## Western Society of Weed Science Annual Meeting 2021

Proceedings of the Western Society of Weed Science Volume 74

Online 1 - 4 March 2021

**Editor:** 

**Carl Libbey** 

ISBN: 978-1-7138-3441-0

## Printed from e-media with permission by:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571



Some format issues inherent in the e-media version may also appear in this print version.

Copyright  $\ \bigcirc \ (2021)$  by Western Society of Weed Science All rights reserved.

Printed with permission by Curran Associates, Inc. (2021)

For permission requests, please contact Western Society of Weed Science at the address below.

Western Society of Weed Science 12011 Tejon Street, Ste. 700 Westminster, CO 80234 USA

Phone: 303-327-8016

info@wsweedscience.org

## Additional copies of this publication are available from:

Curran Associates, Inc. 57 Morehouse Lane Red Hook, NY 12571 USA Phone: 845-758-0400

Fax: 845-758-2633

Email: curran@proceedings.com Web: www.proceedings.com

GENERAL SESSION	1
WSWS/WAPMS 2021 Virtual Meeting Welcome	1
WSWS Presidential Address	1
WAPMS Presidential Address	5
Western Wildfires: USDA Forest Service-Fire Year 2020 and the Path Forward	6
POSTER SESSION	7
Aquatics	7
Evaluating Potential Algaecides for Algae Management in California Rice	7
Simulated Mechanical Control of Flowering Rush ( <i>Butomus umbellatus</i> ) Under Mesoco Conditions	
Education and Regulatory	8
2020 Survey Results for the Most Common and Troublesome Weeds in Grass Crops, Pasture and Turf	8
WSWS Project 1. Weeds of Range, Forest, and Natural Areas	9
Effects of Indaziflam Treatment on Seed Bank Density and Richness in a Sagebrush- grassland Plant Community in Sublette County, WY US	9
Cheatgrass Seed Bank Densities Following Imazapic and Indaziflam Treatments	9
Integrating Seeding with Indaziflam: Evaluating Establishment of Grasses, Forbs, and Shrubs	. 10
Indaziflam Effects on Native Plants: General Hazard Analysis and Application to North-Colorado Front Range.	
African Mustard Response to Treatment Over Time	. 11
Control of Russian Knapweed by Aminopyralid, Clopyralid, and Quinclorac Delayed by Insufficient Precipitation.	,
WSWS Project 2. Weeds of Horticultural Crops	. 12
Bicyclpyrone Use Patterns in Minor Crops.	12
Humulus lupulus Response to Tiafenacil and Tolpiralate	. 13
Tree and Vine Crop Sensitivity to Florpyrauxifen-benzyl in California	
Efficacy and Safety of Topramezone for the Control of Summer Grass Weeds in Turf.	. 14
WSWS Project 3. Weeds of Agronomic Crops	. 14
Resistance Fighter: Local Partnerships Drive Better Herbicide Recommendations	. 15
Weed Suppression Versus Water Use: Can Cover Crops be Sustainable in Water Limited Agroecosystems?	
Palmer Amaranth Interference and Seed Production in Dry Edible Bean	. 16
Sulfosulfuron for Control of Roughstalk Bluegrass in Kentucky Bluegrass Seed Crops	
iv	

	Lactofen Efficacy as Affected by Increased Temperature in PPO-Inhibitor-Resistant and Susceptible Palmer Amaranth ( <i>Amaranthus palmeri</i> )	
	Metabolism of Fluroxypyr in Fluroxypyr-ALS Resistant Kochia from Eastern Colorado	18
	CoAXium Wheat Variety Tolerance to Quizalofop in the Southern Great Plains	18
	Evaluation of ALS- and ACCase- Inhibiting Herbicides for Green Foxtail Control	18
	State of Herbicide-Resistant Palmer Amaranth in Kansas	19
	Amaranthus palmeri Interference in Sugar Beet	20
	Population Dynamics of Weedy Rice ( <i>Oryza sativa</i> f. <i>spontanea</i> ) in a California Rice Fie	
	Kochia Control with Dichlorprop-P	
	Oat Tolerance to Soil- and Postemergence-Applied Herbicides	
	Organic Weed Management of Creeping Perennials Field Bindweed and Canada Thistle.	
	Genetic Architecture of Flowering Time Traits in <i>Bromus tectorum</i> of the Pacific	
	Northwest.	23
	Gibberellic Acid as a Prospective Management Tool for Italian Ryegrass and Downy Bro in Eastern Washington	
	Control of Mayweed Chamomile in Winter Pea with Bentazon Plus Acifluorfen	24
	Cutleaf Vipergrass: An Emerging Threat to Alfalfa Production and Rangeland	24
V	VSWS Project 4. Teaching and Technology Transfer	24
	Methods of Accounting for Sensor Uncertainty in Research and Decision-making	24
	Novel Methods to Teach Difficult Pest Control Concepts in Classroom and Extension Environments	25
V	VSWS Project 5. Basic Biology and Ecology	26
	Constructing a Synthetic EPSPS Copy Number Variation System to Assess Fitness and Glyphosate Resistance	26
	Evaluating Phytohormone Response to Glyphosate Treatment in Rapid Response Giant	
	Ragweed	26
	Microbial Diversity in Response to Solarization	27
WE	ESTERN AQUATIC PLANT MANAGEMENT SOCIETY: AQUATICS	27
	The Phenology of Flowering Rush (Butomus umbellatus) in the Western United States	27
	Sequential Years Spraying to Reduce Flowering Rush Rhizomes	28
	Selection and Application of PRE/POST-Emergent Herbicides for Western Irrigation Systems: Environmental Impacts on Both Sides of the Equation	28
	IPM In Aquatic, Natural Areas and Rights of Way	29
	Endothall Development and Stewardship in Irrigation Canals	29

