2003 EC PYR PESTICIDE INFORMATION EXCHANGE PROCEEDINGS

November 27, 2003

Environment Canada
#201 – 401 Burrard Street
Vancouver, British Columbia

Regional Program Report 04-01

Prepared by:

Jen-ni Kuo
Environment Canada
Environmental Protection Branch
Commercial Chemicals Division
Pacific and Yukon Region

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DISCLAIMER

The presentations in these proceedings represent the views and findings of their authors and do not necessarily reflect the opinions of Environment Canada and the other agencies involved in this Information Exchange.

Comments and inquiries regarding these proceedings should be addressed to:

Commercial Chemicals Division
Environmental Protection Branch
Environment Canada
#201 – 401 Burrard Street
Vancouver, BC. V6C 3S

EXECUTIVE SUMMARY

Established in 1995, the EC Regional Pesticide Committee of the Pacific and Yukon Region is composed of representatives from all operational Branches. The purpose of the committee is to coordinate and promote the exchange of information on regional pesticide matters pertaining to research, monitoring, pollution control, emerging issues, strategic approaches, coordination and communication not only with regional and HQ management bodies but also with other federal, provincial, municipal agencies, industries and academia.

The eighth annual Pesticide Information Exchange was held on November 27, 2003 at the Environment Canada Office of Vancouver, B.C. A total of 59 attendees from agencies and departments such as Environment Canada (Ottawa and PYR), Fisheries and Oceans Canada, B.C. Ministry of Water, Land and Air Protection (BCMWLAP), B.C. Ministry of Agriculture, Food and Fisheries (BCMAFF), Agriculture and Agri-Food Canada (AAFC), the Pest Management Regulatory Agency (PMRA) of Health Canada (Ottawa and PYR), Greater Vancouver Regional District (GVRD), City of Burnaby, Simon Fraser University, Canadian Pacific Railway (CPR) and the British Columbia Transmission Corporation participated. This year's Information Exchange included presentations covering a diverse array of topics including progress achieved on the National Pesticide Science Fund projects, environmental considerations of mosquito control activities to combat West Nile Virus, impacts of pesticide use to B.C. and Yukon salmonid populations and aquatic ecosystems, and a discussion on the use of shrouds for herbicide application along CPR railway rights-of-way. We also heard presentations describing current pesticide program developments at national, regional and local levels of government.

The Information Exchange identified the continued need to explore pesticide issues in a coordinated fashion and the importance of communicating the results of these research initiatives to decision-makers such as those at the PMRA. Much of the information presented resulted from partnerships of various groups within Environment Canada and outside agencies, such as the BCMWLAP, CPR, Southern Railway of BC, BC Hydro, University of British Columbia, Simon Fraser University, University of Victoria, Health Canada and farmers associations. It is anticipated that this event will enable participants to enhance and strengthen their working relationships to further pesticide research and program activities.

John Pasternak

2003 Pesticide Information Exchange
Environment Canada, Pacific and Yukon Region

November 27, 2003

Environment Canada
#201 - 401 Burrard Street, Vancouver, B.C.

FORMAT:	**Presentations**	**09:00 – 12:20**
	Lunch	**12:20 – 13:00**
	Presentations	**13:00 – 16:55**
	Closing Remark	**16:55**

FACILITATOR: John Pasternak

AGENDA:

9:00 **John Pasternak -** CCD Pesticide Program Update

9:15 **Pierre-Yves Caux (EC, HQ) -** EC National Pesticide Program and an overview on the Pesticide Science Fund projects

10:00 ***COFFEE BREAK (refreshment provided)***

10:15 **Mike Wan –** PSF pesticide residue run-off study update

10:25 **Mark Sekela -** PYR pesticide surveillance projects

10:35 **Wayne Belzer -** An overview of pesticide analyses over 6 years in the LFV and Vancouver Island

10:45 **John Elliott** - PSF projects relating to wildlife

10:55 **Robert Adams/Dan Cronin (BCMWLAP) –** New Pesticide Legislation

11:25 **Robert Kent (EC, HQ) -** West Nile Virus - Environmental Implications of Associated Mosquito Abatement Programs

11:45 **David Fishwick (BC Ministry of Health Planning)** – BC Preparations for Control of Mosquitoes carrying West Nile Virus

12:00 **Theresa Duynstee (GVRD) -** Economic Strategy for Agriculture

12:15 **Gevan Mattu** - the pesticide inventory

12:20 ***LUNCH BREAK (lunch not provided)***

13:00 **Peter Delorme (PMRA, HQ)** - Assessment of risks to species at risk

13:20 **Madeline Warring (BCMAFF) -** pesticide component of the BC Environmental Farm Plan Program

13:35 **Victoria Brookes (AAFC) -** The new minor use pesticides program

13:50 **Patricia Bell / Nancy Grenier (GVRD) -** Local Government approaches to restricting non-essential pesticide use

14:05 **Yota Hatziantoniou (City of Burnaby**) – Pesticide program in the City of Burnaby

14:20 **Stacey Verrin (DFO) -** Overview of pesticide use in British Columbia: risks to aquatic ecosystems

14: 35 **Peter Ross (DFO) -** The risk of adverse health effects of current use priority pesticides to Coho salmon in British Columbia

14:40 ***COFFEE BREAK (refreshment provided)***

14:55 **Madeline Warring (BCMAFF) -** Pesticide Wise

15:10 **Graham vanAggelen -** Salmonid and amphibian toxicogenomic effects to select pesticides in the PYR

15:25 **Angelo Dalcin (CP Railway) -** Railway applications and use of shrouds

15:40 **Mike Wan –** Reduced buffer zone – railway right of ways

15:55 **Mike Wan -** Endosulfan / OC study update**/**1973-2005 projects summary

16:10 **Peter Delorme (PMRA, HQ)** - Assessment endpoints

16:30 **Laurie Wilson** - Pesticide poisoning of raptor in south-west BC - Update 2003

16:45 **Jen-ni Kuo** – Bromacil / diuron project update

ATTENDANCE LIST
(in alphabetical order)

NAME	AFFILIATION	PHONE	e-mail
Rob Adams	BCMWLAP	250-387-9414	robert.adams@gems9.gov.bc.ca
Vic Bartnik	EC-ECB-AAS	604-664-4007	vic.bartnik@ec.gc.ca
Patricia Bell	GVRD	604-436-6991	pat.bell@gvrd.bc.ca
Wayne Belzer	EC-ECB-AAS	604-664-9125	wayne.belzer@ec.gc.ca
Don Bernard	EC-ECB-AAS	604-664-4051	donald.bernard@ec.gc.ca
Grete Bridgewater	CPR	403-319-6142	grete_bridgewater@cpr.ca
Victoria Brookes	Ag & Ag-Food Can	604-796-2221 Ext. 228	brookesv@agr.gc.ca
Pierre-Yves Caux	EC-HQ	819-953-0602	pierre-yves.caux@ec.gc.ca
Winnie Cheng	EC-ECB-AASD	604-664-4040	winnie.cheng@ec.gc.ca
May Chiu	EC-EPB-EED	604-666-2165	may.chiu@ec.gc.ca
Jennie Christensen	DFO-IOS	250-363-6810	christensenj@pac.dfo-mpo.gc.ca
Leslie Churchland	EC-EPB-CCD	604-666-3601	leslie.churchland@ec.gc.ca
Bob Costello	BCMAFF	604-556-3031	bob.costello@gems4.gov.bc.ca
Dan Cronin	BC MWLAP	250-387-9416	dan.cronin@gems8.gov.bc.ca
Angelo Dalcin	CPR	403-319-6145	angelo-dalcin@cpr.ca
Dipak Dattaui	City of Burnaby	604-294-7771	dipak.dattaui@city.burnaby.bc.ca
Peter Delorme	PMRA-HQ	613-736-3729	peter-delorme@hc-sc.gc.ca
Theresa Duynstee	GVRD	604-451-6024	theresa.duynstee@gvrd.bc.ca
John Elliott	EC-ECB-CWS	604-940-4680	john.elliott@ec.gc.ca
Randy Englar	EC-ECB-PESC	604-924-2531	randy.englar@ec.gc.ca
Bert Engelmann	EC-EPB-CCD	604-666-3197	bert.engelmann@ec.gc.ca
David Fishwick	BCMHP	250-952-1463	david.fishwick@gems5.gov.bc.ca
Jeff Fournier	BCMWLAP	604-582-5261	jeff.fournier@gems7.gov.bc.ca
Vesna Furtula	EC-ECB-PESC	604-924-2503	vesna.furtula@ec.gc.ca
Sue Garnett	PMRA-PYR	604-666-2153	garnetts@inspection.gc.ca
Chris Garrett	EC-EPB-CCD	604-666-3332	christine.garrett@ec.gc.ca
Melissa Gledhill	EC-ECB-AASD	604-666-2649	melissa.gledhill@ec.gc.ca
Colin Gray	EC-ECB-AASD	604-664-4002	colin.gray@ec.gc.ca
Yota Hatziantoniou	City of Burnaby	604-294-7460	yota.hatziantoniou@city.bunaby.bc.ca
Yvonne Herbison	HC-PMRA-PYR	250-470-4890	herbisony@inspection.gc.ca
Christina Hilliard	HC-PMRA-PYR	604-666-7778	hilliardc@inspection.gc.ca
Hugh Jarrard	SFU	604-291-5634	hej@sfu.ca
Robert Kent	ECNRC	819-953-1554	robert.kent@ec.gc.ca
Jen-ni Kuo	EC-EPB-CCD	604-666-8286	jen-ni.kuo@ec.gc.ca
Bill Lasuta	Bill Lasuta & Assocaites Ltd.	604-885-4480	blasuta@dccnet.com
Sandi Lee	EC-ECB-CWS	604-940-4691	sandi.lee@ec.gc.ca
Pat Lim	DFO	604-666-6529	limp@pac.dfo-mpo.gc.ca
Gevan Mattu	EC-EPB-CCD	604-666-3198	gevan.mattu@ec.gc.ca
Christy Merrissey	EC-ECB-CWS	604-940-4680	christy.merrissey@ec.gc.ca
Gail Moyle	EC-ECB-AASD	604-664-4073	gail.moyle@ec.gc.ca
John Pasternak	EC-EPB-CCD	604-666-1091	john.pasternak@ec.gc.ca
Deborah Portman	EC-EPB-EED	250-847-1879	deborah.portman@ec.gc.ca

