

Garlic mustard, a comparison of management options



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Garlic mustard

- seedlings → rosettes
- bolting → flowering plants







Objectives

1. Compare the effectiveness of management options on garlic mustard when applied in the fall or spring
2. Measure the resulting impact of management and timing on other resident plants

Sites

Site	Garlic mustard	Native plants
Door County	Dominant	Remnants of native 
Green Bay	Nearly 100%	Nearly 0% 
La Crosse	Co-dominant	Healthy native understory 



Methods

- Three RCB trials with 3-4 reps
- Common treatments evaluated at four timings
 - **Early fall:** (before frost)
 - **Late fall:** (after several frosts)
 - **Early spring:** (just garlic mustard seedlings are germinating)
 - **Late spring:** (when garlic mustard adults are producing flowerbuds)

Treatments evaluated

Method	Herbicide	Rate
IPT	Glyphosate*	1% product solution
IPT	Glyphosate*	2% product solution
Broadcast	Glyphosate	22 fl oz/A (0.75 lbs ae A ⁻¹)
Broadcast	Metsulfuron	0.25 oz/A (0.15 oz ai A ⁻¹)
Hand-pull	NA	NA
Untreated	NA	NA

*540 g ae L-1 formulation

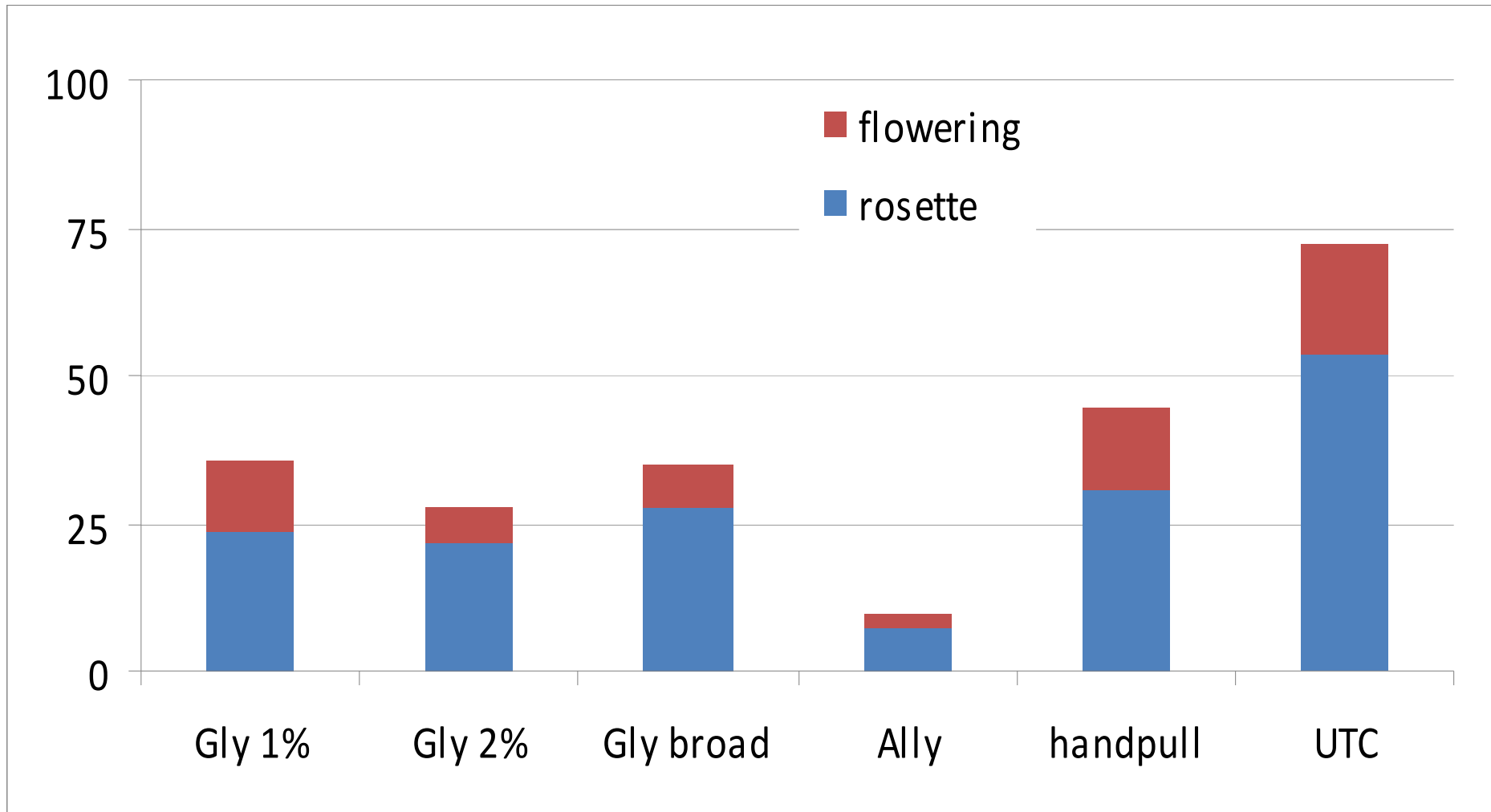
Measurements & Analysis

- Cover of garlic mustard and resident plants was estimated in June in 2009 and 2010 by randomly tossing a 0.125 m² quadrat three times within each plot
- ANOVA for each site separately with SAS PROC GLM for
 - Timing
 - Treatment
 - Interaction of timing and treatment
 - Means separation with LSD ($P < 0.05$)