	California's Hydrilla Eradication Program: Challenges, Successes, and Future Directions.	30
	Soft Sediment Reduction Using MD Pellets and MuckBiotics	30
	Estimating Lyngbya wollei Biomass Using Non-Destructive Echosounding Measures	30
	The Aquatic Plant Management Society Update	31
	Aquatic Ecosystem Restoration Foundation Update	31
	Women of Aquatics Update	31
	The First Year of Operational Use of Florpyrauxifen-benzy Herbicide in the Pacific Northwest, Observations and Results	31
	Chemical-Free Algae Mitigation with Air Nanobubbles.	31
	The Role of the Southwestern Aquatic Applicator	32
	Endothall Translocation in Three <i>Hydrocharitaceae</i> Species	32
	Why Herbicides Fail	33
	Evaluation of Unmanned Aerial Vehicles for Weed Mapping and Site Specific Weed Management	33
	From Bench Scale Trials to Field Cyanobacterial Management with PAA+ Peroxide	33
	Preventative Submersed Aquatic Weed Control Utilizing a Preemergence Use Pattern of Fluridone	34
	What to Look for in Water Quality When Managing and Learning About Ecosystem-Specific Algal Blooms	34
	Do Cyanbacteria Spill Their Guts When Treated with an Algaecide?	34
	The Threat of Cyanbacteria and Cyanotoxins	35
	Effect of Herbicides on Sprouting Curlyleaf Pondweed Turions	35
WS	SWS PROJECT 1: WEEDS OF RANGE, FOREST, AND NATURAL AREAS	36
	Indaziflam Injury to Root Systems of Non-target Perennial Grasses	36
	Restoring Cheatgrass Invaded Rangelands with Indaziflam Decreases Wildfire Risk and Improves Wildlife Browse and Habitat.	36
	Four Years After Application: Medusahead Control with Indaziflam in North Eastern California	37
	Spring Application of Aminopyralid Reduced Germination of Medusahead and Ventenata	a. 38
	Noxious, Invasive and Non-Crop Weed Control with Florpyrauxifen-benzyl + Aminopyralid: Western Species Research Update	39
	Removal of Invasive Scotch Broom Imparts Negative Legacy Effects to Soil and Plant Communities	39
	Evaluating Reclamation Methods of Rangeland from Invasive Annual Grasses	40

