## Established Perennial Grass Tolerance to Esplanade Applied for Annual Grass Control: Year 2

Beuschlein, J.A., R.J. Zuger, & I.C. Burke

The study was established on a conservation reserve program (CRP) site near Pullman, WA. The objective of the study was to evaluate Esplanade® (indaziflam), Laramie® (rimsulfuron), Lambient® (propoxycarbazone), and Plateau® 2XL (imazapic) for tolerances of desirable perennial grasses in Palouse prairie. Treatments were applied in the spring of 2018, detailed in Table 1 and Table 2. The study was conducted in a randomized complete block design with 4 replications of 8' by 15' long plots. Desirable perennial grass stands will be monitored over the next three to four years.

Weed and perennial grass cover was visually assessed 5 & 17 months after the first treatment timing (MAAT) [4 and 16 months after the second treatment timing (MABT)]. First year biomass was collected on August 28, 2018 for assessment 4 MAAT (3 MABT). Second year biomass was collected on July 19,2019 for assessment 15 MAAT (14 MABT). Biomass was taken using 2-tenth meter squared quadrats randomly thrown in the plot. Cover data was collected using a 4 meter transect separated into 12 points. At each point, plant species were evaluated at a foot off either side and assessed on a presence/absence basis. All data were subjected to an analysis of variance using the statistical package built into the Agricultural Research Manager software system (ARM 8.5.0, Gylling Data Management).

**Table 1.** *Treatment application details* 

Study Application	A	В
Date	4/19/2018	5/22/2018
Application volume (GPA)	20	20
Air temperature (°F)	61	81
Soil temperature (°C)	6	14
Wind velocity (mph, direction)	4 NW	2 N
Cloud cover	0	2

## **Results**

During the first year: Application timing did not have an effect on either perennial grasses or invasive grass species biomass. Perennial grass biomass at was similar among treatments 4 MAAT (Table 2). Bluebunch grass (AGRSP) and smooth brome (BROIN) had uneven populations throughout the trial and were not assessable (Table 2). Treatments did not have any effect on perennial grass cover 4 MAAT (Table 3).

Treatments and application timing did not have an effect ventenata (VETDU) biomass. However, two treatments had limited control. They were Laramie at 3 oz A<sup>-1</sup> (12 g m<sup>-2</sup>) and Esplanade (5 oz A<sup>-1</sup>) + Laramie (3 oz A<sup>-1</sup>) (10 g m<sup>-2</sup>), compared to the nontreated (10g m<sup>-2</sup>) (Table 3). Downy brome (BROTE) was at low and uneven populations and was not assessable. Broadleaves (COMBINED) had no significant difference between treatments (Table 3). Ventenata (VETDU) cover at 5 MAAT was significantly reduced for all treatments (<72%) compared to the nontreated control (100%) (Table 3). Esplanade + Plateau 2L had the least amount of VETDU cover 5 MAAT with 15% cover and Laramie alone had the most VETDU cover of 72% (Table 4).

During the second year: Perennial grass biomass 15 MAAT was not affected by treatment and application timing (Table 5). Treatments and application timing had no effect on the perennial grass cover (Table 4). Cover of the most common grasses, prairie junegrass and sheep's fescue were not affected by the herbicides (Table 6).

For the second-year biomass, at 15 MAAT, there was no difference found for any of the broadleaf species (Table 6). Ventenata was not found during the second year due to indaziflam treatments and perennial grass competition.

**Table 2.** Biomass of Idaho fescue (FESID), blue bunch wheatgrass (AGRSP), slender wheatgrass (AGRTR), prairie junegrass (KOLMA), smooth brome (BROIN), and the combination of all desirable perennial grasses (COMBINED) on August 28, 2018 (4 MAAT, 3 MABT) following application of indaziflam, rimsulfuron, and propoxycarbazone. MAT= months after treatment. Means followed by the same letter are not statistically significantly different ( $\alpha = 0.05$ ).

