that state, so he thought that if the number of weed scientists was reduced, then the resistant weed population numbers also would be reduced.

Membership Development – Phil Stahlman
No report

Student Liaison – Angela Kazmierczak
No report. Melissa Bridges, Colorado State University and Ryan Edwards, University of Northern Colorado are the new Student Liaisons.

Poster and Paper Contest – Jim Harbour
Jim told the members that during this meeting, 7 students competed in the oral presentation Agronomic and Horticultural Crops sections and 9 students competed in the Range & Forest and Basic Sciences sections for a total of 16 graduate oral papers. Ten posters were entered in the contest - 6 graduate and 4 undergraduate. He then announced the following student contest winners:
Undergraduate Poster - Jessica Ebler, New Mexico State University
Graduate poster - 1st place Jordana LaFantasie, University of Wyoming; 2nd place Randall Stephens, Washington State University
Oral Papers (Weeds of Agronomic Crops and Horticultural Crops) – 1st Place Lydia Clayton, University of Idaho; 2nd Place Dilpreet Riar, Washington State University
Oral Papers (Weeds of Range and Forest and Basic Sciences) - 1st Place Amy Blair Colorado State University; 2nd Place Travis Almquist, North Dakota State University; 3rd Place Jordana LaFantasie, University of Wyoming

Old Business
WSWS membership was notified on February 14, 2008 of two (2) ballot issues on which they would need to vote at this March business meeting:
1) Add as non-voting members to the WSWS Board of Directors the two student liaisons, a Chairperson and Chair-elect, representing the students of WSWS.
2) Add as a non-voting member to the WSWS Board of Directors the WSWS Web Editor.

Discussion ensued and questions were asked about the voting Executive Board of Directors and the members were told that there are nine: Three officers - President, President-elect, and Secretary; the

Research and Education and Regulatory Section Chairs, both Member-at-Large Representatives, the WSSA Representative, and the Immediate Past-President.

Members were reminded that the Web Editor is appointed by the President and the WSWS graduate students elect the two Student Liaisons. Because these are appointed, not elected positions, that is the reason why the members have been asked to approve them as non-voting Board members. Some members pointed out that the Member-at-Large and WSSA Representatives were also appointed, yet they are voting Board members.

The question was called. The issues were **approved by a majority vote.**

New Business
MOTION: Ron Crockett moved that South Dakota become a member state. The motion was seconded and it was then **passed unanimously.**
Ron Crockett conducted a straw poll about online voting in the future with no mail/fax ballots and the agreement was unanimous.

Passing of Gavel
Ron Crockett officially passed the gavel to the incoming President, Dan Ball after which Dan presented a plaque to Ron and thanked him for doing a great job as the WSWS President this year.

MOTION: It was moved and seconded to adjourn the meeting and **the motion passed unanimously.**

Thursday Post-meeting Board Meeting
March 13, 2008

Approval of Summer 2007 BOD Minutes
Some mistakes in the summer minutes. They will be approved by email after review.
Banks felt that the business arrangement with his company and some fall email votes need to be added.

MOTION: A motion was made by Carol Mallory-Smiths to accept however corrections need to be submitted via email in one week. Kirk Howatt seconds. **Motion passed unanimously.**

Program Committee Report – Dan Ball
Report the same as the morning breakfast meeting. Next year, the section chair will receive the presentations instead of the program chair. An email should be generated to ensure that the presenters know where to send their presentations.

2008 Local Arrangements Committee Report (Anaheim) – Nelroy Jackson
Report the same as the morning breakfast meeting. Three lists of things that need to be accomplished for the meeting at Albuquerque.

Vanelle Peterson reported on an incident where a presenter showed up with a presentation late and caused the session to be 15 minutes behind.

2009 Local Arrangements Committee Report (Albuquerque) – Keith Duncan
Facility appears to be set up well. It's an Embassy Suites, so they provide breakfast. We have a $20,000 food and beverage contract.

Summer Board Meeting will be held July 25 and 26 by vote.
Summer Board Meeting will meet in the afternoon on the 25th and the morning of the 26th.

Rooms are not complimentary – there will be a reduced rate of $99. Each member will be allowed a $500 reimbursement through the WSWS. Reservations are to be made by each board member. (505) 245-7100 for reservations.

WSWS Summer Business Meeting – Albuquerque, NM
Symposium questions.
Reprint Weeds of the West – financial questions.