NAME	AFFILIATION	PHONE	e-mail
Peter S. Ross	DFO-IOS	250-363-6806	rosspe-@pac.dfo-mpo.gc.ca
Ilze Rupners	HC-PMRA-PYR	604-666-0741	rupnersi@inspection.gc.ca
Nick Russo	EC-EPB-EED	604-666-1092	nick.russo@ec.gc.ca
Mark Sekela	EC-ECB-AASD	602-664-4098	mark.sekela@ec.gc.ca
Patrick Shaw	EC-ECB-AASD	604-664-4071	pat.shaw@ec.gc.ca
Gwen Shrimpton	BC Transmission	604-299-7409	gwen.shrimpton@bctransco.com
Diane Sutherland	BCMWLAP	604-582-5375	diane.sutherland@gems9.gov.bc.ca
Keith Tierney	SFU	604-298-7739	keithtierney@shaw.ca
Denise Tomyn	EC-CFIA	604-666-2595	tomynd@inspection.gc.ca
Taina Tuominen	EC-ECB-AASD	604-664-4054	taina.tuominen@ec.gc.ca
Graham Van Aggelen	EC-ECB-PESC	604-924-2513	graham.vanaggelen@ec.gc.ca
Stacey Verrin	DFO-IOS	250-363-6715	verrins@pac.dfo-mpo.gc.ca
Mike Wan	EC-EPB-CCD	604-666-3111	mike.wan@ec.gc.ca
Madeline Waring	BCMAFF	604-556-3027	madeline.waring@gems5.gov.bc.ca
Irene Wilkin	PMRA-PYR	604-666-7730	wilkini@inspection.gc.ca
Laurie Wilson	EC-ECB-CWS	604-940-4679	laurie.wilson@ec.gc.ca
Young Ryu	EC-ECB-AASD	604-664-9123	young.ryu@ec.gc.ca

PRESENTATIONS

ABSTRACTS AND OVERHEADS

(in order of presentation)

EC - CCD Pesticide Program Update

Presented by J.P. Pasternak, Commercial Chemicals Division, Environmental Protection Branch, Environment Canada, (604-666-8077; john.pasternak@ec.gc.ca)

Abstract

In PYR, EPB is a federal co-ordinator on issues relating to pesticides and the environment. EPB is responsible for the protection of non-target organisms and their habitats from the harmful effects of pesticides, as mandated by the *Fisheries Act* (Section 36) and the *Migratory Birds Convention Act* (MBCA) and *Species at Risk Act*. Using these legislated mandates, EPB is actively influencing the decisions made by two key agencies with regulatory authorities on pesticides, the Pest Management Regulatory Agency (PMRA) of Health Canada, and the British Columbia Ministry of Water, Land and Air Protection (BC MWLAP).

EPB influences the PMRA, BC MWLAP and regional municipalities by focusing on the following advisory roles and activities:

- providing scientific and technical advice relevant to the FA and MBCA on BC MWLAP Pesticide Use Permits (PUPs) and Pesticide Management Plans (PMPs) on behalf of PYR (including the Canadian Wildlife Service) and the Department of Fisheries and Oceans.
- participating as an appointed member on the provincial BC Pesticide Control Committee, thereby acting as the liaison between Environment Canada and BC on provincially relevant pesticide issues, Pest Management Plans, Permits, emergency projects, (e.g., Gypsy moth projects, mosquito control projects, etc.), offering technical advice and expertise regarding the protection of sensitive fishery and wildlife resources.
- developing and updating guidelines and conditions on pesticide use to protect non-target organisms and sensitive habitat areas.
- participating in and supporting various work groups, e.g., the BC Wireworm Task Force, BC Wooden Utility Pole Task Team and BC Horticultural Association.
- determining residue levels of selected in-use pesticides and their transformation products from agricultural runoff in the Lower Fraser Valley (part of the Pesticide Science Fund Aquatics Surveillance Study).
- conducting inspections of problem spray programs to adjudicate and mitigate controversies (e.g., BC Rail spaying of gyphosate in Lower Mainland railway rights of way).
- undertaking research on regionally problematic pesticides (i.e., endosulfan, bromacil, diuron) relevant to application and use and providing advice to the PMRA regarding the need for de-registration or use pattern changes in order to protect sensitive wildlife and fish habitats and environmental resources.
- exchanging information on pesticides and related subjects to educate stakeholders.

In the future, CCD will continue with its program activities, and plans to complete its surveillance study to determine residue levels of selected in-use pesticides and their

transformation products in the Lower Fraser Valley agricultural runoff. Upon the completion of this project, we intend to conduct similar surveillance studies in the Okanagan and on Vancouver Island. Also, CCD will continue to conduct regional impact and risk assessment studies by focusing on problem pesticides in the context of local conditions and using new scientific technology to provide timely information to PMRA for pesticide re-evaluations (e.g., toxicgenomic evaluation of simulated field contributions of glyphosate, endosulfan, triazine and transformation products). CCD also hopes to support (given sufficient funding) improved analytical capabilities for pesticides, not only in terms of improved detection limits, but also the capability to identify and recover residues of major transformation products (TP) of in-use pesticides.

EC - CCD Pesticides Program Update

Presentation by:
John Pasternak
Commercial Chemicals Division
2003 Pesticide Information Exchange

Presentation Outline

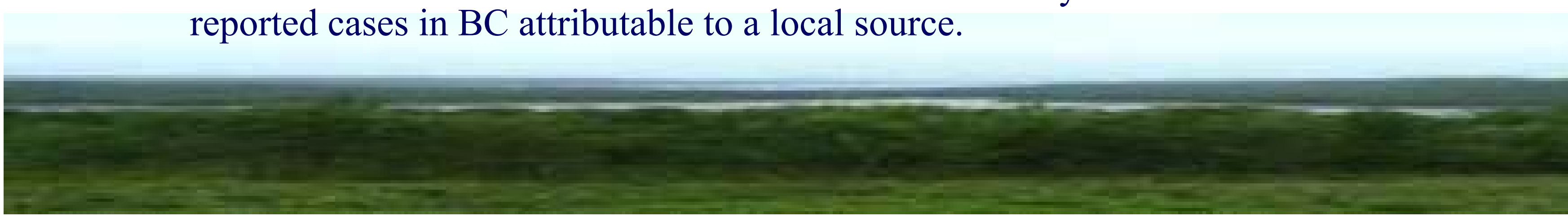
Current Program Activities

Current Field/Research Initiatives

Future Activities

Current Program Activities

- EPB coordinator on pesticide issues. Advisor to PMRA and BC MWLAP. In consultation with DFO and CWS, advise PMRA on regional concerns relating to registered pesticides and requests for emergency registrations.
- *Fisheries Act* (Section 36), *Migratory Birds Convention Act, Species at Risk Act.*
- Scientific advice on BC MWLAP Pesticide Use Permits (PUPs) and Pesticide Management Plans (PMPs) for EC PYR (incl. CWS) and DFO.
  – Advising on, cooperating with legislative changes at the provincial level.
  – New Integrated Pest Management Act received Royal Assent in BC Legislature in Oct. 2003.
- Appointed membership to BC Pesticide Control Committee. Liaison between - Environment Canada and Province.
  – Provincial Permit to combat West Nile Virus. Fortunately there have been no reported cases in BC attributable to a local source.



What are CCD/EC's Standard Conditions

- EC Standard Conditions advised to BC WLAP for PUPs and PMPs
- Based on extensive research by Mike Wan on mobility of pesticides.

  The proponent must observe a **<u>10 metre pesticide-free zone (PFZ)</u>*** measured from the high water mark of all waterbodies. To achieve this, it is recommended that a buffer zone outside the 10m PFZ be observed for the following types of spray application:

a. **<u>Individual tree treatment</u>...0 meter**

(drilling, hacking/squirting, stem injection, stump painting, wipe-on techniques, etc.)

b. **<u>Ground-based treatment</u>..5 metres**

(air blasting, back-packing, fogging, hi-rail, power-hose, truck mounted equipment)

c. **<u>Aerial application</u>**

   (i) Rotary aircraft..100 metres

   (ii) Fixed-wing aircraft..200 metres

- Continuous updates for specific applications and pesticides. Other conditions identified.

Current Program Activities (cont.)

- Inspection of spray programs
  - Inspection of CPR ROW glyphosate spraying.
- Coordinating information exchange, stakeholders education (pesticides, IPM, etc.).
  - Horticulture Growers' Short Course (Abbotsford Tradex), education on IPM methods, nonchemical controls, etc.

Current Field/Research Initiatives

- Runoff/leaching of bromacil and diuron along Lower Fraser Valley rights-of-way.
  - Publication in progress.
- Pesticide Science Fund (PSF) Study determining residue levels of selected in-use pesticides and their transformation products from agricultural runoff in the Lower Fraser Valley.
  - Field work for this fiscal year is now complete.
  - A national report on the state of pesticide contamination in the Canadian environment will be prepared.
  - Coordinated effort with ECB
  - Parent and transformation products. Partnership between CCD (funding, list development) and PESC, with input from ECB.

List of pesticides/transformation products for Aquatics Surveillance PSF Project

Acid extractable pesticides:
- **2,4-D** (*2,4-dichlorophenol*)
- dicamba (*5-hydroxydicamba*)
- **trichlorpyr** (*3,5,6-trichloro-2-pyridinol*)
- **MCPA** (*4-chloro-2-methylphenol*)
- **Mecoprop** (*4-chloro-2-methylphenol)*

Organochlorine pesticides:
- **g-BHC** (*pentachlorophenol*)
- **a-endosulfan** (*endosulfan sulfate*)*
- **b-endosulfan** (*endosulfan sulfate*)*
- **methoxychlor** (*o,p'-methoxychlor*)

Organophosphate pesticides:

azinphos-methyl (*azinphos-methyl oxon*)

chlorpyrifos (*chlorpyrifos oxon*)

diazinon (*diaoxon*)

dimethoate (*omethoate*)

malathion (*malaoxon*)

methamidophos**

naled (*dichlorvos*)

parathion (*paraoxon*)

terbufos**

Nitrile pesticides:

benomyl (*2-amino-benzimidozole*)

chlorothalonil (*~90% remain as parent compound*)**

Triazine pesticides:
- **atrazine** (*atrazine desethyl, atrazine-2-hydroxy*)
- **simazine** (*simazine hydroxy*)

Miscellaneous pesticides:
- **captan** (*cis-1,2,3,6-tetrahydrophthalimide*)
- **Cu++**
- **Glyphosate** (*aminomethylphosphonic acid*)
- **methoprene** (*7-methoxycitronellal*)
- **metam** (*methyl isothiocyanate, methyl isocyanate*)***
- **metolachlor** (*2-[(2-ethyl-6-methylphenyl)amino]-1-propanol*)
- **quintozine** (*pentachloroaniline*)
- **trifluralin****

Current Field/ Research Initiatives (cont.)