			YEA	R 1: BIO									
				August 28, 2018 (4 MAAT, 3 MABT)  Desirable Perennial Grasses									
	Application	R	ate	FESID	AGRSP	AGRTR	KOLMA	BROIN	COMBINED				
Treatment	Code	Field rate	lb ai A <sup>-1</sup>				g m <sup>-2</sup> ———						
Nontreated		-	-	4	0	87	99	0	108				
Laramie Induce	A	3 oz/a 0.25% v/v	0.047	7	0	151	1	0	67				
Esplanade Induce	A	3 oz/a 0.25% v/v	0.039	20	28	131	92	1	146				
Esplanade Induce	A	5 oz/a 0.25% v/v	0.065	8	105	186	105	0	155				
Esplanade Induce	A	7 oz/a 0.25% v/v	0.091	18	0	50	72	1	152				
Esplanade Laramie Induce	A	3 oz/a 3 oz/a 0.25% v/v	0.039 0.047	46	73	131	95	1	134				
Esplanade Laramie Induce	A	5 oz/a 3 oz/a 0.25% v/v	0.065 0.047	22	0	64	75	3	84				
Esplanade Laramie Induce	A	7 oz/a 3 oz/a 0.25% v/v	0.091 0.047	18	157	118	140	4	132				
Esplanade Imazamox	A	5 oz/a 5 fl oz/a	0.065 0.039	22	0	71	121	0	143				
Esplanade Induce	В	3 oz/a 0.25% v/v	0.039	13	0	116	128	0	168				
Esplanade Induce	В	5 oz/a 0.25% v/v	0.065	21	0	137	121	4	171				
Esplanade Induce	В	7 oz/a 0.25% v/v	0.091	12	0	177	68	0	176				
Esplanade Lambient Induce	В	3 oz/a 1.2 oz/a 0.25% v/v	0.038 0.053	7	26	97	135	0	163				
Esplanade Plateau 2L Induce	В	5 oz/a 7 fl oz/a 0.25% v/v	0.065 0.109	4	277	293	139	0	171				
Esplanade Imazamox	В	5 oz/a 5 fl oz/a	0.065 0.039	20	0	333	54	1	156				
			LSD (P=0.05)	NS	NS	NS	NS	NS	NS				

**Table 3.** Biomass of ventenata (VETDU), downy brome (BROTE), Canada thistle (CIRAR), and all the broadleaves combined on August 28, 2018 (4 MAAT, 3 MABT) following application of indaziflam, rimsulfuron, and propoxycarbazone. Percent cover of ventenata (VETDU) and desirable perennial grasses on September 25, 2018 (5 MAAT, 4 MABT). Pullman, WA 2018. MAT= months after treatment. Means followed by the same letter are not statistically significantly different ( $\alpha = 0.05$ ).

		-	Au	gust 28, 2018	September 25, 2018 (5 MAAT, 4 MABT)				
				BIO Annual sses	OMASS Bro	padleaves	VETDU	VER Desirable Perennial	
	Appl.	Field	VETDU	BROTE	CIRAR	COMBINED	VEIDO	Grasses	
Treatment	Code	Rate			m <sup>-2</sup>			%	
Nontreated	_	-	10	0	22	22	100 a	100	
Laramie Induce	A	3 oz/a 0.25% v/v	12	0	34	23	72 b	100	
Esplanade Induce	A	3 oz/a 0.25% v/v	2	1	1	1	21 c	100	
Esplanade Induce	A	5 oz/a 0.25% v/v	2	0	10	1	29 с	100	
Esplanade Induce	A	7 oz/a 0.25% v/v	6	0	0	0	25 с	100	
Esplanade Laramie Induce	A	3 oz/a 3 oz/a 0.25% v/v	2	0	26	13	38 c	100	
Esplanade Laramie Induce	A	5 oz/a 3 oz/a 0.25% v/v	10	0	0	0	17 c	100	
Esplanade Laramie Induce	A	7 oz/a 3 oz/a 0.25% v/v	2	0	0	6	23 c	100	
Esplanade Imazamox	A	5 oz/a 5 fl oz/a	3	0	41	16	27 с	100	
Esplanade Induce	В	3 oz/a 0.25% v/v	1	0	0	4	27 с	100	
Esplanade Induce	В	5 oz/a 0.25% v/v	4	0	20	8	15 c	100	
Esplanade Induce	В	7 oz/a 0.25% v/v	3	0	17	4	23 с	100	
Esplanade Lambient Induce	В	3 oz/a 1.2 oz/a 0.25% v/v	3	0	2	27	29 с	100	
Esplanade Plateau 2XL Induce	В	5 oz/a 7 fl oz/a 0.25% v/v	1	0	6	1	15 c	100	
Esplanade Imazamox	В	5 oz/a 5 fl oz/a	2	0	2	0.2	17 c	100	
		LSD (P=.05)	NS	NS	NS	NS	22.7	NS	