Garlic mustard cover

Summer after Treatment

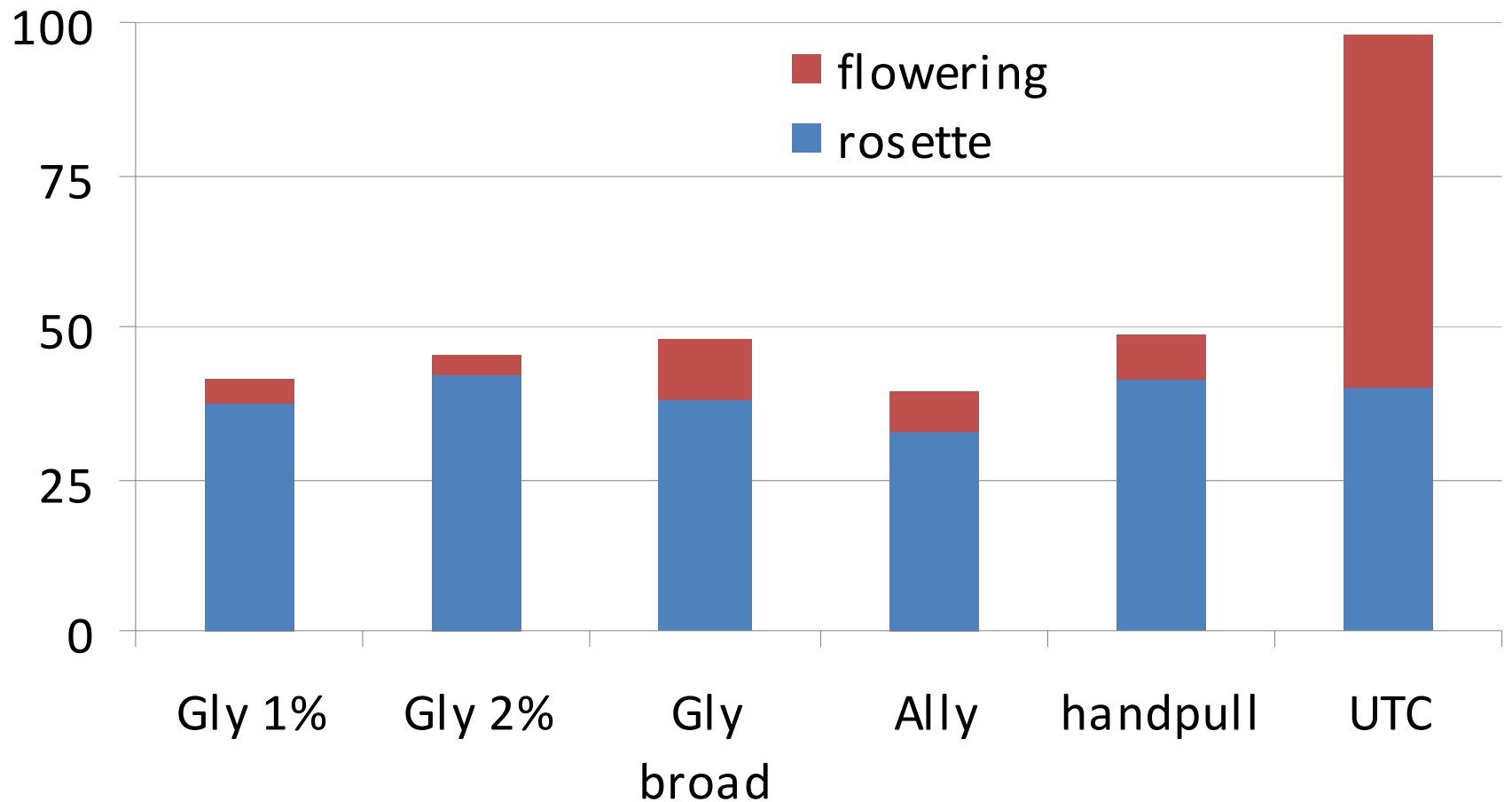
Door County



Garlic mustard cover