	Abiotic and Biotic Factors Associated with <i>Ventenata dubia</i> in Montana	40
	The Effectiveness of Traditional and Novel Management Strategies on Ventenata and Cheatgrass	41
	Effects of Ventenata Control on Northern Mixed Prairie Ecosystem Goods and Services Two Years Posttreatment.	41
	Priority Effects or Rapid Growth Rates: What Helps Cool-season Bunchgrasses Compete with Invasive Grasses.	
	Sagebrush Steppe Plant Community Response and Annual Grass Control After Aerial and Ground Application of Indaziflam and Imazapic.	
	Does Seeding Depth Affect Native Species Establishment in the Presence of Indaziflam?	. 43
	Considerations of Life Cycle in Invasive Mustard Management	43
	Understanding Auxin Herbicides for Aquatic Plant Management	44
	Selective Control of Flowering Rush in Mesocosms and Field Sites	44
WS	SWS PROJECT 2: WEEDS OF HORTICULTURAL CROPS	45
	Canada Thistle and Hop Response to Clopyralid Applied with a Sponge Wiper	45
	Response of Direct-Seeded Onion and Weed Control with Bicyclopyrone Plus Bromoxyn Premix	
	Pendimethalin Application Methods in Onion	46
	Intelligent Weed Management in California Lettuce Production	46
	Florpyrauxifen-benzyl for Orchard Floor Weed Management in Tree Nuts	47
	My Experience Using Video Recordings of Potato Research Trial Plot "Walk-Throughs" Virtual Weed Control Tours: the Good, the Not Too Bad, and the Definitely Not Ugly	
	Mustard Cover Crop for Early Season Weed Control in Chile Pepper	48
WS	SWS PROJECT 3: WEEDS OF AGRONOMIC CROPS	48
	Sequential PRE/POST Application Timing of Dimethenamid-P to Control ALS-Inhibitor Resistant Palmer Amaranth in Dry Edible Bean.	
	Effect of Winter Wheat Cover Crop Termination Time on Dry Bean Production	49
	Hemp Canopy Light Interception and Injury with Pre-Emergence Herbicides	49
	Metribuzin Tolerance of Southern Great Plains Winter Wheat Varieties	50
	Tillage System Impact on Efficacy of Delayed Preemergence Herbicides in Winter Whea	t. 50
	Effect of Planting Date Window and Herbicide Selection on Rescuegrass ( <i>Bromus catharticus</i> ) Management in Winter Wheat.	
	Metabolic Resistance to PPO-inhibitors in a Six-way-resistant Palmer Amaranth Populati	

	Fall-Established Cover Crop Tolerance to Soybean Herbicides	52
	Picking on the Panicle - a New Management Timing Opportunity for Wild Oat ( <i>Avena fatua</i> )	52
	Precision vs. Uniform Spraying for Broadleaf Weed Control	53
	Influence of Sodium on Glyphosate Performance and Interaction with AMS Adjuvants	53
	Tame Mustard and Buckwheat Response to Various Herbicides	54
	Rush Skeletonweed ( <i>Chondrilla juncea</i> ) Control in Winter Wheat Fallow	55
	Control of Multiple Herbicide-Resistant Kochia in Fallow	55
	Distribution of Herbicide-Resistant Kochia in Southcentral Great Plains	56
	Investigation of Herbicide Resistance in Palmer Amaranth ( <i>Amaranthus palmeri</i> ) Introduce Through Sunflower Screenings.	eć 57
	Sequential Applications of Metamitron for Control of Palmer Amaranth and Kochia in Sugarbeet	58
	Banded Cover Crop Termination to Reduce Negative Impacts on Sugarbeet	59
WS	SWS PROJECT 4: TEACHING AND TECHNOLOGY TRANSFER 5	59
	Herbicide Diversity Calculator: Interactive Web App That Estimates the Risk of Herbicide Resistance.	59
	The International Weed Genomics Consortium: A Resource for Weed Genomics 6	5(
	Assessment of Light Activated Sensor Controlled Spray Technology in Eastern Washington Fallow Systems	
WS	SWS PROJECT 5: BASIC BIOLOGY AND ECOLOGY	51
	Genetic Mapping of Dicamba Resistance in Bassia scoparia	51
	Utilizing Thermal Time to Assist in Scheduling Management Practices to Control Weedy Rice ( <i>Oryza sativa spontanea</i> ) in California Rice Cropping Systems	51
	Enhanced Metabolism of 2,4-D in 2,4-D Resistant Palmer Amaranth Population from Kansas	52
	Isolation of Acetyl-CoA Carboxylase to Compare Specific Activity and Enzyme-Level Quizalofop Resistance of CoAXium® and Non-CoAXium® Wheat	53
	Using a New Reference Genome to Investigate the Genetic Architecture of Flowering Time Traits in <i>Bromus tectorum</i>	
	Integrating Grazing, Herbicide, and Seeding to Diversify Crested Wheatgrass Monoculture	
	Exploring the Constituitive Shade Avoidance Response in <i>Beta vulgaris</i>	54
	Russian Thistle Genomics to Help Understand "Tumbleweeds"	54
SV	MPOSIUM 1: Annual Invasive Grass Management	55