- Impact assessment of endosulfan and transformation product (endosulfan sulfate) using simulated field conditions and determination of static acute toxicity to salmonids and aquatic invertebrates
- Determination of endosulfan concentrations in the environment, historical OC compounds in aquatic and terrestrial environments in control and agricultural areas of Lower Fraser Valley.
- Forestry Glyphosate Study. Determining concentrations of glyphosate and transformation products in dry ditches and streams following aerial treatment to assess downstream contamination.
  - Field work completed. Data analyses completed for year one. Project funded by Timberwest Co. Ltd.

Future Initiatives

- Continue with research to identifying problem pesticides in the Pacific Region, specifically those of the Lower Fraser Valley, Vancouver Island, and the Okanagan regions.
- Continue conducting regional impact and risk assessment by focusing on problem pesticides in the context of local conditions and using new technology. Information to PMRA for re-evaluations.
  - E.g., Toxicgenomic evaluation of simulated field contributions of glyphosate, endosulfan, triazine and transformation products.
- Support the enhancement of analytical chemistry on the recovery of pesticide residues, and the capability to identify and recover residues of major transformation products (TP) of in-use pesticides.

Pesticide Program at Environment Canada

Presented by Pierre-Yves Caux, Conservation Priorities Branch, Conservation Strategies Conservation Strategies Directorate, Environment Canada
Gatineau, QC

Abstract

Recent reports of fish and bird kills and other environmental impacts from pesticides are unacceptable and need our immediate attention. Environment Canada is re-engaging in the pesticide file at a national level and is shifting from reactive to proactive science knowledge generation. Its mandate rests mostly with research, surveillance and guideline development. The challenge will be to ensure that while our mandate is fulfilled, knowledge is also provided in a timely fashion for regulatory action. A lot of work needs to be done to strengthen science policy linkages to integrate our research and monitoring into decision-making processes. A Memorandum of Understanding between ourselves and the Pest Management Regulatory Agency has recently been signed and is an enabling document that will promote and foster closer cooperation among scientists and regulators working on pesticide and pest management issues within the two parties.

At present, public and stakeholder expectations are high. Because resources are limited, the federal government needs to coordinate and collaborate interdepartmentally by building networks and working on issues of mutual interest. The new funds that departments received are being used to address priorities and to provide national strategic direction for future work. At Environment Canada, the Pesticide Science Fund is being expended to gather knowledge on determining the current exposure of pesticides in the Canadian environment as well as on research on the effects of pesticide to indigeneous biota. The new Pesticide Program will promote dissemination of this information by targetting a wide audience including the science community, regulators, stakeholders and the public at large.

Pesticide Program at Environment Canada

Pierre-Yves Caux
Conservation Priorities Branch
Conservation Strategies Directorate

2003 Pesticide Information Exchange

Vancouver, BC
27 November, 2003

Talk Outline

- Introduction
- Pesticide Program
  - – covering the bases
- Program past, current and future activities
  - – MOU & governance
- Pesticide projects
  - – Pesticide Science Fund

Pesticide Program Concept

EC Mandate

Program Elements

Science/Policy Linkages

Strategies and Action Plans

Environment Canada's Mandate

La raison d'être

- Preserve and enhance; conserve resources; meteorology; enforce; set environmental quality objectives, co-ordinate environmental policies and programs for the federal government (*Department of Environment Act*)
- Business lines: Clean, nature, weather, management.
- Understanding and reduction of human impacts/toxics on the health of ecosystems.

Pesticide Program Elements

- Core activities
  - research, monitoring, assessments and guideline/standards development
- Management activities
  - ministerial letters, admin. and finances, advice to senior management, coordination of activities internal & external, communication in & out

Science Policy Linkages

- What do we mean & why is it important?
- Intricately linked but often dipolar
- Government funding & government action depend on it
- Science and knowledge generation
- Policy to support our mandates & regulation

Science Policy Linkages

- Policy:
  - is what we will do with the science
    - made in Canada science?
    - timing & costs
  - not necessarily always science-based
    - risk-based decision making means different things to different people
  - conflicting views within & between organizations
    - need for a system/process

Strategies and Action Plan

- Set out short and long-term goals and objectives, deliverables and milestones (products and outcomes), performance indicators, influences etc.
  - Based on mandates - business lines
  - Based on Report on Plans and Priorities
  - Based on Sustainable Development Strategy
  - Based on what we do well, new opportunities, resource capacities and commitment to effect change

Past EC Program

- Pre-95, EC Pesticide Division
  - coordination HQ and regions, PESTFUND
- Mid-90s, EC Program Review
  - severely reduced capacity
- Late 90s early 10s, low priority, minimal activity
  - regional interests

Current EC Program

- A distributed network of scientists and activities (surveillance, monitoring, research, assessment, guideline development) across Regions, Institutes, labs and HQ
- **National coordination and direction has been initiated**

The New Pesticides Program

"Strategic Objective"

- All new incremental responsibilities are science related - surveillance, monitoring, research, assessment and guidelines/standards
- Deliver a <u>nationally-coordinated</u> and targeted science program on the presence and effects of priority pesticides in the Canadian environment
- Improve our understanding of the environmental risks of in-use pesticides and the use of this <u>knowledge in decision making</u>
    - Augment our ability to influence and support decision-making

The New Pesticides Program
"Current Context"

- Regulatory support and existing mandate
- Broad range of clients and decision-makers
  - Growers, industry, PMRA, public
- "Initial step" to reduce gap between demands and existing capacity
- Expectation and willingness for improved collaboration and cooperation with other S&T departments and the regulator

Globe and Mail Article

Response to CESD report, Oct. 7., 2003

"The federal government is approving new pesticides without basic information, such as how they act in the environment and whether they harm children."

At the Federal Level

Shared S&T Challenges & Opportunities

- Timing/coordination with regulatory action - *shift from reactive to proactive science knowledge generation*
- Priority setting - *who's priorities? Identifying areas of common interest*
- Strategic knowledge generation - *balancing mandate with industry obligation*
- Interdepartmental co-planning: EC, DFO and PMRA underway, AAFC, NRCan-Forestry
  - Collaboration on projects & methods
  - Building networks
  - Common reporting

Interdepartmental Workshop

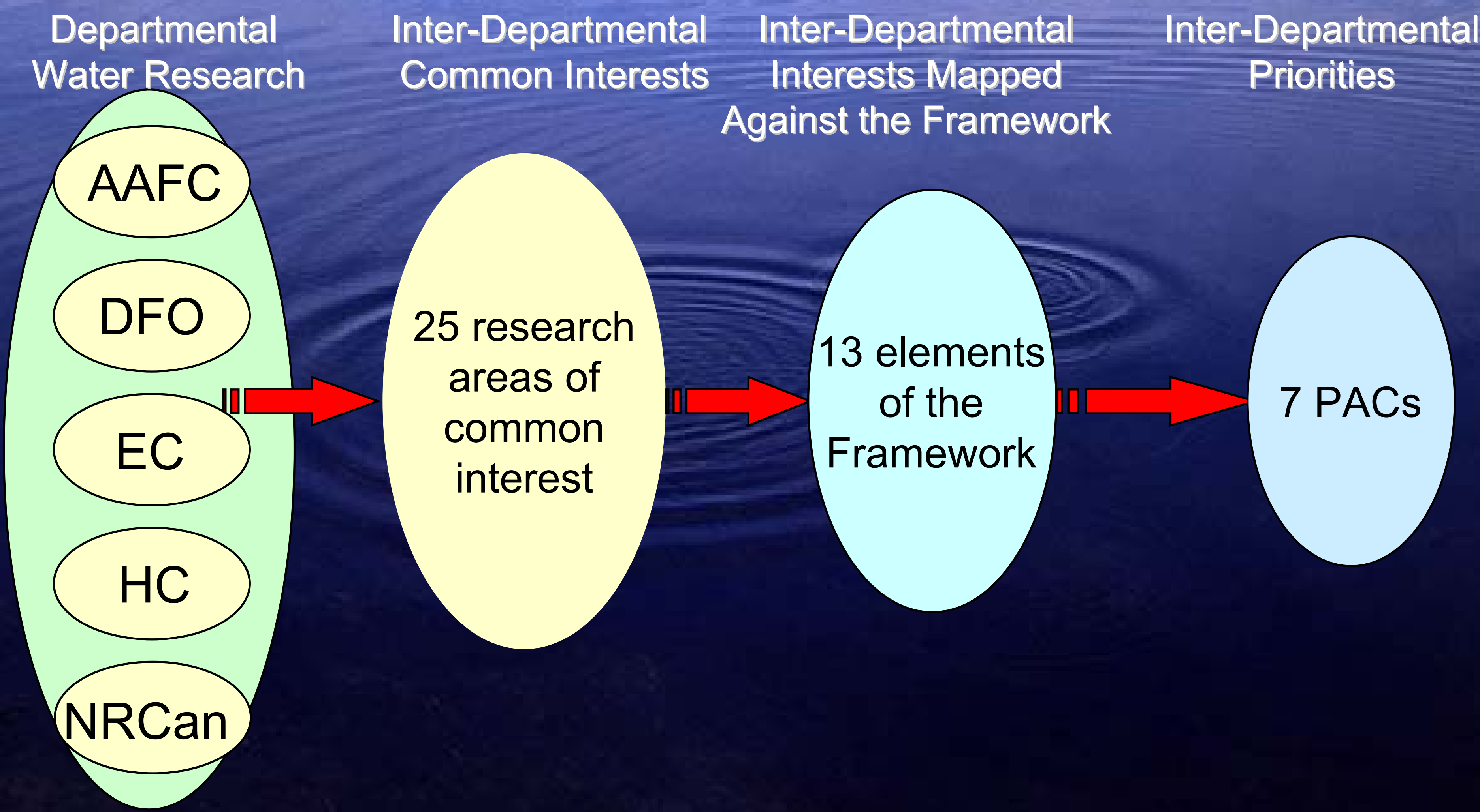
Ottawa, Dec. 2, 2003

Commitment to Treasury Board

Objectives:

- to share information on programs
- to identify collective priority gaps and issues in support of pesticide regulatory decisions
- to envisage potential solutions and avenues for collaboration
- to engage departments in a sustained effort for effective collaboration and timely information exchanges in support of pesticide regulations and departmental mandates.