Summer after Treatment

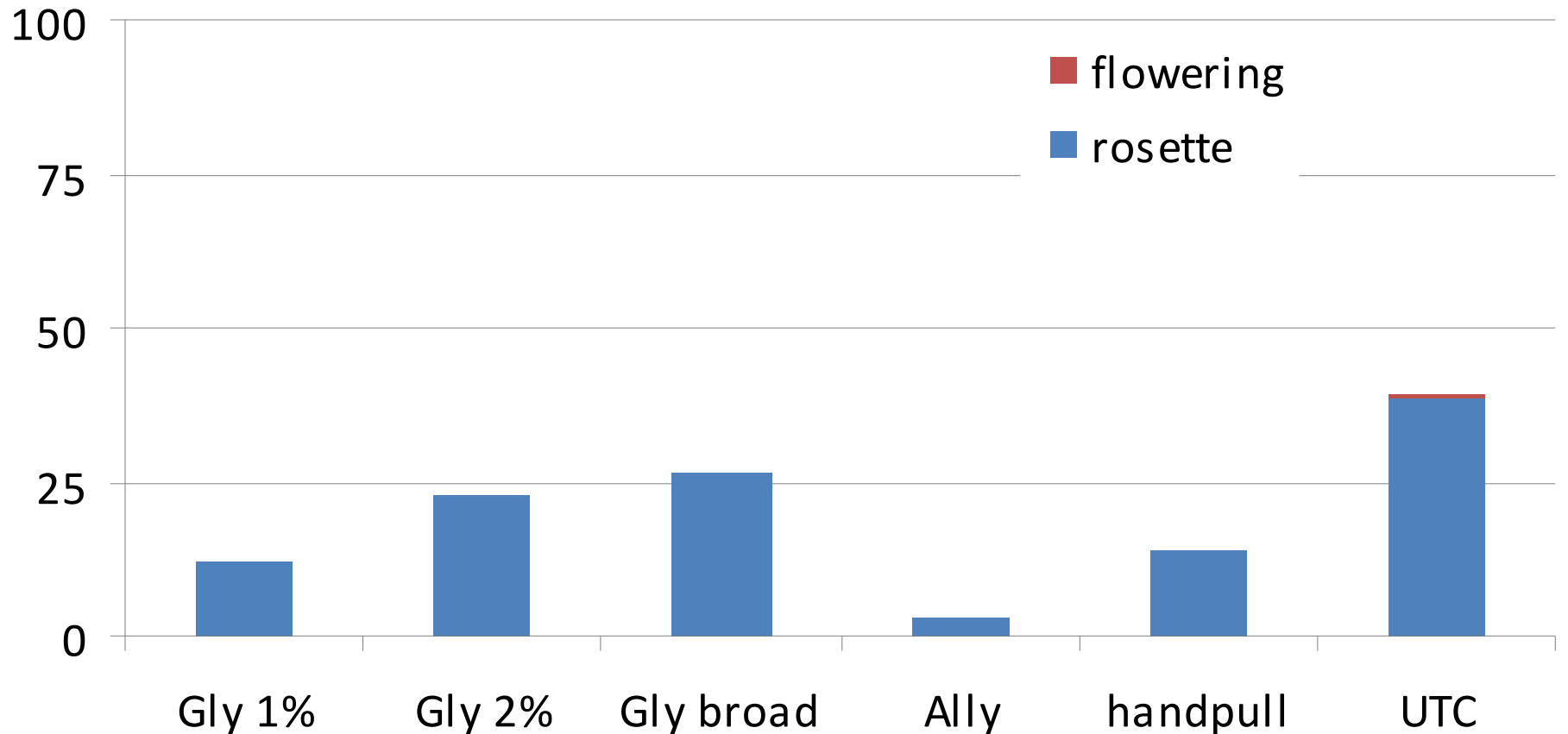
Green bay



Garlic mustard cover