	"Invasive Annual Grass Challenge: Stepping it Down for a Path Forward"	65
	Bio-pesticides for Exotic Annual Grasses: Review of Evidence for Effectiveness of Weed suppressive Bacteria.	
	Managing Rangelands for Outcomes.	65
	Changing the Tide by Targeting the Seed Bank and Preserving In-tact Perennial Systems.	66
	Putting it All Together: Putting Tools into Landscape Context	66
	Sublette County Invasive Species Taskforce: Countywide Cheatgrass Program	66
	Ventenata and Medusahead in Northeast Wyoming	67
	Invasive Annual Grass Management in Utah - Ventanata	67
	Colorado Front Range Invasive Annual Grass Management Successes	68
	Collaborative Invasive Grass Projects from the Federal Level in Colorado and Nevada	68
	MPOSIUM 2: Are Herbicide-Resistant Crops the Solution to Herbicide-Resistant eds?	69
*****		69
	•	69
	Herbicide Resistant Crops: Friend or Foe in the Canadian Prairies?	
	PNW Herbicide Resistant Crops: Any Role in Resistance Management?	
	Role of Herbicide-Resistant Crops for Controlling Herbicide-Resistant Weeds in the Great Plains.	ıt
	MPOSIUM 3: Updates from Weed Biocontrol-An Unsung Component of Integrated ed Management on Land and in Water	
	Biological Control of Invasive Weeds: Ensuring Safety Through the Regulatory Process	72
	Western Weed Biocontrol Collaboration: Using Low Tech Tools to Pool Resources and Amplify Understanding and Impact.	72
	Monitoring Weed Biocontrol with the Standardized Impact Monitoring Protocol (SIMP)	72
	New Online Weed Biocontrol Tools iBiocontrol, SIMP Survey 1 2 3, SIIPA, Apps	73
	The Knotweed Psyllid: A New Tool to Combat Knotweeds in Riparian Zones	73
	What Seven Sequential Years of Spring Dry Ground Applications of Imazapyr and Imazamox to Deplete the Rhizomes of Flowering Rush Has Taught Us About the Need to Continue Biocontrol Development for Flowering Rush	
	Prospects for Classical Weed Biocontrol to Address Expanding Populations of Flowering Rush	74
	Where We Stand After 20 Years of Tamarisk Biological Control	75
	Managing Post-Fire Landscape Scale Toadflax Infestations Using Biocontrol and/or	-
	Herbicide	75

target Impact in MT, WA, and ID	
Inundative Biological Control Releases for Leafy Spurge Management: The Bureau Management's Experience Using Biocontrol Along with Additional Options in an Int Weed Management Approach.	tegrated
Canada Thistle Rust, a New Tool to Address a Persistent Foe	76
Russian Knapweed Biological Control Success with Host Specific Wasps and Midge	s 77
A Newly Approved Biological Control Agent for Yellow Starthistle: The Rosette We Ceratapion basicorne.	
Classical Biological Control of Invasive Annual Grasses in the Intermountain West	78
DISCUSSION SESSIONS	79
Project 1 Discussion Session: Pasture, Range, Forest, Rights of Ways, Wildland	nd, and
Aquatic Invasive Plants	79
Project 2 Discussion Session: Weeds of Horticultural Crops	81
Project 3 Discussion Session: Weeds of Agronomic Crops	82
Project 4 Discussion Session: Teaching and Technology Transfer	84
Project 5 Discussion Session: Basic Biology and Ecology	86
WESTERN SOCIETY OF WEED SCIENCE NET WORTH REPORT	88
WESTERN SOCIETY OF WEED SCIENCE CASH FLOW REPORT	89
WSWS 2021 FELLOW AWARDS	90
Carl Libbey - Fellow Public Sector, Washington State University	90
Charlie Hicks - Fellow Private Sector, Bayer Crop Science	91
WSWS 2021 HONORARY MEMBER	92
Michael Walsh	92
WSWS 2021 OUTSTANDING WEED SCIENTIST AWARDS	93
Nevin Lawrence	93
Prashant Jha	93
WSWS 2021 WEED MANAGER AWARD	94
WSWS 2021 PROFESSIONAL STAFF AWARD	94
WSWS 2021 PRESIDENTIAL AWARD OF MERIT	95
Elizabeth Mosqueda	95
WSWS 2021 ELENA SANCHEZ MEMORIAL STUDENT SCHOLARSHIP	
RECIPIENTS	96
WSWS 2021 RITA BEARD ENDOWMENT STUDENT SCHOLARSHIP	96

WSWS 2021 STUDENT PAPER AND POSTER AWARDS	97
WSWS 2021 ANNUAL MEETING NECROLOGY REPORT	99
James (Jim) Gray (1959–2019)	99
Travis Bean (1977-2020)	99
E. Stanley Heathman (1927-2020)	100
WSWS 2021 ANNUAL MEETING RETIREES REPORT	101
WSWS & WAPMS 2021 ANNUAL MEETING ATTENDEES	102
WSWS & WAPMS 2021 ANNUAL MEETING – AUTHOR INDEX	109
WSWS & WAPMS 2021 ANNUAL MEETING ABSTRACT NUMBER, PAGE NUMBER	ER
INDEX.	115
2021-2022 WSWS STANDING AND AD HOC COMMITTEES	117
2021 WSWS SUSTAINING MEMBERS	118