Freshwater Research Network



Environment Canada Environnement Canada

Priority Areas for Collaboration (PAC)

Knowledge required for protection of human health

1. through source water protection
2. through surveillance

Knowledge required for protection of diversity of aquatic ecosystems

3. from effects of toxic chemicals & nutrients
4. from effects of land use practices

Knowledge required for sustainable use of aquatic resources

5. protection of habitat, health and productivity of fish stocks
6. availability, quality and optimum use of surface and ground water

Knowledge required for protection from water-related hazards & extreme events

7. impacts of severe hydrological events and adaptation strategies

Pesticide Memorandum of Understanding- EC/PMRA

- Enabling document with purpose, principles, implementation guidance and accountabilities
  - Accountability structure and contacts
- Core components:
  - Science Policy
  - **Science / Knowledge Generation**
  - Issue Management and Communication
  - Compliance Promotion and Enforcement

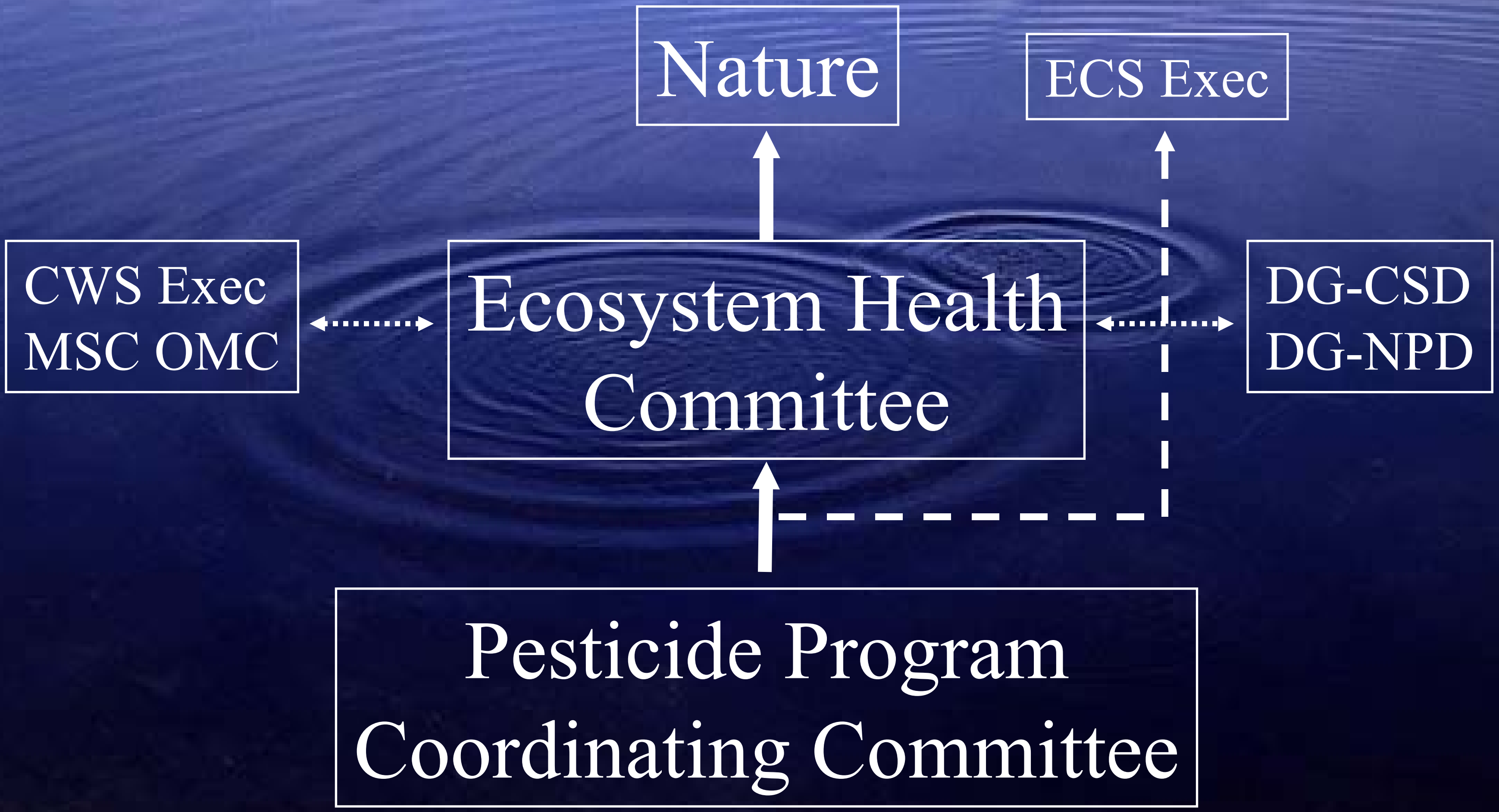
Who's Involved

Within EC	Regions ECS (CSD, WPCD, NWRI, CWS) EPS (TPPD, NPD) MSC (ACSD)
Close Partners	PMRA Federal House (DFO, AAFC, NRCan, HC…) CCME
At the Periphery	Public Industry ENGOs

Pesticide Program Coordinating Committee

- Mandate: direct and oversee the delivery of the Pesticide Program for the department
- Functions:
  - implement MOU & dev. annexes
  - direction & strategies, workplans short & long-term
    - PSF, APF Standards
  - establish priorities for EC mandate
  - encourage strategic dissemination of info.
  - strengthen linkages, EC, Federal House, FPT & key stakeholders

Likely Governance Mechanism



Program Activities

The Pesticides Science Fund
PSF

- Pesticide MC by PMRA
- Other departments funded, DFO, PMRA, NRCan, AAFC
- Most effective and accountable use of reduced funds ($2M yrs 1-2; $1M ongoing)
- Steering Committee to set priorities and provide national strategic direction
- Targeted, centrally administered O&M fund focusing on a predetermined set of EC priorities

PSF Strategic Themes 2003-2006

National environmental surveillance (50%):

- Aquatic ecosystems (Water Quality)
- Atmospheric (including transport)

Effects (50%):

- Fish and invertebrates
- Amphibians
- Birds
- Mammals
- Plants

PSF Recipients

- 52 LOIs
- 11 projects funded

Project Title	Contact
Reducing Pesticide Impacts in Aquatic Systems of PEI	Bill Ernst Mark Hewitt
Canadian Pesticide Air Sampling Campaign	Tom Harner Pierrette Blanchard
National study on the effects of pesticides on amphibians	Bruce Pauli
Use of the comet assay as a biomarker of potential population and organismal effects after exposure to a common in-use pesticide with genotoxic potential (chlorothalonil), and the validation of tissue cryopreservation techniques for sustained comet assay	Pierre Mineau
Single feed anticoagulant rodenticides – OCs for the 21st century ?	Pierre Mineau
Improving methodologies for pesticide risk assessment to non-target plants	Céline Boutin
Improved Ecological Risk Assessments for Pesticides in Aquatic Ecosystems	Joseph Culp
National Survey of Pesticides Aquatic Ecosystems in Canada	Janine Murray
The transport, environmental concentrations and effects of sulfonylurea and other currently used agricultural herbicides on prairie wetland landscapes.	David Donald
Raptor and waterfowl exposure to pesticides in agricultural ecosystems of southwestern BC	Laurie Wilson
Impact of the use of MSMA (monosodium methanearsonate) for bark beetle control on cavity nesting birds in British Columbia forests	John Elliott

National Water Surveillance

- *Presence, levels and relative risk of priority pesticides in selected aquatic ecosystems in Canada (J. Murray, NWRI)*
  - national 3-yr synoptic surveillance study
  - HQ coordination with all 5 regions and lab network
  - targeted ai's and sites
  - responsive to use surveys
  - preliminary trends on national exposures
  - wide partnership opportunities
  - guide future effects research

National Water Surveillance (cont.)

Pacific Yukon Region (Tuominen, Pasternak)

Partners: -BC Ministry of Water Land, and Air Protection
-BC Ministry of Agr., Fish & Foods
-Simon Fraser University
-PMRA (Vancouver Regional Office)

Parameters: acid herbs, OPs, OCs (lindane, endosulfan, methoxychlor), triazines, nitriles & misc. compounds (captan, glyphosate metam, metolachlor, trifluralin

Sites: 10 to 15 streams & 10 to 15 ground water stations each year

Locations: 2003-2004: Lower Fraser Valley
2004-2005: South Okanagan
2005-2006: Vancouver Island and/or urban-agricultural areas of the Lower Fraser Valley

National Water Surveillance (cont.)

Prairie Northern Region

Surveillance of sulfonylurea and other currently used agricultural pesticides on prairie landscapes (Dave Donald).

Partners: -Saskatchewan Agriculture, Food, and Rural Revitalization
-University of Saskatchewan (Toxicology Centre)
-Canada - Saskatchewan Irrigation Diversification Centre

Parameters: Sulfonylureas, acid herbs, neutral herbs, and OPs

Locations: 2003-2004: 6 rivers and 15 drinking water supply reservoirs
2004-2005: 6 rivers and 30 wetlands
2005-2006: 7 rivers

National Water Surveillance *(cont.)*

Ontario Region

Occurrence of in-use pesticides in Ontario Rivers and Great Lakes Areas of Concern (John Struger)

Partners:
- -DFO
- -OMOE
- -University of Guelph

Parameters: -triazine herbicides, phenoxy acid herbicides, sulfonyl urea herbicides, glyphosate, OPs, pyrethroids, and methoprene

Sites:
- -30 sites, including rivers
- -samples collected every 3 weeks during pesticide application season
- -4-8 events per year including some sampling after precipitation
- -Methoprene monitoring in Niagara, Hamilton, Burlington, & Ottawa

National Water Surveillance (cont.)

