

April 2015

FLNRO – Invasive Plant Program

The Biocontrol Agent Lifecycle Schedule describes the months during the year that secondary and tertiary agents (see Status for definition) may be handled. The schedule is initially broken down by alphabetically listed specific biocontrol agents and their target invasive plant (first column). The next column describes the Activity of Interest.

First is the Life Cycle row:

The Life Cycle row contains the predicted life cycle for the agent and is based on literature sources and BCMFR field studies; Life cycle stages are coded by colour; and



White blocks with black text indicate a life cycle stage usually during a non-field season time period, e.g. overwintering larva.

Following are the Monitor and Collection rows:

The Monitor and Collection rows use the life cycle colour codes to indicate the applicable life cycle stages and may include additional information; The preferred life cycle stage(s) to monitor or collect within are indicated in the appropriate months or part months;

When a forward slash is used, it indicates the overlap of two or more life stages i.e. adult/larva or adult/larva/pupa;

"Other" may include an acceptable form of monitoring specific to that bioagent, ie: evidence. Notes will further identify 'other';

Finally there is the Notes row:

The Notes row contains specific information pertaining to the agent that may be of use to the handler.

Example of use:

To determine when to monitor and collect Agapeta zoegana:

- Locate the A. zoegana bioagent information block;
- Follow the Monitor row until a colour code and life cycle stage is indicated (there may be more than one life cycle stage during which to monitor at multiple times in a year);
- In this case, it is best to monitor A. zoegana larva from mid-April through the end of May and again in late September and October;
- Follow the Collection row until a colour code and life cycle is indicated (there may be more than one life cycle stage during which to monitor at multiple times/year);
 - In this case, it is best to collect A. zoegana from mid-June through all of July; and
- Refer to the Life cycle row for predictable information and how it may be adjusted for a particular situation.

[&]quot;All stages" includes recurring or overlapping generations, common with rusts (fungus) or very short-lived insects (midges, aphids); and

Biocontrol	Activity							4	pr	Мау		Jı	Jun 1-15 16-30		ul	A	ug	Se	ер		Oct	ı	lov		Эес
agent ↓	of	1-15 16	6-31 1	1-15	16-28	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-31	1-15	16-30	1-15	16-31	1-15	16-30	1-15	16-31
	interest																								
Agapeta	Life cycle		ov	erwi	nterin	g lar	va			larva		pupa		adult							larva	ov	erwinte	ring	larva
zoegana	monitor	TT-	Т	T		<u></u>		Γ		larva											larva				[
Controls	collect													adult											
Knapweeds	Notes	Larva (overv	vinte	rs in a	anv ii	nstar a	and re	sumes	feedin	g and	develo	pina th	ne follo	wina s	sprina.					1				
Agonopterix	Life cycle				lult				gg		lar			pu		İ					adult				
nervosa	monitor	T	T									larva					[Γ	<u>_</u>			T			T
Controls	collect											larva													
Scotch broom & Gorse	Notes	NOT P	ERMI	ITTE	D FOF	REI	DISTR	IBUTI	ON																
Aphthona	Life cycle		ove	erwii	nterin	ıg la	rva			pu	ра			adult		ad	ult/lar	va			larva	ove	rwinte	ring	larva
cyparissiae	monitor		T											ad	ult							T			
Controls	collect													ad	ult										
Leafy spurge	Notes	А. сур	oaris	siae	has	a lor	nger c	vipo	sition p	erioc	than	A. nig	griscu	tis.											
Aphthona	Life cycle		ove	rwir	nterin	g la	rva			pu	ра			adult		ad	ult/lar	va			larva	ove	rwinte	ing	larva
nigriscutis	monitor													ad	ult										
Controls	collect													ad	ult										
Leafy spurge	Notes	A. nig	riscu	utis	has a	1-w	eek s	horte	r ovipo	ositio	n peri	od tha	ın <i>A. c</i>	ypari	ssiae										
Aplocera	Life cycle			2nd	l gene	ratio	n larv	a		pu	ра	adult	adult	/larva	pu	ра	adu	It 2nd	gen. la	rva	overwintering	2nd	gen. la	rva	
plagiata	monitor													lar	va		lar	va							
Controls	collect													lar	va		lar	va							
St. John's wort	Notes																								
Botanophila	Life cycle				ove	rwin	nterin	g pup	a			adult	adul	t/egg/	larva	larva	lar	va/pu	ра		overwinteri	ng pı	і ра		
seneciella	monitor												ad	ult		lar	va								
Controls	collect												ad	ult		lar	va								
Tansy ragwort	Notes	At hig	h ele	evati	ions,	larva	a may	eme	rge in	July.															
Brachypterolus	Life cycle		ove	erwii	nterin	g pı	ира		pupa		adult		adul	t/egg/	larva		lar	va			overwinteri	ng pı	іра		
pulicarius	monitor												adult												
Controls	collect												adult												
Toadflaxes	Notes	Adults	s car	ove	<u>erwi</u> n	ter i	n clin	nates	with lo	ng gi	owing	g seas	ons.												