New business
Tony White plans to have a base platform available to vote online at the Summer Board meeting for feedback. Option should be available for a paper ballot.

MOTION: Kirk Howatt made a motion that electronic voting be implemented. Carol Mallory-Smith seconded. **Motion passed unanimously.**
Dan Ball raised the issue: Does the WSWS want to support the IWSS?
The SWSS and the NCWSS will not be supporting the IWSS funding requests. Dan Ball suggests supporting a half a break ($4000). Kirk restates the position of Carol Mallory-Smith that they are in our region and asks if APMS may provide support? Carol Mallory-Smith asked what are we saving our money for? Nelroy also supports giving money.

MOTION: Kirk Howatt moves that the WSWS makes a $4000 donation to the IWSS Congress.
Carol Mallory-Smith seconds. **Motion passed unanimously.**

Jointed Goatgrass Symposium
All day symposium in Hawaii in 2010. Dan Ball notes that half day will probably be more appropriate. $5000 support offered from the JGI. Jesse expresses support for the symposium. Would work well with an all-day invasive grass symposium. Whatever happens, the whole process needs to be streamlined with an operating guide.

Dan Ball had a conversation about why there is no longer a head-table at the morning breakfast meeting. At one of the functions outgoing and incoming board members need to introduced. Phil Banks will probably arrange photographs. Dan Ball will make arrangements for head-table at next meeting.

Dan Ball brings up letter about letter about refilling Dell Foss's position. Those that are filling the position asked for names of qualified individuals for Dell Foss's position. It is important that a proactive weed scientist in that position. Nelroy Jackson strongly emphasizes our responsibility to do so. Names suggested: Rod Hedberg, John Brack, Rich Banono.

Vanelle Peterson suggests Tim Miller as the replacement WSSA representative on the Board.

Carol Mallory-Smith raised the issue of when the jointed goatgrass group met. She would like to see the WERA 77 meeting reinstated. That group would like to meet Monday afternoon from 1-5 instead of the more traditional time the jointed goatgrass group has met (Sunday all day). She requests the board approve the Monday afternoon WERA-77 meeting. Phil Banks notes that room blocking should take the extra people into account should they arrive on Sunday. No formal action needed.

Carol Mallory-Smith was asked to communicate with Alex Ogg on the Jointed Goatgrass symposium.

Student Organization Update (Ryan Evans)
Informally met to discuss how develop the organization. There is a question of how the SO will interact with the WSWS. Students could have a lunch instead of a breakfast. There are two different companies that support the two student breakfasts, they may be interested in funding one lunch. We need to talk with Mike Edwards (Sustaining Members). Dan Ball states that the lunch will have to be on Tuesday. Ryan Evans suggests a mixer after the Monday formal receptions.

Graduate night out was poorly attended. The sign up sheet needs to be passed around when it is announced at the general session.

Graduate function room shouldn't be a problem. Carol Mallory-Smith raised the issue of liability with alcohol at functions.

Respectfully submitted, Ian C. Burke, WSWS Executive Board of Directors Secretary – June 10, 2008.

Western Society of Weed Science Financial Report
April 1, 2007 through March 31, 2008
Annual Report

CAPITAL

2006-2007 Balance Forward	$311,044.20
Current Income (loss) for 2006-2007	69,678.59
	$380,722.79

DISTRIBUTION OF CAPITAL

RBC Dain Rauscher Funds	$213,757.67
Money Market (Bank of the West)	71,198.89
Checking (Bank of the West)	43,620.67
Certificate of Deposit (Bank of the West)	52,145.56
	$380,722.79

WSWS Financial Report – April 1, 2007 through March 31, 2008

INCOME

Registration & Membership Dues (includes Proceeding and Research Progress Report income)	$ 66,603.31
Noxious Weed Control Short Course	19,689.30
Weeds of the West	61,277.31
Bio Control of Invasive Weeds book	1,425.65
California Weeds Books	2,559.01
Bank interest & Investment income	7,376.86
2007 Sustaining Membership Dues	6,200.00
Jointed Goatgrass Symposium Deposit	5,000.00
Misc. Income	674.21
	$ 170,805.65