Quebec Region

Présence et suivi de pesticides dans les eaux du fleuve Saint-Laurent et de ses tributaires (Bernard Rondeau)

Partners: -Ministère de l'Environnement du Québec

Parameters: -Acid herbs, neutral herbs, OPs, carbamates, triazines, nitriles

Sites: -Mouths of Yamaska River, Saint François River, and Nicolet River.
-weekly samples for 15 weeks starting in mid May

-St Lawrence River at Quebec City, and at Wolf Island
-monthly samples, all year.

National Water Surveillance (cont.)

Atlantic Region

Multi-Media Pesticide Monitoring Program in Prince Edward Island: Pesticides in Surface Water (stream water, sediment and surface runoff water) (Clair Murphy)

Partners: -PEI Department of Fisheries, Aquaculture and Environment
-Atlantic Veterinary College, UPEI

Parameters: -Carbofuran, Dithiocarbamates, Metribuzin, Endosulfan (alpha and beta), Linuron, Azinphos-methyl, MCPA, Metalaxyl, Chlorothanonil, Heptachlor, Methamidophos, 2,4-D, Thiophanate-methyl, Atrazine, Imidacloprid, Cypermethrin, Fenfos

Sites: 2003- Mill River, Wilmot River, & Valleyfield River
2004- Dunk River, Souris River, & Big Pierre Jacques River
2005- Huntley River, Westmoreland River, Winter River

National Atmospheric Surveillance

Canadian Pesticide Air Sampling Campaign

(Pierrette Blanchard and Tom Harner, MSC)

Assess air concentrations of currently-used pesticides (CUPs) in agricultural and background regions across Canada through a national sampling campaign and intensive field study in a high usage agricultural region

Two complementary approaches:

- The implementation of the Canadian Atmospheric Network for Currently Used Pesticides (CANCUP)
- An intensive sampling campaign at several sites in the Canadian prairies.

Samples will be collected using high volume and passive air samplers and precipitation and deposition collectors

National Atmospheric Surveillance (cont.)

3 year study

Partners: AAC- Ste-Foy, ACC- Ottawa, SLRI-Cornwall, INRS-ETE, Ministère de l'environnement du Québec, PEI Fisheries, Aquaculture and Environment

Parameters: lindane, 2,4- D (all forms), atrazine, dicamba, mecoprop, metolachlor, endosulfan (alpha, beta, and sulfate), diazinon, chlorothalonil, chlorpyrifos

Study Sites:
1. Atlantic Region – Prince Edward Island
2. Quebec Region – St. Anicet, Baie St-Francois
3. Ontario Region – Egbert
4. PYR – Abbostford
5. PNR - Bratt's Lake (south), Hafford (central), Waskesiu (north)
6. An additional 5 passive samplers may be deployed at sites of interest

National Amphibian Effects Study

Effects of in-use priority pesticides on native amphibians (Bruce Pauli)

Partners: -DFO
-PMRA
-Trent University
-University of Waterloo
-Carleton University
-McGill University

Design: -5 Separate Studies include in-field exposures, laboratory experiments, and outdoor mesocosm experiments.
-Endpoints are both chronic and acute.

National Amphibian Effects Study (cont.)

Study #1 : *Assessment of pesticide exposure and effects in amphibians using agricultural habitats in the South Okanagan, British Columbia (John Elliot)*

Parameters: azinphos-methyl, diazinon, carbaryl, glyphosate, & triclopyr

Effects to be measured may include cholinesterase activity levels in adult and larval amphibians, hatching success, rates of developmental abnormalities, and disease challenge tests in a laboratory setting following pesticide exposure

National Amphibian Effects Study (cont.)

Study #2: *Toxicity to amphibians of herbicides commonly occurring in Saskatchewan wetlands (Doug Forsyth)*

Parameters: MCPA, 2,4-D, bromoxynil, dichlorprop, Dicamba, mecoprop and triallate

Design:
1) determine the presence and frequency of health deficits and developmental abnormalities in amphibians
2) mesocosm-based exposures of larval amphibians to priority prairie pesticides.

National Amphibian Effects Study (cont.)

Study #3: *Endocrine effects of atrazine and other row crop pesticides on amphibians. (Pam Martin)*

Parameters: Atrazine and metolachlor

Design: 1) Assess the extent of atrazine and metolachlor contamination of lentic wetlands in watersheds of intensive corn/soybean agriculture in southwestern Ontario.

2) Assess endocrine effects of these pesticides on amphibians inhabiting wetlands and surrounding agricultural habitat through field monitoring of adult and emerging juvenile leopard frogs.

National Amphibian Effects Study (cont.)

Study #4: *Measuring the effects of exposure to in-use pesticides: Influence on the incidence of disease and developmental abnormalities in Canadian amphibians (Bruce Pauli)*

Pesticides: candidates are atrazine, glyphosate, metolachlor, chlorothalonil, captan, carbaryl, malathion, chlorpyrifos, methoprene, diflubenzuron, & possibly surfactants

Design: 1) Multiple laboratories will conduct chronic exposures of leopard frogs and assess effects on hatching, survival, growth, metamorphosis, and deformities

2) Examine tissue samples for immune function, gonadal histology and virus burden

3) Pathogen challenges to assess immune system suppression

National Amphibian Effects Study (cont.)

Study #5: *Comparing the sensitivity to pesticides of Canadian amphibian and fish species and establishing the importance of amphibians as an environmental indicator (Bruce Pauli)*

Pesticides: candidates include: atrazine, metolachlor, carbaryl, chlorothalonil, captan, & diazinon

Design: Acute and sublethal toxicity to early-life stages of leopard frogs and rainbow trout will be determined and compared under similar experimental conditions

Objective: Determine whether amphibian species are being protected by current regulations and how potential effects on amphibians might be mitigated

Prairie-Northern Region

Surveillance, transport, and effects of sulfonylurea and other currently used agricultural pesticides on prairie landscapes (Dave Donald)

Partners: -Saskatchewan Agriculture, Food, and Rural Revitalization
-University of Saskatchewan (Toxicology Centre)
-Canada - Saskatchewan Irrigation Diversification Centre

Parameters: Sulfonylureas, acid herbs, neutral herbs, and OPs

Design: -National projects (water & atmospheric surveillance, & amphibians)
-Fate of sulfonylurea and other herbicides in prairie wetlands
-Transport of sulfonylurea and other herbicides in surface and ground waters
-Effects of sulfonylurea and other herbicides on the integrity of wetland communities (algae, bacteria, invertebrates, fish, ducks)

Aquatic Effects

Reducing Pesticide Impacts in Aquatic Systems of PEI
(Bill Ernst)

Partners: AAFC, PEI, NB

Objective: Determine the principle factors affecting the aquatic deposition and impacts of pesticides used in agriculture in PEI

Parameters: azinphos-methyl, endosulfan, chlorothalonil, and carbofuran

5 Part Study

1. Toxicity of high risk pesticides under short-term pulses
2. Assessing levels of pesticides in runoff from potato land.
3. Examining the ecological effects of pesticide use in streams.
4. On-farm soil management practices to minimize/reduce runoff
5. The effectiveness of riparian buffer zones in reducing pesticide runoff.
6. Modelling to predict levels of pesticides in surface waters

Aquatic Effects

Improved Ecological Risk Assessments for Pesticides in Aquatic Ecosystems (Joseph Culp)

Partners: -AAFC, Canadian Rivers Institute & University of Saskatchewan

Parameter: Imidacloprid

Design: 1) Laboratory studies with selected aquatic invertebrates

2) Artificial stream mesocosm studies with field-collected invertebrate populations

3) Field monitoring at imidacloprid-contaminated stream site

Mammalian Effects

Use of the comet assay as a biomarker of potential population and organismal effects after exposure to chlorothalonil (Pierre Mineau)

Partners: University of Ottawa

Comet assay will be used to assess the genotoxicity of chlorothalonil in meadow voles.

Avian Effects

Single feed anticoagulant rodenticides (Pierre Mineau)

Parameters: Brodifacoum, bromadiolone, difethialone

Objectives:

- Development of in-house methodology for residue determination
- Collection of bird of prey liver samples in order to complete the cross-Canada survey of residue levels
- Laboratory studies will look at the consequence of liver residues in exposed wildlife (bobwhite quail)

Avian Effects (cont.)

Impact of the use of MSMA (monosodium methanearsonate) for bark beetle control on cavity nesting birds in British Columbia forests (John Elliott)

Partners: BCMOF, Simon Fraser University, & UBC

Design: 1) Insects will be identified to species, pooled by site and analyzed for arsenic

2) A preliminary assessment of arsenic exposure and effect in woodpeckers will also be conducted

Avian Effects (cont.)

Raptor and waterfowl exposure to pesticides in agricultural ecosystems of southwestern British Columbia (Laurie Wilson)

Partners: AAFC, PMRA, BC, Yukon

Parameters: carbofuran, fensulfothion, phorate, fonofos, terbufos, parathion, fenthion & chlorpyrifos

Design: 1) Monitor the incidence of secondary poisoning of raptors by currently used agricultural pesticides, in particular OPs (chlorpyrifos) the preferred product to control wireworm pests in potatoes.