Summer after Treatment

La Crosse

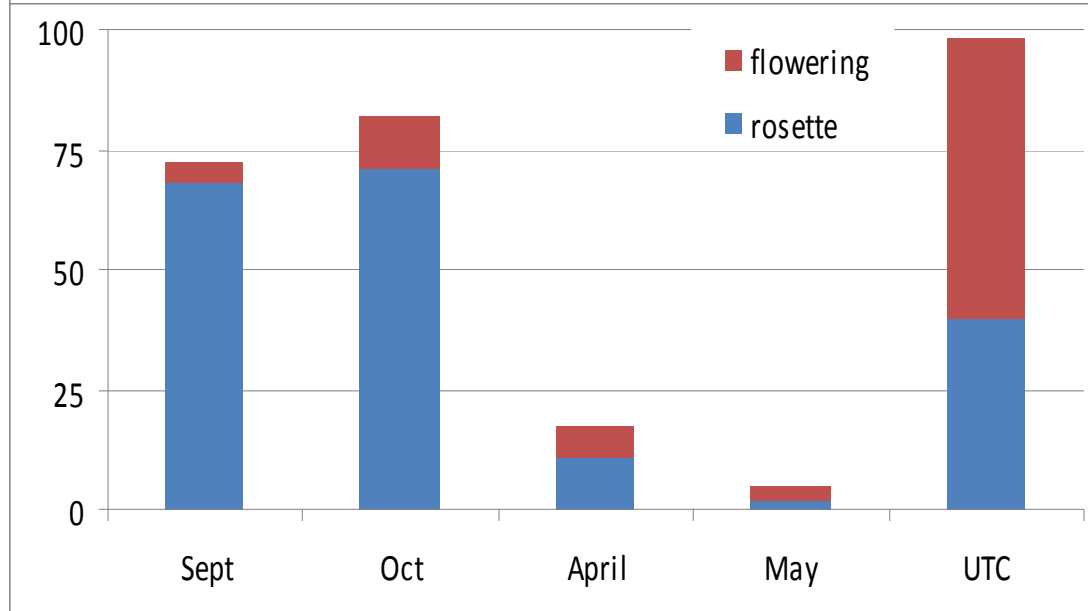
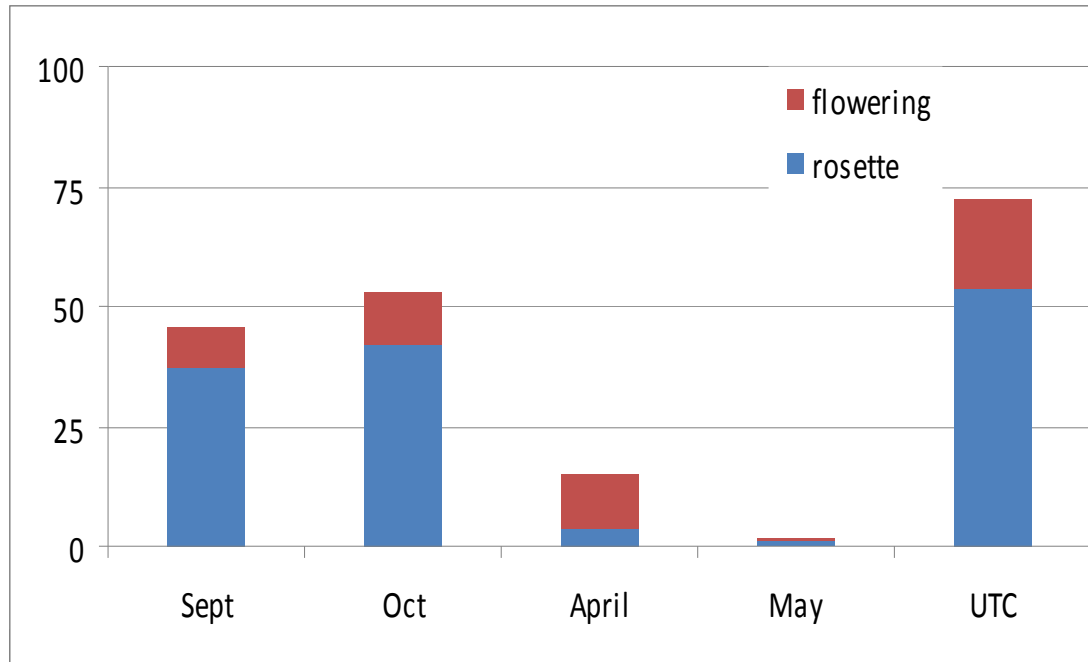