Chrysolina	Life cycle	0	verv	winte	ering	egg			larva		pupa	pupa/	adult a	dult		inac	tive a	dult	adı	ult	overwint	ering	ı egg		
hyperici	monitor	T	T	T		T		T	lar	 va			adu	lt		[adı	ult		<u>_</u>			
Controls	collect											ĺ	adu	lt											
St. John's wort	Notes	C. hyp	eric	<i>i</i> no	rmall	y ov	erwin	ters i	n the e	gg st	age, h	oweve	er, it m	ay ove	winte	er in	adult	and la	arva s	tages	.				
Chrysolina	Life cycle	0	verv	winte	ering	egg	l		larva		pupa	pupa/	adult a	dult		inac	tive a	dult	adı	ult	overwint	ering	g egg		
quadrigemena	monitor								lar	va			adult						adı	ult					
Controls	collect											i	adult												
St. John's wort	Notes	C. qua	drig	emi	<i>na</i> no	orma	ally ov	erwii/	nters ir	the e	egg st	age, h	oweve	r, it ma	y ove	rwin	ter in	adult	and la	arva s	stages in mild climate	es.			
Chrysolina	Life cycle	0	verv	winte	ering	egg	<u> </u>		larva		pupa	pupa/	adult a	dult		inac	tive a	dult	adult		overwint	erinç	egg		
varians	monitor								lar	va			adult						adı	ult					
Controls	collect											i	adult												
St. John's wort	Notes																								
Cochylis	Life cycle			lar	va			рі	ира	ad	lult	lar	va I	Larva/pı	ра а	dult	adult/	larva			larva			larva	
atricapitana	monitor					la	rva						larv	a							larva				
Controls	collect					la	rva						larva								larva				
Tansy ragwort	Notes	Multiple	e larv	va/pı	ıpa fo	ound/	plant	root/c	rown. E	xcava	ate infested plants prior to larva va						g to pu	pate ir	the s	oil					
Cyphocleonus	Life cycle		ove	rwii	nterir	ng la	rva			larva		puj	pa <mark>p</mark>	oupa/ac	ult		adult				overwintering l	arva			
achates	monitor							larva				larva/	<mark>pupa</mark>				adult		larva						
Controls	collect															ad	ult								
Knapweeds	Notes	Early a	dult	ts yi	eld n	nore	male	s, the	ratio e	evens	durin	g peal	k, and	near th	e end	of t	he se	ason t	here a	are m	ore females present.				
Galerucella	Life cycle			0	verw	inte	ring a	dult			ad	ult	all	stages		ad	ult				overwintering adu	ılt			
calmariensis	monitor											adı	ult	egg/lar	va	ad	ult								
Controls	collect											adı	ult	egg/lar	va	ad	ult								
P. loosestrife	Notes	Spring	adι	ults	and I	F1 ac	dults	overla	ap one	mont	h ovip	ositio	n in s	ummer	Spri	ing a	dults	emerç	ge one	wee	k earlier than <i>G. pus</i>	illa.			
Galerucella	T 10			_	verw	inte	ring a	dult			ad	ult	all	stages		ad	ult				overwintering adult				
q	Life cycle			¥																	i e				
pusilla	monitor			ĭ	<u> </u>		9	<u> </u>				adı	ult	egg/lar	va	ad	ult								
	•			<u>Ť</u>								adı adı		<mark>egg/lar</mark> egg/lar		ad ad									
pusilla	monitor collect	Spring	adı						ap one	mont	h ovip	adı	ult	<mark>egg/lar</mark>	va	ad	ult	emerg	e one	wk la	ater than <i>G. calmari</i> e	nsis.			
pusilla Controls	monitor collect	Spring	adı	ults	and I	F1 ac		overla	ap one	mont	th ovip	adı	ult n in su	<mark>egg/lar</mark>	va Sprii	ad ng ad	ult dults (wk la	ater than <i>G. calmarie</i> overwintering a				
pusilla Controls P. loosestrife	monitor collect Notes	Spring	adı	ults	and I	F1 ac	dults	overla	ap one	mont	th ovip	adı ositio	ult n in su	egg/lar ımmer. adult/la	va Sprii rva la	ad ng ad	ult dults (wk la					
pusilla Controls P. loosestrife Larinus	monitor collect Notes Life cycle	Spring	adu	ults	and I	F1 ac	dults	overla	ap one	mont	th ovip	adı ositio	ult n in su	egg/lar ummer. adult/la	va Sprii rva la	ad ng ad arva/	ult dults (wk la					