EXPENSES

Annual Meeting Expenses (includes cost of Proceedings, Research Progress Report, & programs printing and mailing)	34,320.92
Website (Host Fees)	360.00
Tax Accountant	374.94
Liability Insurance	500.00
CAST Membership Dues (2007)	643.00
CAST Representative Travel	899.92
WSSA Director of Science Policy	15,000.00
Service Contract for business management	19,500.00
Noxious Weed Control Short Course	17,158.82
Missoula County Invasive Species Shortcourse	1,000.00
Newsletters (printing and postage)	1,018.35
Travel to meeting for editors, student rep, and speakers for Knotweed Symposium.	3,279.83
Website transaction fee	972.00
Book handling charges	735.00
Misc. Expenses	544.06
California Weeds Book fee	4,451.14
Weeds of the West	369.08
	$ 101,127.06

WSWS 2007 Fellow

Dr. Rick Boydston

Agronomist -USDA-ARS, Prosser, WA

Dr. Rick Boydston is a native of Nebraska and grew up in several small towns including Weeping Water and Walthill and graduated from Loup City. He received a BS in Agronomy from the University of Nebraska, an MS in Plant Physiology, and a Ph.D. in Weed Science both from the University of Illinois. Rick first attended WSWS in 1986 and became very active in the Society. He was on the Executive Board as Member at Large in 2001, served on the Finance Committee (twice), and was the Research Section Chair in 1994-1995 and is currently the Chair-elect for a second time. He has also chaired several WSWS sections including Teaching and Technology Transfer, Weeds in Horticultural Crops, and the Physiology and Chemical Studies section.

Rick began his career as a Plant Physiologist at the USDA Irrigated Agriculture Research and Extension Center in Prosser, WA in 1985 where he has remained except for 2 years when he was an agronomist for a private firm in Washington. He has cooperated with several scientists in the Pacific Northwest and Midwestern states on various research projects which has resulted in 51 refereed journals and extension publications, four book chapters, and numerous extension bulletins. He has authored 24 papers and posters presented at the WSWS annual meeting.

Dr. Boydston's research responsibilities include weed control in potatoes, mint, and associated rotational crops. Results of his innovative research program includes: fall planted rapeseed and white mustard to suppress weeds in potato, a program that has been adopted on over 25,000 acres and increasing; development of improved volunteer potato management methods in onion and corn which can save over $200/A in control costs; and research that led to the registration of seven herbicides in mint.

Rick became an Honorary Member of the Washington State Weed Association in 1997 and received the IR-4 Meritorious Service Award in 1994. He has twice awarded Friend of the Industry from the Washington Mint Growers Association. As stated in one of his supporting letters "I have always been pleasantly surprised by Rick's massive volume of extension work since he is an ARS scientist....'he' goes above and beyond the call of duty by his involvement with potato growers and agricultural professions." As a scientist, scholar, and teacher the WSWS is pleased to present Rick Boydston as a Fellow in the Society.

WSWS 2007 Fellow

Dr. K. George Beck

Professor - Colorado State University

Dr. George Beck is a native of Sepulveda, CA located in the San Fernado Valley. George received a BS and MS in Animal Science and a PhD in Plant Science all from the University of Idaho. George has been a member of WSWS for 24 years. He has served the Society as Member at Large, was elected to Chair of Project 1- Weeds of Range and Forest (twice) and was Research Section Chair for 2002-2003. George has published 28 papers in the WSWS Proceedings and 103 in the Research Progress Report. George has served on numerous committees including the Intermountain Noxious Weed Advisory, Resolutions (twice), Poster, and Legislative (Chair) Committees. Dr. Beck received the WSWS Outstanding Weed Scientist award in 2000.

Dr. Beck is most known nationally for is efforts in securing passage of the Federal Noxious Weed Law beginning in 1987 and continuing through the 1990's. During this time, George worked many hours in writing letters, making calls, and frequently visiting Washington DC to meet with Legislatures and their aids. "For many years, he has effectively worked and with legislative committees on state and Federal noxious weed legislation, which has resulted in the proactive management of noxious weeds in Colorado, the West, and the Nation."

George serves on the Invasive Species Advisory Committee which is composed of eight members of the President's Cabinet and representatives from the EPA and USAID. This has allowed Dr. Beck to make additional advances concerning a variety of invasive species issues at the international, national, and state levels.