**Table 4.** Biomass of Idaho fescue (FESID), bluebunch wheatgrass (AGRSP), slender wheatgrass (AGRTR), prairie junegrass (KOLMA), sheep's fescue (FESOV), intermediate wheatgrass (AGRIT), and a combination of all desirable perennial grasses (COMBINED) on July 19, 2019 (15 MAAT, 14 MABT) following application of indaziflam, rimsulfuron, and propoxycarbazone. MAT= months after treatment. Means followed by the same letter are not statistically significantly different ( $\alpha = 0.05$ ).

				YEAR 2:	BIOMAS	S							
			July 19, 2019 (15 MAAT, 14 MABT)										
			Desirable Perennial Grasses										
	Appl.		FESID	AGRSP	AGRTR	KOLMA	FESOV	AGRIT	COMBINED				
Treatment	Code	Field Rate				g m <sup>-2</sup>							
Nontreated	-	-	0	0	26	9	59	0	137				
Laramie Induce	A	3 oz/a 0.25% v/v	3	22	66	0	11	15	121				
Esplanade Induce	A	3 oz/a 0.25% v/v	3	0	27	14	31	34	149				
Esplanade Induce	A	5 oz/a 0.25% v/v	0	12	0	48	21	19	172				
Esplanade Induce	A	7 oz/a 0.25% v/v	0	34	91	5	8	30	189				
Esplanade Laramie Induce	A	3 oz/a 3 oz/a 0.25% v/v	5	15	46	11	97	1	234				
Esplanade Laramie Induce	A	5 oz/a 3 oz/a 0.25% v/v	0	0	66	14	18	0	116				
Esplanade Laramie Induce	A	7 oz/a 3 oz/a 0.25% v/v	0	16	91	7	48	3	174				
Esplanade Imazamox	A	5 oz/a 5 fl oz/a	4	0	34	13	112	0	233				
Esplanade Induce	В	3 oz/a 0.25% v/v	12	44	77	1	27	3	227				
Esplanade Induce	В	5 oz/a 0.25% v/v	0	43	13	32	39	99	316				
Esplanade Induce	В	7 oz/a 0.25% v/v	0	0	4	11	39	52	182				
Esplanade Lambient Induce	В	3 oz/a 1.2 oz/a 0.25% v/v	3	0	102	27	60	0	242				
Esplanade Plateau 2XL Induce	В	5 oz/a 7 fl oz/a 0.25% v/v	15	0	137	12	0	0	261				
Esplanade Imazamox	В	5 oz/a 5 fl oz/a	12	21	67	6	65	0	260				
		LSD (P=.05)	NS	NS	NS	NS	NS	NS	NS				

**Table 5.** Biomass of Canada thistle (CIRAR), Western salsify (TRODM), prickly lettuce (LACSE), and the combination of all the broadleaves (COMBINED) on July 19, 2019 (15 MAAT, 14 MABT) following application of indaziflam, rimsulfuron, and propoxycarbazone. Pullman, WA 2018. MAT= months after treatment. Means followed by the same letter are not statistically significantly different ( $\alpha = 0.05$ ).