L								-114				114			//			114							
Larinus	Life cycle		т		verw	Inte	ring a	auit L	Г			adult				larva/		adult		г	overwintering	T	<u>t</u>	-г	
obtusus	monitor												ad	ult	lar	va/pu	ра					-	+	$+\!\!\!-\!\!\!\!-$	
Controls	collect												ad	ult									\perp		
Knapweeds	Notes	Femal	es a	re n	ore i	num	erous	than	males	, how	ever,	males	live le	onger.	Some	e adul	ts hib	ernate	e a se	cond	year.				
Larinus	Life cycle					over	winte	ring a	adult				ad	ult	larva/	/pupa	ad	ult			overwintering	adu	lt		
planus	monitor												ad	ult	larva/	/pupa	ad	ult							
Controls	collect												ad	ult	larva/	/pupa									
Thistles	Notes	Mating	g and	d ov	iposi	ting	occu	rs wh	nen ten	nperat	tures	reach	22 *C	Flow	er buc	ds nee	d to b	e 5-7	mm f	or ovi	position. One larva	/bud.			
Longitarsus	Life cycle			ove	rwinte	er eq	g larva	3		adult		,	adult d	orman	t	ad	ult	adult	/egg		overwinter	eqq/la	ırva		
gracilis	monitor	T	T			<u></u>	Ž	Γ	T	ad	lult											Ť		Т	
Controls	collect									ad	lult														
Tansy ragwort		NOT P	ERMI	TTE	D FO	REI	DISTR	IBUTI	ON																
Longitarsus	Life cycle			eaa/	larva			р	upa		ad	lult		inad	ctive a	dult		adult			adult/egg	ı/larva	a		
jacobaeae (IT)	monitor	T-	T	-99		Γ	Γ		 			[otł			L	adult			Γ	T
Controls	collect																				adult				
Tansy ragwort		Applica	able t	to L.	iacol	naeae	e (Italia	ın) str	ain only	. Mor	nitor O	THER	refers 1	to feed	ina evi	idence	(Aug/	Sep).							
Mecinus	life cycle						adult			adult			ages		lar			pupa	pu	ра	overwi	nter	adult		
janthinus	monitor		T	7					adult	L		Γ						va/pu		pupa		Τ		T	
Controls	collect						dor	mant	adult	ad	lult									J J			1	1	+
Toadflaxes		Adults	rea	red	on ve	ellow						r. Col	d clim	nates d	cause	morta	ality. A	Adults	over	vinter	in cells inside sten	ıs.			
Metzneria	Life cycle	raunc					g larv		0 400		adult			l stage				tuunto	010.1		overwintering larva				
paucipunctella	monitor	T-	T			<u> </u>	g iai v		a/pupa		addit		evide			[[Γ		Τ	T	Т	T
Controls	collect								rva	pupu			UTIGO								larva		+	+	+
Knapweeds	Notes	*Discs	ordec	d nu	nal c	aein.	ue ca		observ	od se	evide	nce ii	nsida	saadh	ahea	long a	fter th	ne adı	ılt had	e ovite					
										eu as	CVIG			Securi	caus				iit iias	CAIL		1			
Mogulones	Life cycle	over	winte	er -	mixe	d Sta	iges T	a	dult	L		ali si	ages				adult			г	overwinter - mixe	d Sta	iges	-г	
cruciger	monitor		-						ad				lar	va			adult					+	+	+	+
Controls Hounds	collect								ad	uit							adult					1		Щ	
tongue	Notes	Summ	er e	mer	ging	adul	lts rer	main	in their	coco	on fo	r 10 da	ays to	allow	their	bodie	s to h	arden							
Puccinia	Life cycle	ov	erwi	nter	ing s	pore	es —	in	oculati	on			recur	ring g	enera	tions					overwintering	spor	es		
acrolopti	monitor	<u> </u>	T				T					re		g gen							<u>-</u>	Ť		T	
Controls	collect													g gen											1
Russian KW		The o	verw	inte	ring	spor	es de	velor	on de	ad lea	aves			J J							L	-			
russian ix vv	110168		· • · · · ·		· ·····g ·	opoi	ac	7010	<i>5</i> 511 ac	au ice	4700.														