2) Determine the density of waterfowl and raptor use of selected fields treated with Chlorpyrifos G in the Delta area, & estimate the numbers of dead wildlife

Non-Target Plant Effects

Improving methodologies for pesticide risk assessment to non-target plants (Céline Boutin)

Partners: PMRA, Carleton University, US EPA

Parameters: atrazine, bromoxynil, dicamba, glyphosate, metolachlor, metsulfuron methyl, pendimethalin, picloram, triallate

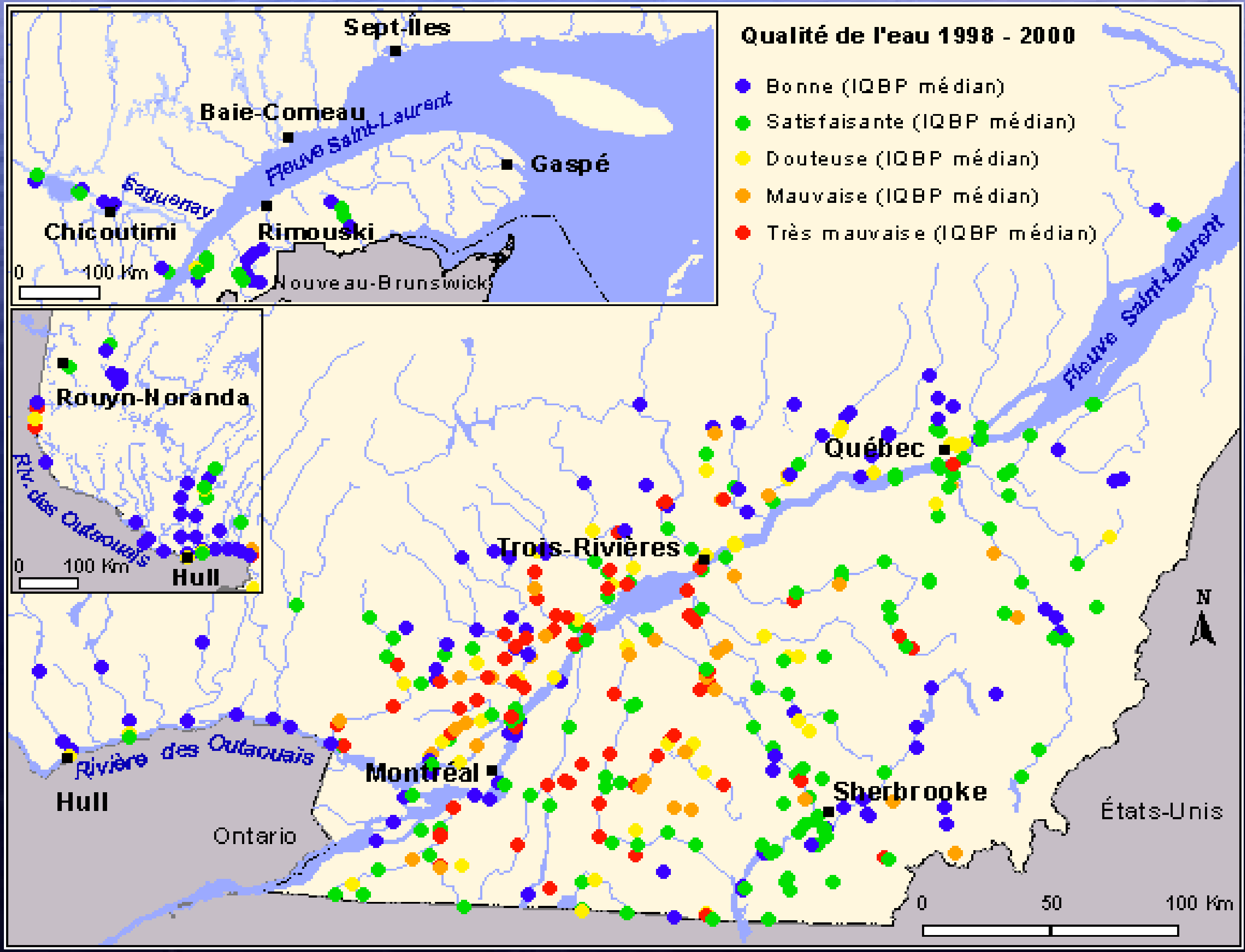
Design: -Plant species will represent species typical of areas that may be affected: woodland species (herbs, ferns, shrubs and trees), wetland emergent species, & hedgerow species

-Sensitive non-destructive endpoints will be evaluated: e.g., photosynthetic rates, stomatal conductance, genotoxicity techniques

-Compare sensitivities of plant species growing under greenhouse and field conditions


Merci!

Water Quality Index - Quebec



Back

Residues of Selected In-use Agricultural Pesticides in Farm Runoff on the Lower Mainland of British Columbia

by

M.T. Wan, J. Kuo & J. Pasternak

Environment Canada
Environmental Protection Branch
Commercial Chemicals Division, Pacific Region
401 Burrard Street, Vancouver, B.C.
Canada V6C 3S5

November 27, 2003

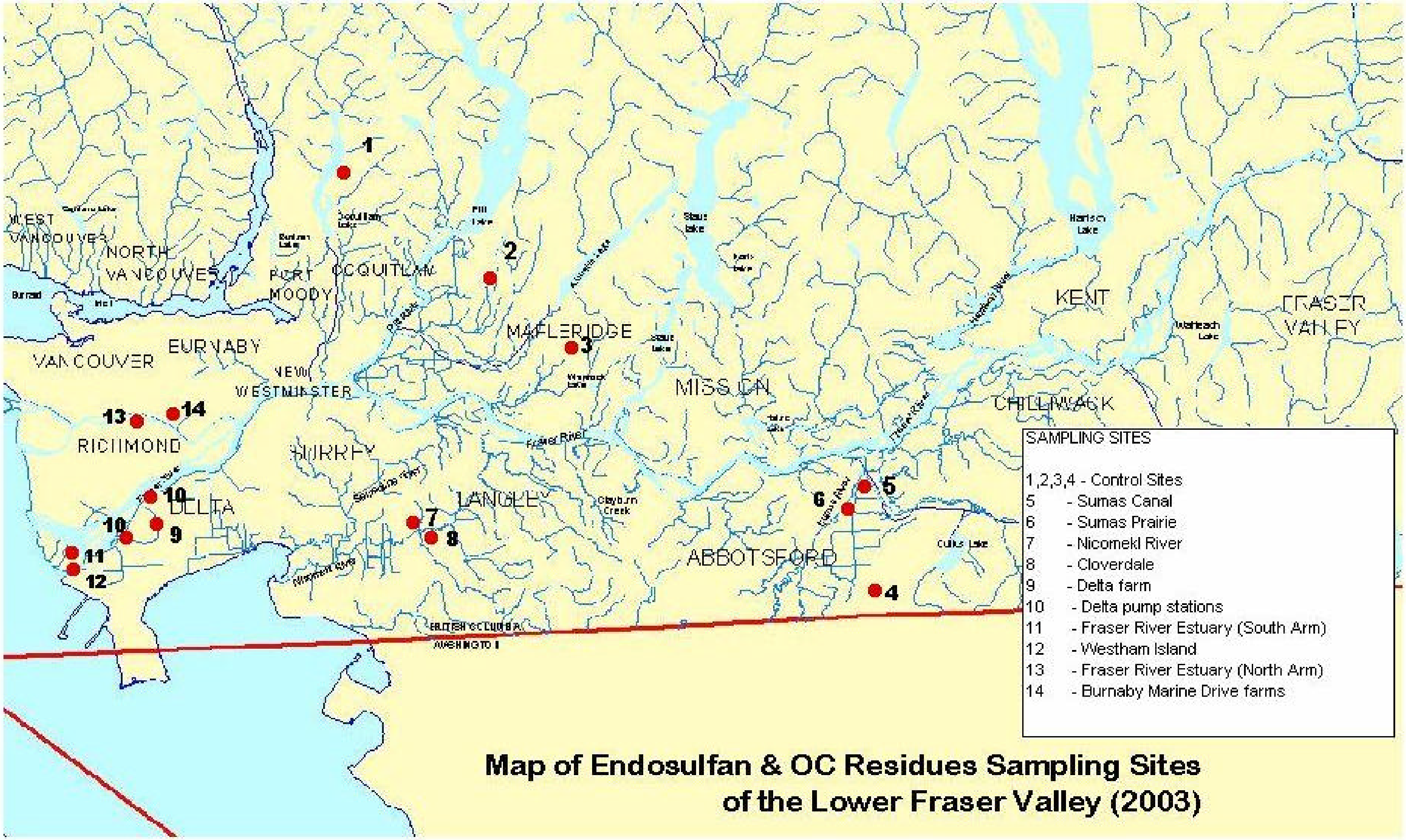


Figure 1 Sampling Sites

ABSTRACT:

- **Study objective = to identify and determine the state of in-use pesticide contamination in farm run-off on the Lower Mainland and possibly the Okanagan in future years**
- **Project in progress and Figures 1 show PSF sampling sites**
- **Water and selective sediment samples were collected and analyzed for residues of parent pesticides listed in Table 1**
- **CCD is funding PESC Lab to develop analytical method for selective transformation products listed in Table 1**
- **Each water sample will be split to the filtered and unfiltered components, then extracted and analyzed separately**
- **Partially completed first phase of 2003/2005 sampling program**

PSF Pesticides/TP list - June 2003

Developed by CCD with inputs from AASD (using regional A-base funding only)

Acid extractable pesticides:

- **2,4-D** (*2,4-dichlorophenol*)
- **dicamba** (*5-hydroxydicamba*)
- **trichlorpyr** (*3,5,6-trichloro-2-pyridinol*)
- **MCPA** (*4-chloro-2-methylphenol*)
- **Mecoprop** (*4-chloro-2-methylphenol)*

Organochlorine pesticides:

- g**-BHC** (*pentachlorophenol*)
- a**-endosulfan** (*endosulfan sulfate*)*
- b**-endosulfan** (*endosulfan sulfate*)*
- **methoxychlor** (*o,p'-methoxychlor*)

Organophosphate pesticides:

- **azinphos-methyl** (*azinphos-methyl oxon*)
- **chlorpyrifos** (*chlorpyrifos oxon*)
- **diazinon** (*diaoxon*)
- **dimethoate** (*omethoate*)
- **malathion** (*malaoxon*)
- **methamidophos****
- **naled** (*dichlorvos*)
- **parathion** (*paraoxon*)
- **terbufos****

Nitrile pesticides:

- **benomyl** (*2-amino-benzimidozole*)
- **chlorothalonil** (*~90% remain as parent compound*)**

Triazine pesticides:

- **atrazine** (*atrazine desethyl, atrazine-2-hydroxy*)
- **simazine** (*simazine hydroxy*)

Miscellaneous pesticides:

- **captan** (*cis-1,2,3,6-tetrahydrophthalimide*)
- **Cu^{++}**
- **Glyphosate** (*aminomethylphosphonic acid*)
- **methoprene** (*7-methoxycitronellal*)
- **metam** (*methyl isothiocyanate, methyl isocyanate*)***
- **metolachlor** (*2-[(2-ethyl-6-methylphenyl)amino]-1-propanol*)
- **quintozine** (*pentachloroaniline*)
- **trifluralin****