Garlic mustard cover

Summer after treatment

	Green Bay		Door County		Lacrosse	
	rosette	flower	rosette	flower	rosette	flower
Gly 1%	37	4	23	12	12	0
Gly 2%	42	4	22	6	23	0
Gly broad	38	10	27	7	27	0
Ally	32	7	7	3	3	0
Handpull	42	7	31	14	14	0
UTC	40	58	53	19	39	0
Prob	ns	0.06	0.01	0.09	0.03	ns

GM cover summer after trt



Garlic mustard cover

Summer after treatment

timing

	Green Bay		Door County		La Crosse	
	rosette	flower	rosette	flower	rosette	flower
Sept	68 a	4 cd	37 a	9 a	-	-
Oct	71 a	11 b	42 a	11 a	24 a	0
April	11 c	7 bc	4 b	12 a	-	-
May	2 d	3 d	1 b	1 b	6 b	0
UTC	40 b	58 a	53 a	19 a	39 a	0
Prob	<0.01	<0.01	0.07	<0.01	<0.01	ns

Fall gly broadcast vs

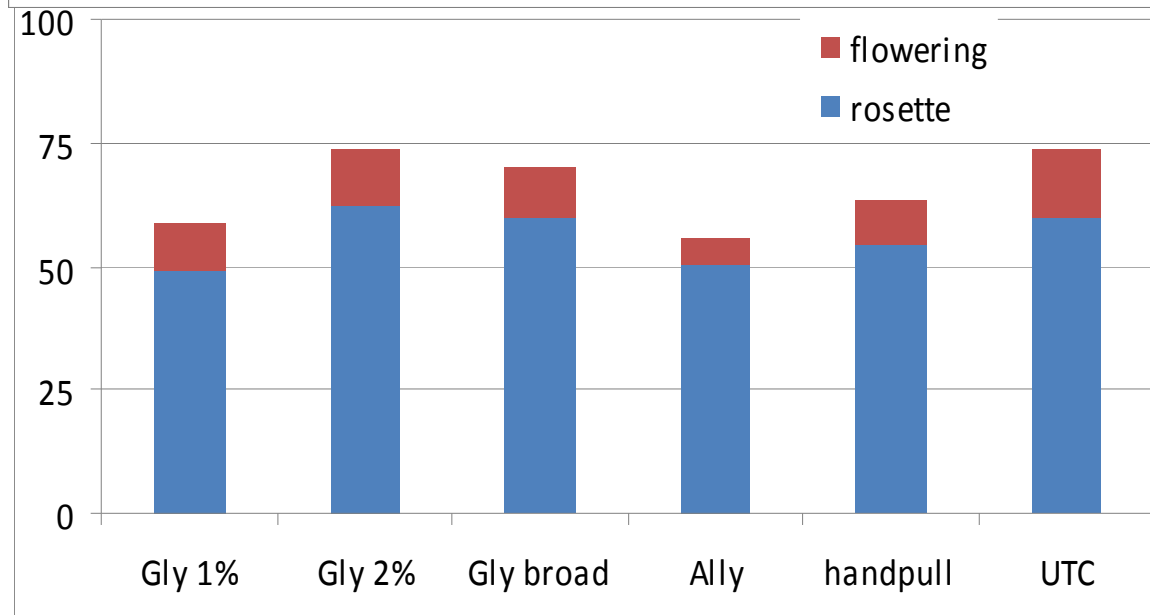
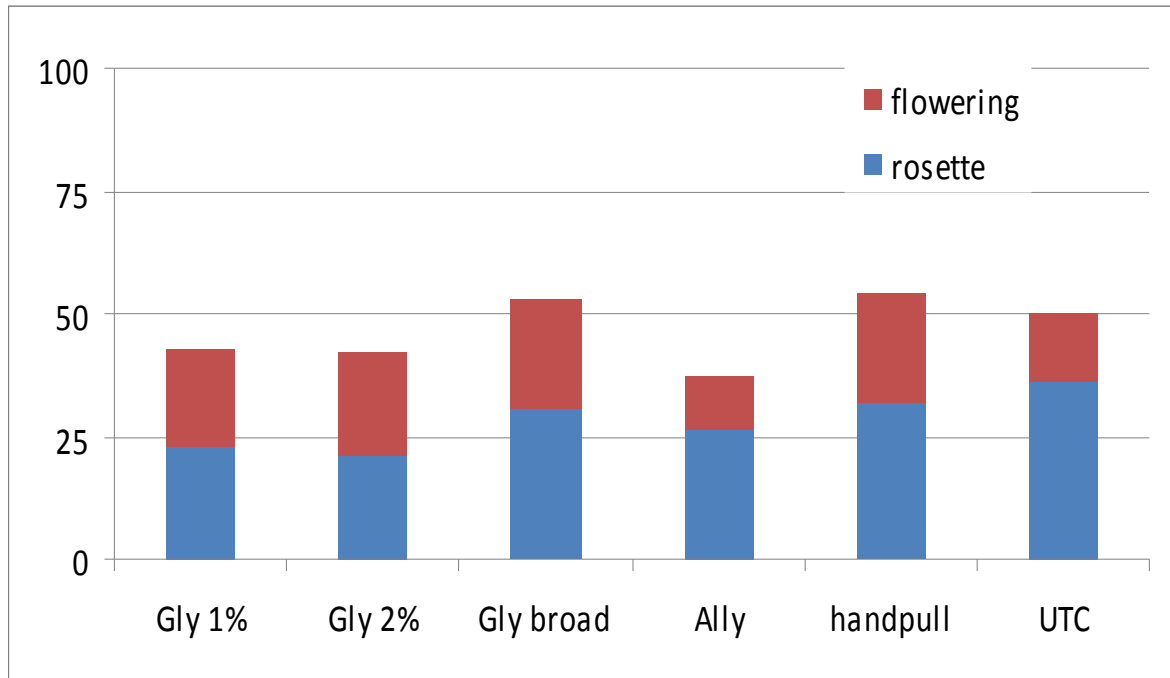
UTC