Puccinia	Life cycle	٥	verw	inte	ring s	spore	s	in	oculat	on			recur	ring ge	enera	tions					over	winterin	q spoi	es		
chondrillinia	monitor	TT	7	[Ť			T			re		g gene				Γ		Γ	Γ		<u> </u>	[T	
Controls R.	collect													g gene											1	
skeletonweed		NOT	PFRM	IITTE	D FOI	R RFI	DISTR	IBUTI	ON. In a	old cl	imates						e gern	ninatio	ı to ir	itiate f	urther dev	elonment		1		
Puccinia	Life cycle		verw						oculat					curring								verwinte	_	oores		
jaceae	monitor	T				Ť						re		g gene		7		[-			Ť	[-T	
Controls	collect													g gene												
				IITTE	D FOI	R REI	DISTR	івиті	ON. In o	lry clii	mates,	P. jace	eae ma	y overw	inter a	as my	elium	on ros	ettes	or as	exual repr	oductive	spores	on all	ernati	ve
Knapweeds	Notes	plant																								
Puccinia	Life cycle	<u></u>	verw	inte	ring s	pore	es F	in	oculat	on	_		recu	rring ge	enerati	ions				r	over	winterin	g spoi	es		
punctiformis	monitor										recurring generations recurring generations											\bot	\bot			
Controls	collect	lect										re	ecurrin	g gene	ration	S										
	• •	otes NOT PERMITTED FOR COLLECTION OR REDIS																								
Canada thistle	Notes	NOI	PERM						OK KEL												overwintering adult					
Rhinusa	Life cycle			ove	rwint	erinç	g adu	lt T		ad	lult		ult/lar	<mark>va </mark>	all sta	II stages		lult		r	ove	rwinterii	ng adu T	ılt 		
antirrhini	monitor											adult					adult			-			_		+	
Controls	collect											adult					adult							L		
Toadflaxes	Notes	The	life cy	ycle	for b	oth s	train	s of F	R. antir	rhini a	are the	same	э.	-												
Rhinusa	Life cycle	L	-	ove	rwint	ering	g adu	<u>lt</u>	,	ad	lult	ad	ult/lar	va	all	stage	es	adult		.	ove	rwinterii	ng adı	lt		
neta	monitor											adult		larva/ _l	oupa	ad	ult									
Controls	collect											adult				ad	ult									
Toadflaxes	Notes	Sprir	ng en	nerg	ing a	dults	live	until	Septen	nber a	and ma	nay mix with I		new a	ew adults emer		jing ii	n Sept	embe	er.						
Rhinocyllus	Life cycle			ove	rwint	ering	g adu	lt			adult		lar	va	pupa		adult				overwintering			ılt		
conicus	monitor	TT				T		Γ			ad	ult	egg/l	larva	pupa	ad	ult	[T			- <u>-</u> -T			
Controls	collect													larva/	oupa	ad	ult									
Thistles	Notes	Sum	mer a	adult	s ren	nain	in se	edhea	ads un	til the	ir bod	ies ha	rden.										-			
Sphenoptera	Life cycle				ove	erwir	nterin	g larv	va			pupa	/adult		adult		laı	rva			ove	rwinterii	ng larv	⁄a		
jugoslavica	monitor					Τ		Ĭ		la	rva	pu	ра	adı	ılt		laı	rva		T			T		T	
Controls	collect											•		adı	ılt											
Knapweeds		Male	s em	erge	1 wk	earl	ier th	an fe	males.	Imma	ature I	arva c	joina i	into wi	nter v	vill res	sume	feedir	ng in	the sr	ring befo	re they r	oupate	,		
Î	Life																			•			•			
Tyria	cycle	 -		Γ7	<u>p</u>	upa T		Т	Т	ad	lult	adult	/larva		larva					т	<u>p</u> ı	ıpa	T		F	
jacobaeae	monitor										ad	ult		larv	/a	oth	ner			1			_		+	
Controls	collect													larv	/a										\bot	
Tansy ragwort	Notes	Moni	tor OT	THER	indic	ates	the op	portu	nity to	nonito	or for p	resenc	e only	, extens	sive fo	liar fee	eding	is typic	al of	Г. јасо	baeae					