TP = transformation product; ** no substantial transformation product; *** may order later

Figure 2 Sumas Road South., Chilliwack

Figure 3 Marine Dr., Burnaby

Figure 4 Westham Is., Delta

Figure 5 Westham Is., Delta

Figure 6 104 Str., Delta

Figure 7 104 Str., Delta

Figure 8 & 9 **Marine Dr., Burnaby**

Figure 10 104 Str., Delta

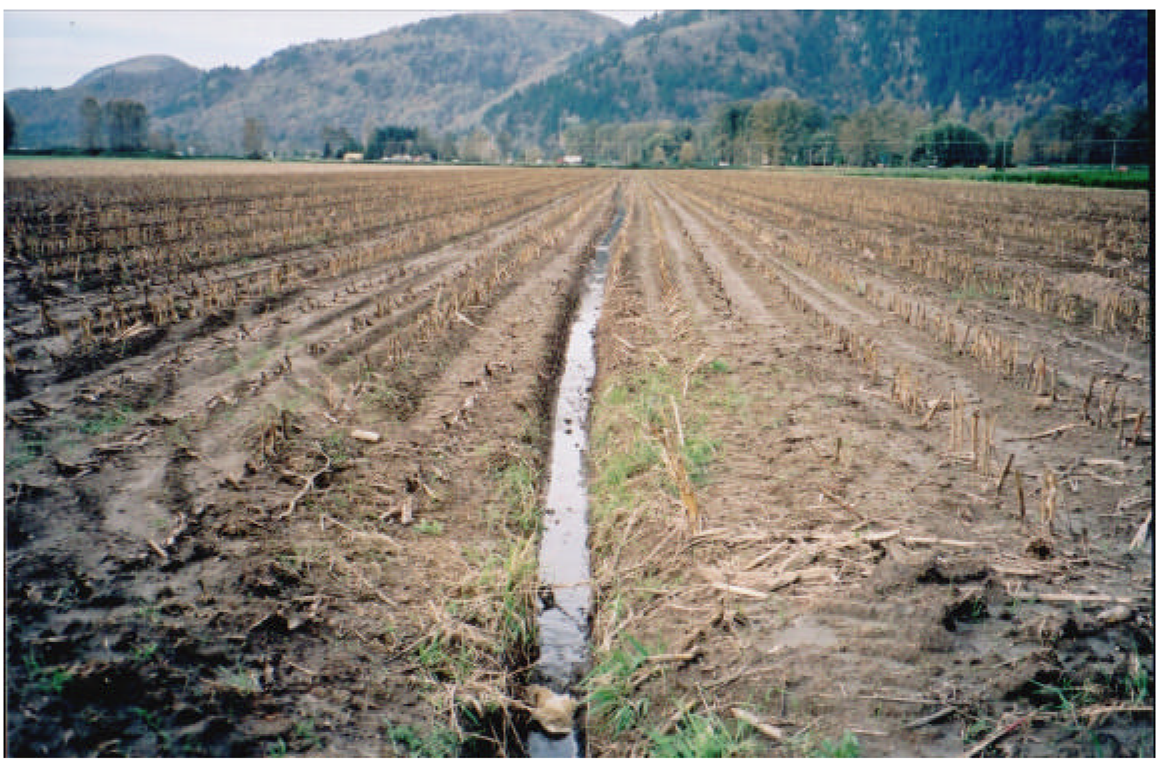


Figure 11 Dixon Rd., Chilliwack

Figure 12 Ross rd., Abbotsford

Figure 13 168 Str., Surrey

Figure 14 168 Str., Surrey

Figure 15 168 Str., Surrey

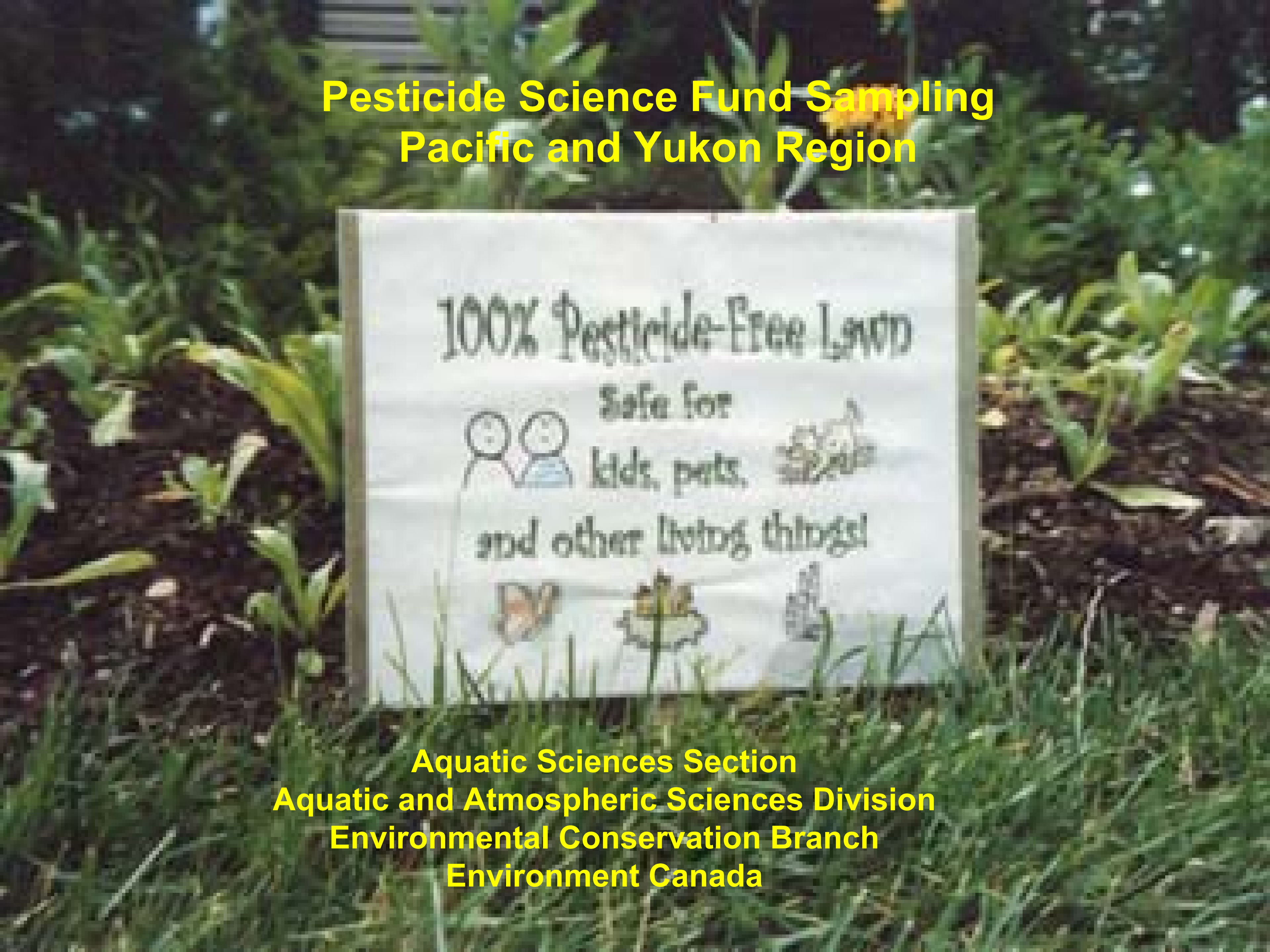
Pesticide Science Fund Sampling – Pacific and Yukon Region

Presented by Mark Sekela, Aquatic and Atmospheric Sciences Division, Environmental Conservation Branch, Environment Canada

Abstract

The Aquatic and Atmospheric Sciences Division of Environment Canada began sampling surface waters and groundwaters for the presence of in-use pesticides in the Pacific and Yukon Region. Sampling commenced in September with a joint Provincial-Federal sampling of the sediment, biota (fish) and water of Duck Lake (Creston, B.C.); a waterway recognized internationally for it's importance as a waterfowl refuge and Bass fishery. Following the first significant rain event of the summer (October 12) surface water and groundwater sampling commenced at 15 surface water streams and 10 groundwater wells to measure the presence of in-use pesticides in the lower Fraser Valley. Surface water sampling sites were selected to coordinate with field drainage sampling sites sampled by the Environmental Protection Branch of Environment Canada. In an effort to determine the most appropriate sampling methods for future sampling both 20 liter and 1 liter samples were collected at each site. The 20 liter samples were run through a XAD resin column to improve potential detection limits whereas the 1 liter samples were treated as a whole water sample. All samples have been submitted to the analytical laboratory for analyses.

Pesticide Science Fund Sampling
Pacific and Yukon Region



Aquatic Sciences Section
Aquatic and Atmospheric Sciences Division
Environmental Conservation Branch
Environment Canada

insecticide containing DDT descends on passengers in this 1955 photo


DEC. 11. 1997
18:38



May 17, 2001
Covington,
Louisiana


June 21, 2001
Seven Springs,
North Carolina


September 1, 2002
Rosedale,
Mississippi

Objective: survey the aquatic environment for *in-use* pesticides

- Lower Fraser Valley, Okanagan, Vancouver Island
- Based on 1999 pesticide sales data
- OC's, OP's, AEH, Nitriles, Triazines, others
- 20L versus 1L samples