			OMASS for Weedy Species  July 19, 2019 (15 MAAT, 14 MABT)  Broadleaf Weeds						
		_							
	Application	_	CIRAR	TRODM	LACSE	COMBINED			
Treatment	Code	Field Rate		g	m <sup>-2</sup>				
Nontreated	-	_	0	0	0	2			
Laramie		3 oz/a							
Induce	A	0.25% v/v	3	2	0	4			
Esplanade	٨	3 oz/a	0	2	0.1	2			
Induce	A	0.25% v/v	0	2	0.1	2			
Esplanade	A	5 oz/a	11	0	0	4			
Induce	Α	0.25% v/v	11		0	4			
Esplanade	Α	7 oz/a	0	6	0	6			
Induce	Α	0.25% v/v	0	0	0	0			
Esplanade		3 oz/a							
Laramie	A	3 oz/a	2	0	0	1			
Induce		0.25% v/v							
Esplanade		5 oz/a							
Laramie	A	3 oz/a	0	7	0	7			
Induce		0.25% v/v							
Esplanade		7 oz/a							
Laramie	A	3 oz/a	0	5	0	5			
Induce		0.25% v/v							
Esplanade	A	5 oz/a	0	1	0	1			
Imazamox	А	5 fl oz/a	U	1	U	1			
Esplanade	В	3 oz/a	17	2	0	12			
Induce	Б	0.25% v/v	17	2	U	12			
Esplanade	В	5 oz/a	5	3	0	6			
Induce	Б	0.25% v/v	3	3	U	0			
Esplanade	В	7 oz/a	0	0	0	0			
Induce	Б	0.25% v/v	U	U	U	U			
Esplanade		3 oz/a							
Lambient	В	1.2 oz/a	1	3	0	4			
Induce		0.25% v/v							
Esplanade		5 oz/a				<del></del>			
Plateau 2XL	В	7 fl oz/a	3	5	0	6			
Induce		0.25% v/v							
Esplanade		5 oz/a	-	0	0	3			
Imazamox	В	5 fl oz/a	6	U	U	5			
		LSD (P=0.05)	NS	NS	NS	NS			

**Table 6.** Percent cover of Idaho fescue (FESID), bluebunch wheatgrass (AGRSP), slender wheatgrass (AGRTR), prairie junegrass (KOLMA), sheep's fescue (FESOV), and intermediate wheatgrass (AGRIT) on August 28, 2019 (17 MAAT, 16 MABT) following application of indaziflam, rimsulfuron, and propoxycarbazone. MAT= months after treatment. Means followed by the same letter are not statistically significantly different ( $\alpha = 0.05$ ).

			YEA	R 2: COVI	ER					
		_	August 28, 2019 (17 MAAT, 16 MABT)							
		_	Desirable Perennial Grasses							
	Application	_	FESID	AGRSP	AGRTR	KOLMA	FESOV	AGRIT		
Treatment	Code	Field Rate		_		/o	_			
Nontreated	-	-	2	0	25	75	100	0		
Laramie Induce	A	3 oz/a 0.25% v/v	6	8	50	75	75	25		
Esplanade Induce	A	3 oz/a 0.25% v/v	6	0	25	75	75	75		
Esplanade Induce	A	5 oz/a 0.25% v/v	0	25	0	75	100	25		
Esplanade Induce	A	7 oz/a 0.25% v/v	0	8	50	100	100	38		
Esplanade Laramie Induce	A	3 oz/a 3 oz/a 0.25% v/v	6	6	8	100	100	25		
Esplanade Laramie Induce	A	5 oz/a 3 oz/a 0.25% v/v	0	0	69	100	100	25		
Esplanade Laramie Induce	A	7 oz/a 3 oz/a 0.25% v/v	0	6	75	100	100	50		
Esplanade Imazamox	A	5 oz/a 5 fl oz/a	8	0	31	100	100	0		
Esplanade Induce	В	3 oz/a 0.25% v/v	15	6	50	100	100	50		
Esplanade Induce	В	5 oz/a 0.25% v/v	0	6	50	100	100	38		
Esplanade Induce	В	7 oz/a 0.25% v/v	0	0	42	100	100	25		
Esplanade Lambient Induce	В	3 oz/a 1.2 oz/a 0.25% v/v	0	0	50	100	100	0		
Esplanade Plateau 2XL Induce	В	5 oz/a 7 fl oz/a 0.25% v/v	31	0	60	100	100	0		
Esplanade Imazamox	В	5 oz/a 5 fl oz/a	15	0	29	100	100	0		
		LSD (P=0.05)	NS	NS	NS	NS	NS	NS		

Figure 1. Climate from nearest weather station located ~4 miles east of trial site