Urophora	Life cycle		ov	erwin	tering	g larva	a		pu	ра	ad	ult	adult/	larva	larva/	pupa	adult/	larva			overw	vinterir	ng lar	va	
affinis	monitor							larv	/a/pu	oa		adult		larva	larva/	<mark>pupa</mark>									
Controls	collect											adult							larv	a					
Knapweeds	Notes	Only th	e earl	iest e	merg	ing la	rva wi	ill pupa	ate in	sumi	mer w	hich g	o on t	o pro	duce t	he se	cond	gener	ation	overw	intering	larva.			
Urophora	Life cycle			la	arva				pu	ра	ad	ult		egg/l	arva						larva	a			
cardui	monitor							larv	va		ad	ult									larva	а			
Controls	collect							larva														larva			
Canada thistle	Notes	Larva o	verwi	nter iı	n woo	ody ga	alls. C	Galls a	re co	llecte	d and	releas	ed int	act to	allow	the p	upa to	o deve	elop.						
Urophora	Life cycle		ov	erwin	tering	g larva	a		pu	ра	pupa	/adult	adult/	larva	larva/	adult		larva			ove	erwinte	ering	larva	
quadrifasciata	monitor		la	rva		pupa			adult		- 11	- 1													
	momtor											auuit		all	stage	es				larv	а				
Controls	collect							va/pup					adult	aii		es adult				larv					
Controls Knapweeds	collect	Diffuse	knap	weed	offer		lar	va/pup	oa 💮	nent f			adult			adult	on.								
	collect			weed		s bett	lar	va/pup	oa relopr		or the		adult ce of a			adult enerati	on. larva				a	vinterir	ng lar	va	
Knapweeds	collect Notes					s bett	lar	va/pur al dev	oa relopr		or the	chan	adult ce of a	a seco		adult enerati			larv	larv	a	vinterir	ng lar	va	
Knapweeds Urophora	collect Notes Life cycle					s bett	lar	va/pur al dev	oa relopr		or the	chan	adult ce of a	a seco		adult enerati			larv larv	larv	a	vinterir	ng lar	va	

The biological control agent lifecycle schedule was developed by using British Columbia field studies and available literature sources.

Seasonal temperatures, climate change and unique habitats may alter the biological control agents' schedule.

Complete details regarding the biological control agents and their host plants can be found at: https://www.for.gov.bc.ca/hra/Plants/Agent-Plant_Matrix.htm