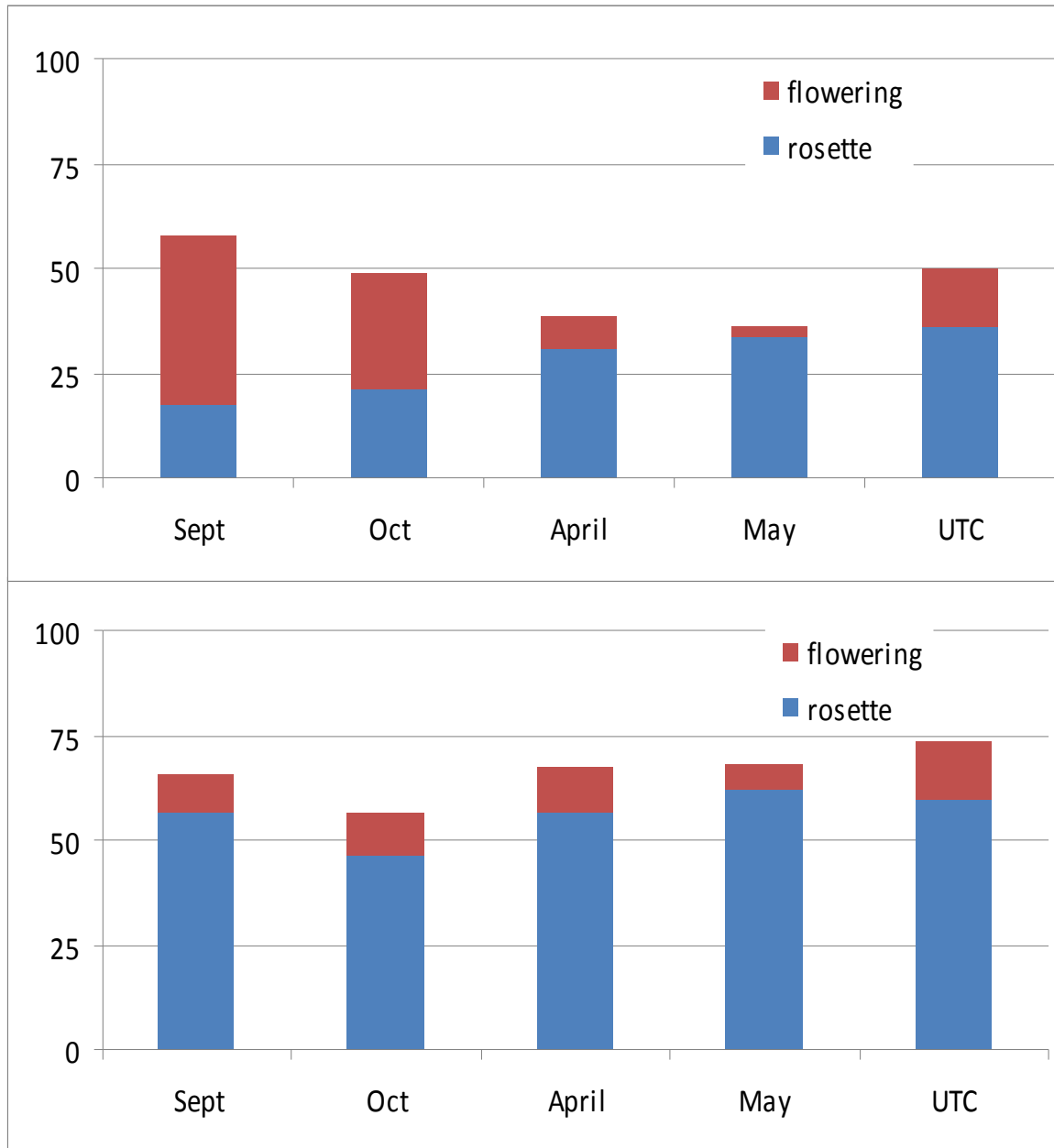
L-Spring gly IPT 2% VS E-Spring gly broad