George has also been an effective teacher, training 10 MS and 5 PhD students as well as serving on committees of many others. He has served as an instructor for the WSWS Noxious Weed Course on three occasions. George has served this society and others for many years as indicated by receiving the Lifetime Achievement Award from both the Colorado Weed Management Association and the North American Weed Management Association.

Dr. K. George Beck is dedicated to weed science endeavors and is a man of integrity, honesty, and good humor. His many achievements and contributions to weed science in general and the WSWS in particular make him extremely qualified to become a Fellow of the Western Society of Weed Science.

WSWS Honorary Member

Dr. Robert Zemetra

Professor - University of Idaho

Dr. Robert Zemetra is a native of Northridge, CA and graduated from Granada Hills High School. He received a BS degree from the University of California-Davis in Plant Science and a MS and Ph.D. degree in Agronomy from Colorado State University. In graduate school he specialized in maize and revegetation species breeding and then went to the University of Nebraska as a Post-Doctoral Research Associate in wheat genetics and cytogenetics. In 1984 he joined the faculty at the University of Idaho in plant breeding and genetics.

Dr. Zemetra has contributed to the knowledge base and understanding of jointed goatgrass genetics and its hybridization with wheat. His knowledge in the area of jointed goatgrass has led to Dr. Zemetra cooperating on many weed related projects. His early work explored the potential for producing hybrids and gene flow between wheat and jointed goatgrass. Later research assessed whether genome placement would make a difference in transmission and retention of a herbicide resistance gene from wheat. Much of this research would not have been initiated or executed without Dr. Zemetra's expertise and willingness to work with weed scientists. His contribution has significantly impacted weed science and weed scientists in the western US.

Although Dr. Zemetra is receiving Honorary Membership, he has attended and participated in numerous WSWS Meetings. He is an author on seven abstracts of papers presented at WSWS meetings and four abstracts of papers presented at Weed Science Society of America meetings. In addition, he is an author on 26 other abstracts related to weed science. He has advised four students whose research areas were related to weeds and has served as a committee member for several other weed science graduate students. He is an author on 18 papers related to weed science, six in Weed Science and three in Weed Technology.

Dr. Zemetra received the Award for Excellence in Extension from the Idaho Grain Industry and Grain Producers in 2001, the Outstanding Research Award from the Department of Plant, Soil, and Entomological Sciences at the University of Idaho in 2006, and an Outstanding Service Award from the Idaho Wheat Commission in 2007.

Outstanding Acheivement - Professional Staff Award
Delores Howlett

Lori has been employed as Ag Research Technician since April 1988 at the University of Nebraska Panhandle Research and Extension Center. During this time she has continued to expand her knowledge about weeds and weed control as directed in both field and laboratory research projects. Lori has eagerness to expand her knowledge about new equipment and techniques to use on her job. Within her varied job assignments she has proven ability to teach others how to identify weeds, operate equipment, or collect research data.

Lori cheerfully interacts with weed scientists in the adjoining states of Wyoming, Colorado, Kansas, and also New Mexico on cooperative research and extension projects by collecting, organizing and sending data, plot pictures, treatment information. She is key to the success of many plot tours and workshops in her support role. These behind the scene activities support the smooth transfer of information to producers as well as the exchange of knowledge at the WSWS meetings.

For many years Lori has worked with the IR-4 program for pesticide registration on minor crops. She acts as a quality assurance specialist for projects conducted in Western Nebraska.

In addition to our meetings Lori has also participated in the North Central Weed Science Society and American Society of Sugarbeet Technologists Meetings by presenting posters.

Outstanding Acheivement - Weed Manager Award

John Lars Baker

Lars has been Weed Supervisor in Freemont county Wyoming for over 32 years. He has taken a program that had very limited resources in its early years and expanded it to one that now has sixteen permanent staff and 20 to 25 seasonal workers with a two million dollar annual budget.

He has taken the lead in many areas for on-the-ground weed management and elevated his program to the highest level of excellence using the latest technology and vision. Today, Lars operates a truly integrated systems approach for weed management by utilizing inovative educational and weed control techniques. He is a proponent of a holistic approach that emphasize long-term methods such as using perennial grasses to replace noxious weeds or using bioagents in conjuction with the more traditional chemical weed control methods.

Lars has been a member of WSWS since 1986 and has supported our society through poster presentations and committee involvement.

