Washington State Surface Water Monitoring for Pesticides in Salmonid Bearing Streams



Chris Burke Washington State Department of Ecology WRIA 3: Lower Skagit-Samish Agriçultural Watershed

> WRIA 46: Entiat Agricultural Watershed

WRIA 8: Cedar-Sammamish Urban Watershed

Chinook

WRIA 45: Wenatchee Agricultural Watershed

WRIA 37: Lower Yakima Agricultural Watershed

Illustrations - USFS



Marion Drain



What do we find?

> 81% Herbicides

- (Sinbar) Terbacil
- Atrazine
- 2,4-D
- (Basagran) Bentazon

(Aatrex)

- (Karmex) Diuron
- Pendimethalin (Prowl)
- (Treflan) • Trifluralin

- > 19% Insecticides
- Chlorpyrifos (Dursban)
- Malathion
- Ethoprop (Mocap)
- Dimethoate
- Carbaryl
- Propargite
- Azinphos-methyl (Guthion)

(Sevin)

(Omite)

<1% degradate compounds Average of 5 pesticide residues in each sample

Fisheries detection profile

General Life Cycle of Yakima Basin Summer Steelhead (Haring, 2001)

Life Stage	March	April	Мау	June	July	August	September	October					
Spawning Run													
Winter Holding					_								
Spawning													
Incubation													
Emergence													
Fry Colonization													
0+ Summer R.													

Maximum (Risk) Residue Detections of the Marion Drain

Year	Freq.	March	Α	pril		May	June				July					August				ept	em	Octok			۶r	
2003	10%																									
2004	17%																									
2005	15%																									
2006	6%																									

Chlorpyrifos Residue Detections of the Marion Drain

Year	Freq.	March	April					May			June				July					٩u	st	ļ	September						October				
2003	43%																																
2004	37%																																
2005	24%																																
2006	65%																																
		Each square re	prese	ents	the	pe	riod v	whei	n a	sar	nple	e w	as	tak	en.	lf	bla	Ink	th	en	no	ins	ect	ticio	de o	dete	ect	ed					
		No samples tal	ken du	uring	g thi	s p	erioc	I.																									
		Detection of ins	Detection of insecticide residue, concentration below toxicological endpoint.																														
		Magnitude of d	detection above chronic (NOEC) or acute (LC50) invertebrate endpoint.																														
		Magnitude of d	etecti	on a	abov	еE	Enda	nger	red	Spe	ecie	es l	_ev	el o	of C	on	cer	n fo	or fi	sh	(1/	20t	h c	of L	C5	0).							

Invertebrate detection profile



Invertebrate Detection Evaluation of the Marion Drain

Year	Freq.	March	April					ıy		Jı	ine		July				August				Ser	October			r			
2003	29%																											
2004	47%																											
2005	39%																											
2006	68%																											
		Each square re	prese	nts tł	ne pe	riod	whe	nas	samp	ole w	/as t	ake	en.															
		No samples tal	ken du	ring	this p	erio	d.																					
		Magnitude of d	etectic	n ab	ove	1/10t	h of o	chro	nic ir	nver	tebr	ate	end	poi	nt (l	NO	EC).										
		Magnitude of detection above chronic invertebrate endpoint (NOEC).																										
		Magnitude of d	etectic	n ab	ove	acute	e inve	erteb	orate	end	lpoir	nt (L	C5())														

Om

Outmigration

Application rate and detection timing



Thornton Creek









Thornton Creek Detection Profile

- > 80% Herbicides
- Dichlobenil (Casoron)
- Triclopyr
- MCPP
- 2,4-D
- Diuron
- Prometon
- Trifluralin

(Mecoprop) (Prowl) (Karmex) (Pramitol) (Treflan)

- <u>10% Wood Preservative</u> Pentachlorophenol (Penta)
- > <u>9% Insecticides</u>
 - Diazinon
 - Carbaryl (Sevin)

<1% degradate compounds
Average of 3 pesticide residues in each sample</pre>

Fish and invertebrate detection profile

General Life Cycle of Thornton Creek Fall Chinook

Life Stage March April May June July August September October																																		
Life Sta	age	N	larc	:h		Ap	oril			Ma	ay			Ju	ne			J	uly			Au	gu	st	S	јер	ter	nb	er	0	cto	be	ŗ	
Spawni	ng Run																																	
Spawni	ng																																	
Incubat	ion				_																													
Emerge	ence							-																										
Fry Col	onization																																	
0+ Sum	nmer R.																								-									
Juvenile	e Om.																																	
R	Rearing																																	
Om	Outmigrati	ion																																
											Re	esi	idu	ie D	Det	ect	tior	n E	val	uati	on													
Year	Freq.	N	larc	h		Ap	oril			Ма	ay			Ju	ne			J	uly			Au	gu	st	S	зер	ter	nb	er	October				
2003	38%																								_									
2004	6%																																	
2005	6%																																	
2006	8%	•		·																														
		Magn	itud	e of d	letect	ion	abo	ve 1	/1(Oth	of c	hro	oni	c in	ver	teb	rate	e ei	ndp	oint ('NC	EC).											
		- 5						Dia		nor		96	idı		Ποί	00	tin	ne	of	Tho	rnt	on	/ Cri	مملا	,									
Voar	Freq.	N	laro	h		Δr	ril		1211	M	<u></u>	-3	lut		no			113			T			et.	Ì	lon	tor	nh	or	0	ct	he	. -	
0000	400/	14	arc	,11							ay			Ju					ury		<u> </u>	<u>Au</u>	gu	51						_			4	
2003	46%						_													<u> </u>	-	-		1	-					—	_	-		
2004	16%		<u> </u>				_														_	_				┢	┢	⊢	\square					
2005	3%						_														_	_				┢		L		ш				
2006	8%																																	
		Each	squ	are re	epres	ent	ts the	e pe	rio	d w	hen	а	sar	mpl	e w	as	tak	en.	lf I	olank	k, th	nen	chl	orp	yrif	os \	was	s no	ot de	etec	cteo	d.		
		No sa	amp	les ta	ken d	uriı	ng th	is p	erio	od.																								
		Detection of insecticide residue, concentration below assessment endpoints.																																
		Magn	itud	e of d	letect	ion	abo	ve 1	/10	Oth	of c	hro	oni	c in	ver	teb	rate	e ei	ndp	oint (NC	EC).											

Magnitude of detection above chronic invertebrate endpoint (NOEC).

Magnitude of detection above acute invertebrate endpoint (LC50).

Long term evaluation



Conclusions

Pesticide residues present March-October in all watersheds. Complex mixtures predominate.

Organophosphorus insecticides may exert stress directly to fish and indirectly through food supply reduction or modification in the Marion Drain.

Diazinon, malathion and chlorpyrifos presence is reduced in response to urban use restriction and registration cancellations (1996-2006).

Recommendations

Surface Water

- Determine pulsing dynamic
- Agricultural metals
- Entire spectrum of habitat envelope

Sediment

- > Exposure bioassay and passive sampling
- Data assessment
 - Complex mixtures
 - Sublethal effects
 - Pulsed exposure recovery of organisms

Contact information

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