GM cover 2 summers after trt



GM cover 2 summers after trt



Cover of Non GM plants

Only different from UTC in spring

	Green Bay		Door County		Lacrosse	
	2009	2010	2009 *	2010	2009	2010
Gly IPT 1%	7	3	11 b	8	33 abc	77 ab
Gly IPT 2%	5	3	7 c	7	39 ab	82 ab
Gly - broad	6	9	11 b	10	26 bc	64 bc
Ally	7	9	9 b	7	20 c	56 c
Hand-pull	1	15	31 a	6	48 a	84 a
UTC	0	2	27 ab	11	36 abc	74 abc
P value	NS	NS	0.01	NS	0.01	0.01

* Interaction with trt and timing

Species Richness (m²) of plots

	Green Bay		Door County		La Crosse	
	total	native	total	native*	total	native
Gly IPT 1%	1.5	1.0	1.7	1.6	6.3	6.0 ab
Gly IPT 2%	1.7	1.1	1.4	1.4	7.3	7.1 a
Gly - broad	2.7	1.6	1.6	1.5	5.8	5.6 b
Ally	2.1	1.0	1.1	1.1	7.0	6.8 a
Hand-pull	2.0	0.8	1.0	1.0	5.6	5.4 b
UTC	1.7	0.7	2.5	1.8	5.5	5.3 b
P value	ns	ns	ns	ns	ns	0.09

* Interaction with trt and timing Ally Sept.; Gly2% April

Summary

- Many methods are effective at managing garlic mustard
 - Control only lasted 1 year
- Applications in spring were more effective than fall as rosettes/seedlings also controlled
- When desirable plants are present reductions in non gm vegetation was observed with all herbicides, but didn't persist
 - September or April applications had less injury in some sites

Management implications

- Any management tested will reduce GM cover
- Select management method based on site specific characteristics
 - With few native/desirable plants, broadcast herbicide applications are effective and economical
 - With healthy understory handpulling/IPT is recommended
 - Applications in late fall to early spring MAY reduce non-target injury

Garlic mustard cover

2 summers after treatment

	Green Bay		Door County		Lacrosse	
	rosette	flower	rosette	flower	rosette	flower
Gly 1%	49	9	23	20	7	3
Gly 2%	62	12	21	21	2	4
Gly broad	60	10	31	22	7	10
Ally	50	6	26	11	17	2
Handpull	54	9	32	22	3	6
UTC	60	14	36	14	1	13
Prob	ns	ns	ns	ns	ns	ns