Outstanding Weed Scientist – Early Career
Pat Clay

This award is being presented to Pat Clay based on his delivery of technology transfer as area Extension agent for central Arizona. The major focus of his research-based extension program as prioritized by clientele was to reduce production costs, cotton variety testing, and pest management – primarily weed control. He collaborated both in Arizona and regionally with extension agents, departmental specialists and researchers, and allied industry representatives to address cross-commodity and interdisciplinary issues.

During Pat's tenure at the University of Arizona he proved himself very capable of servicing a wide clientele base which included everyone from homeowners with questions about their houseplants to large growers with thousands of acres of crops. Those supporting Pats nomination felt that one of Pat's strongest attributes was his ability to wear the many hats necessary for an Area Extension Agent and always represented the University of Arizona well.

Pat also has the distinction of being the founder and organizer of the Arizona Weed Contest and Training Symposium that was a field day he created, developed, and conducted analogous to other regional weed contests for students. The program included weed identification, herbicide injury symptoms, crop diagnostic exercises, and calibration problem solving targeted for training growers and crop consultants.

In addition to his job responsibilities Pat sought the opportunity to serve affiliated professional organizations such as the WSWS, SWSS, and The Beltwide Cotton Conference in various capacities.

Outstanding Weed Scientist – Private Sector
Leo Charvet

Leo Charvet has been employed by BASF for the past 32 years. During this time he has held several positions within BASF including stints in Market Development, Field Development, Technical Service, and is currently Field Biology manager.

Those who have had the opportunity to work with Leo quickly appreciate his dedication and integrity as well as his understanding of farming systems (both crops and pastures) when evaluating his company products and how they best fit in the marketplace. He has been involved in innovations in varied geographical areas, under dryland and irrigated conditions, and with both no-till and conventional tillage systems.

One example of Leo's effectiveness was the success of one day short course he developed on weed identification and resistance management for Dealers and Applicators in Minnesota and South Dakota. Attendance grew from 250 at four locations the first year to more than 800 at 12 locations in the fourth year the short course was offered. The success of this short course led to Leo being invited to serve on the Board of Directors of a No-Till Center at Watertown, SD.

Those supporting his nomination were impressed with his versatility, his inquisitive nature, acute observation, and attention to detail, his common-sense approach to problem solving, and his professionalism. They cited his innate ability to identify and assess research problems that are important to the discipline of weed science and are at the same time relevant to producers.

Outstanding Weed Scientist – Public Sector
Robert G. Wilson

Dr. Wilson has been employed by the University of Nebraska at the Panhandle Research and Extension Center since May of 1975. His appointment in the Department of Agronomy and Horticulture involves a 50/50 research and extension split. Dr. Wilson has the responsibility for developing integrated weed control systems in irrigated crops and rangelands in Western Nebraska. In this appointment he has directed a well funded research program and disseminated information instrumental in helping producers remain competitive as well as bringing a new value-added industry to Nebraska. Those supporting his nomination cited his ability to compile many years of basic and applied research into easy to understand publications for the end user.

Throughout his career he has collaborated with scientists from other disciplines and institutions to increase profitability of Nebraska producers.

An example of his recognized stature as a weed scientist was being awarded The WSSA Outstanding Extension worker in 2006.

Bob has been active in the North Central Weed Conference since 1971 presenting 57 papers at 29 annual meetings. He began attending the WSSA in 1975 and since that time has attended and presented 15 papers at 11 annual meetings. His attendance at our meetings began in 1994 and since that time has attended and presented 19 papers at 9 annual meetings. He has also been a presenter at several international conferences.

First place award winners in graduate student contest: Lydia Clayton (Oral), Amy Blair (Oral), and Jordana LaFantasie (Poster), left to right.

Second place award winners in graduate student contest: Randall Stephens (Poster), Travis Almquist (Oral), and Dilpreet Riar (Oral), left to right.

First place award winner in undergraduate student poster contest: Jessica Ebler (left)
Third place award winner in graduate student oral contest: Jordana LaFantasie

Executive Board Members

NECROLOGY

William R. (Bill) Furtick, was born in Salina, Kansas, on January 8, 1927 and died on May 16, 2007, at age 80 after a lengthy illness.

He graduated from Kansas State University in 1949, and received his M.S. and Ph.D. degrees from Oregon State University in 1952 and 1958. He was professor of weed science at Oregon State and in the late 1960s, he conceived of, established, and became director of the International Plant Protection Center at Oregon State University. In late 1971, he left OSU to join the United Nations in setting up an Agricultural Research Center in Taiwan. His next assignment was as director of the Plant Protection Division of the Food and Agriculture Organization of the United Nations in Rome. At the University of Hawaii he served as Dean of Agriculture, then moved to USAID in Washington, D.C., where he served as Agency Director for Food and Agriculture in the Bureau for Science and Technology. He lived in and developed programs in Cairo, Egypt; Amman, Jordan; and Tbilisi, Georgia. During his career, he worked in or visited all but five countries in the world. Bill served as President and Fellow of both the Weed Science Society of America and the Western Society of Weed Science. He was guest of honor at the eighth annual British Weed Control Conference in Brighton, England; and gave the invitational address in the National Research Council, National Academy of Science. The Association of Western Agricultural Experiment Directors awarded the title of Director Emeritus to him in recognition of his leadership, dedication, and outstanding service to agricultural research in the Western Region and the United States.

One of his favorite activities was the training of graduate students, at which he excelled. His continual optimism and exuberance kept his group excited and eager to explore new developments in the weed science field. He was energetic, innovative, and ambitious to develop new programs. A common comment within his group was, “Bill has more ideas before breakfast than anyone else has in a year”. He was most active in weed control in the 1950s and 1960s when many crops lacked satisfactory methods of selective weed control. He was a master at evaluating one set of field trials and using those observations to design new approaches with other crops and weeds which resulted in many new practices in Oregon’s multitude of crops.

Bill was a “mover and shaker” in the weed control field and made things happen wherever he was located. His enthusiasm and ideas will be missed.

W. Orvid Lee, was born in Brigham City, Utah, on July 2, 1927, and passed away at his home in Corvallis, Oregon, on April 2, 2007, at age 79.

He received his B.S. degree in 1950 and M.S. degree in 1954 from Utah State University. He joined USDA-ARS as a research agronomist during that time and worked with F.L. Timmons at Utah State. He transferred to the University of Wyoming and continued research on a variety of weed situations, including control of dodder, perennial weeds, and aquatic weeds. In 1956, Orvid was appointed to head up a new USDA project in Corvallis, Oregon, for controlling weeds in grass and legume seed crops. He completed the PhD degree from Oregon State University under Bill Furtick in 1965 and spent the remainder of his professional career at Corvallis until his retirement in 1984. Orvid’s work led to the introduction or refinement of many weed control methods in seed crops in the Pacific Northwest. This included, for example, diuron for perennial grasses and red clover, atrazine and simazine for perennial grasses, pronamide for legumes, ethofumesate for ryegrass, and many more. He developed two major procedures for the establishment of grass-seed crops that are still widely used today. One was the refinement of the use of paraquat or glyphosate in chemical seedbed preparation. The other was the application of a carbon band at seeding to allow application of diuron for selective weed control.

Orvid was highly respected and revered by the seed growers of the Pacific Northwest, and widely admired by fellow professionals. Growers recognized and appreciated that his work made possible the production of high-quality seed, making the Pacific Northwest one of the leading seed-producing areas of the world. He was a quiet and humble man, a productive scientist who had a significant impact on the agriculture of the area.

John William Wilcut, 52, passed away August 24, 2007 at his home after a valiant battle with adrenal cancer. He is survived by his wife, Cathy and children Jared and Caitlyn, and his three siblings.

John was born in Farmington, MO and grew up in Missouri and Illinois. He was an avid St. Louis Cardinal fan. He received his BS and MS degrees at Eastern Illinois University and earned his Ph.D in Weed Science at Auburn University where the Auburn Tigers were added to his list of favorite teams. Early in his career, John worked at research stations at Virginia Tech University and The University of Georgia. His desire to be on a main campus to teach and work with students led him to North Carolina State University, where he was a Professor in the Crop Science Department. He dedicated his life to being a mentor to other weed scientists and helping farmers find weed control solutions to maximize crop yields. He was nationally and internationally recognized for his contributions to Agriculture and Weed Science, but his greatest satisfaction came from working with students as they embarked on their careers. John's mentoring gave him many more "sons and daughters" beyond his family.

John was strongly devoted to his family, and his first priority was to take care of each of them in the best way he could. He was a thoughtful, romantic man who cherished his wife and children. His impact was profound and he will be sorely missed.

Robert (Bob) Edward Wilson, 59, died suddenly at his home, Feb. 16, 2008. Bob was born June 15, 1948 in Elko, NV, the eldest son of Ernest and Juanita Wilson. Bob is survived by his wife of 32 years, Ida, his two sons Brandon and Eric, his mother and seven siblings.

Bob served as a member of the U.S Navy Seabees from 1967 to 1970 and was stationed in Cam Ranh Bay, Vietnam. He was honorably discharged from the Naval Reserves in 1973 after receiving the National Defense Service Medal, the Vietnam Service Medal, and the Vietnam Campaign Medal. Following his discharge, Bob attended the University of Nevada Reno where he earned his B.S. degree in Agriculture Economics and M.S. degree in Agronomy and Plant Science.

Bob worked as an agronomist throughout his life, most recently as an Associate Professor for the University of Nevada. His university extension program was based in Ely, NV and centered in White Pine County Nevada. At the time of his death, Bob was serving as President of the Nevada chapter of the Society of Range Managers. Bob's agricultural research positions took him many places in the US and around the world including Switzerland, Central Europe, and Turkmenistan.

Although his illustrious career brought numerous accolades and awards commemorating his accomplishments, Bob felt that he had barely begun to contribute to the field of agriculture and rangeland management. He was a source if infinite strength and wisdom for his family, friends, and all with whom he came in contact. Bob will be sorely missed.

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1976	Dick Beeler
1978	Dale W. Bohmont
1982	R. Phillip Upchurch
1983	Virgil H. Freed
1984	Warren C. Shaw
1987	Norman B. Akesson
1988	Logan A. Norris
1989	Gary A. Lee
1990	Earl Spurrier
1992	Bruce Ames
1993	Jerry Caulder
1994	Will D. Carpenter
1995	K. James Fornstrom
1997	F. Dan Hess
2001	Darrell Hanavan
2002	Senator Larry Craig-Idaho
2003	Roy Nishimoto
2004	Doug Schmale
2006	Wanda Graves
2007	Rob Hedberg

WSWS FELLOWS

1968	Robert B. Balcom	1989	John O. Evans
	Walter S. Ball		W.B. “Jim” McHenry
	Alden S. Crafts	1990	Harry S. Agamalian
	F.L. Timmons		Bart A. Brinkman
	D.C. Tingey	1991	Larry W. Mitich
1969	Lambert C. Erickson		Edward E. Schweizer
	Jesse M. Hodgson	1992	Donald C. Thill
1970	Lee M. Burge		Harold M. Kempen
	Bruce Thornton	1993	Paul J. Ogg
1971	Virgil H. Freed		Peter K. Fay
	W.A. Harvey	1994	Sheldon E. Blank
1972	H. Fred Arle		Gus J. Foster
	Boysie E. Day	1995	Stephen D. Miller
1973	Harold P. Alley		John T. Schlesselman
	K.C. Hamilton	1996	Don Colbert
1974	William R. Furtick		Robert Parker
	Oliver A. Leonard	1997	Steven A. Dewey
1975	Richard A. Fosse		Mike Newton
	Clarence I. Seely	1998	Doug K. Ryerson
1976	Arnold P. Appleby		Tom D. Whitson
1977	J. LaMar Anderson	1999	Charlotte V. Eberlein
	Arthur H. Lange		John E. Orr
1978	David E. Bayer	2000	Rodney G. Lym
	Kenneth W. Dunster		Frank L. Young
1979	Louis A. Jensen	2001	Barbra Mullin
	Gary A. Lee		Jill Schroeder
1980	W.L. Anliker	2002	Jeff Tichota
1981	P. Eugene Heikes		Philip Westra
	J. Wayne Whitworth	2003	Vanelle Carrithers
			Carol Mallory-Smith
1982	Bert L. Bohmont	2004	Don Morishita
	Lowell S. Jordan		Phil Banks
1983	Richard D. Comes	2005	Nelroy Jackson
	Clyde L. Elmore		Roland Shirman
1984	Larry C. Burrill	2006	Joan Campbell
			Celestine Duncan
1985	L.E. “Jack” Warren	2007	Bill Cobb
			Phil Stahlman
1986	Dwight V. Peabody		
	Robert L. Zimdahl		
1987	Alex G. Ogg, Jr.		
	Jean H. Dawson		
1988	Harvey D. Tripple		
	E. Stan Heathman		

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