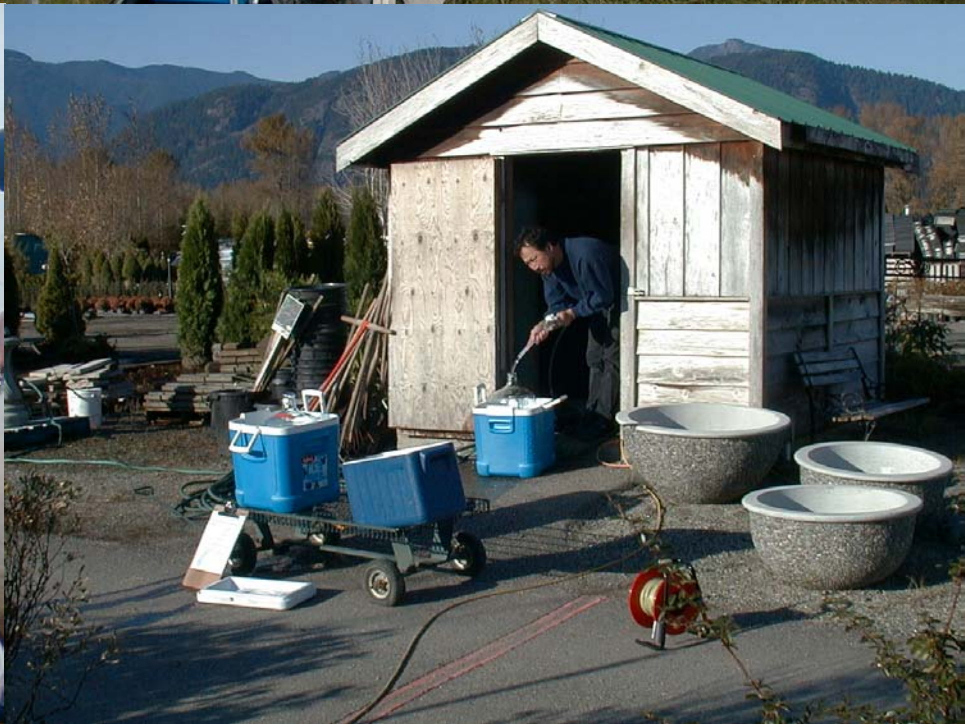

22/07/2003

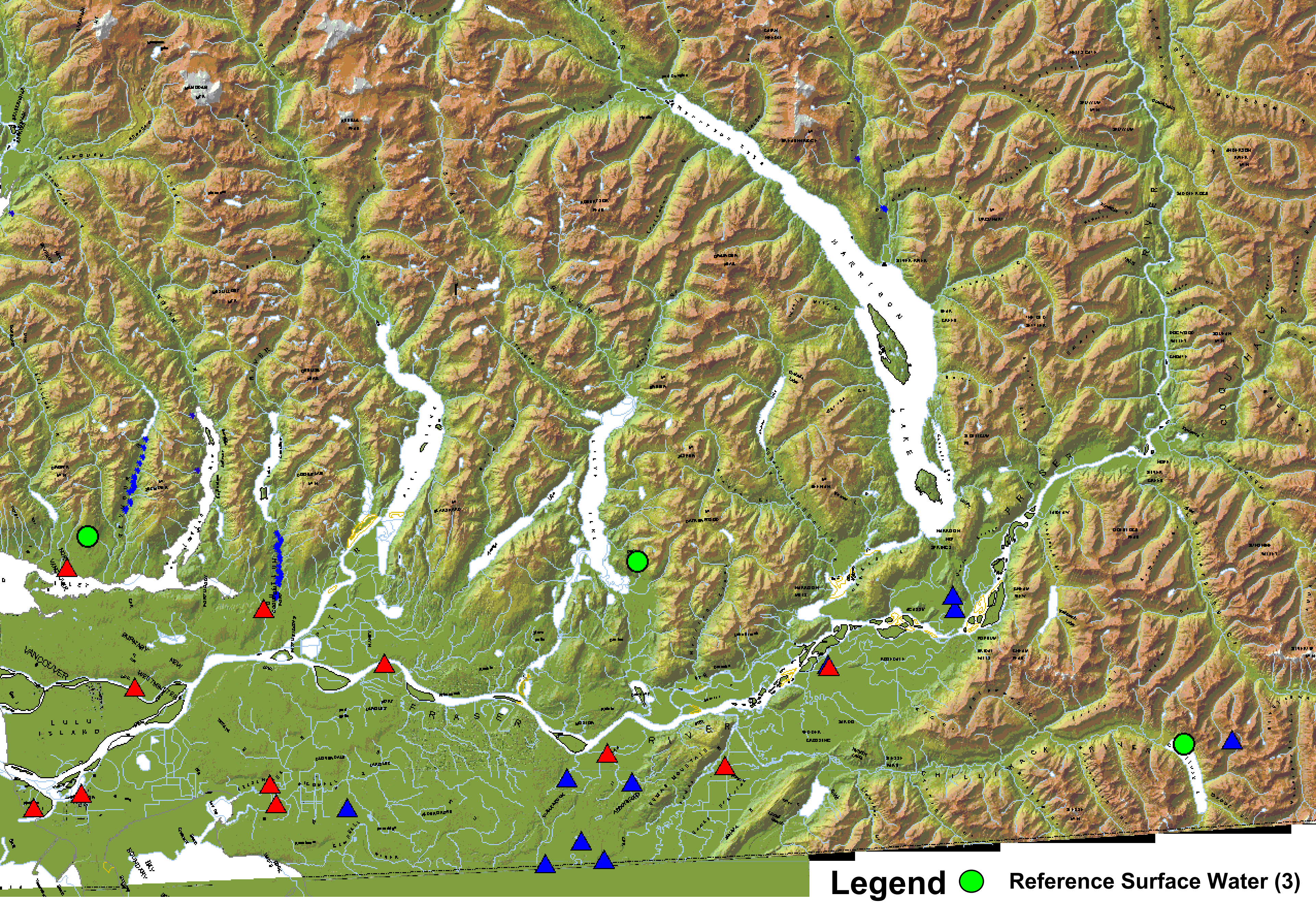

Environment
Canada
Environnement
Canada
FIELD LABORATORY
4x4


CHEVROLET

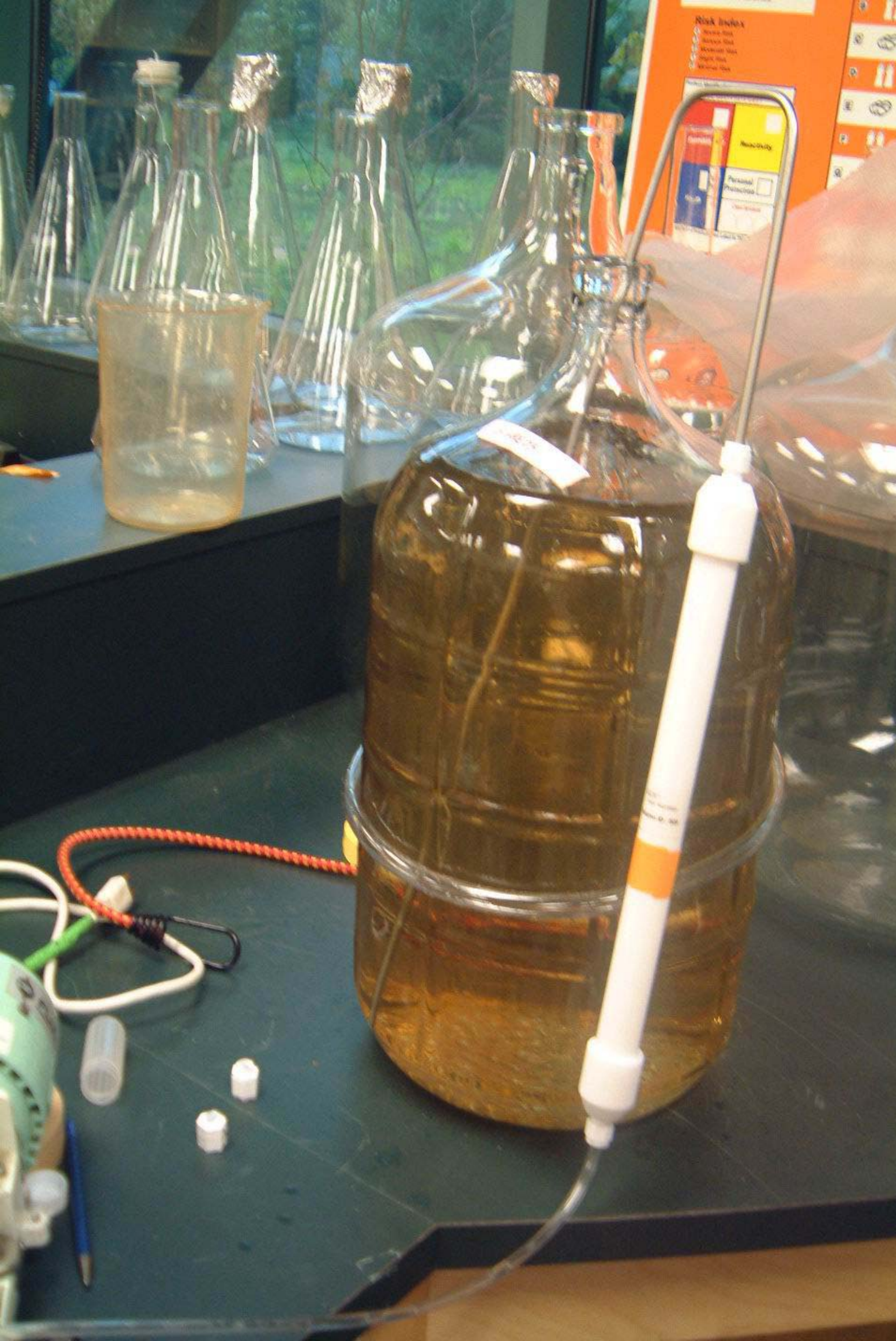

LADNER BOTTLE DEPOT


LAFARGE
VALLEY RITE MIX LTD.



Sampling Sites in Lower Fraser Valley


Risk Index
Personal Protection

W.I.S.H.
Personal Protection Risk Chart
Tableau des risques à la protection de la personne
W.I.S.H.
Burdick & Jackson
Honeywell
Burdick & Jackson
Honeywell


Andrea Ryan, Taina Tuominen, Gail Moyle, Basil Hii,
Melissa Gledhill, Monique Fluegel, Mike Mazalek
John Pasternak, Mike Wan, Jen-ni Kuo
Brad McPherson, Richard Strub

Atmospheric Concentrations of Pesticides

in the Georgia Basin Airshed

Wayne Belzer

Environment Canada

Vancouver B.C.

Abstract

- The air in the Georgia Basin contains a wide variety of pesticides and particles.
- Some of these substances are locally produced but some are the result of long-range transport to this area.
- Over a five-year period Environment Canada has sampled the air and rainfall in four different locations to assess presence and impacts on the Georgia Basin.

Strategy

- No previous assessment of persistent organic pollutants (POPs), toxic chemicals on the Priority Substance List (PSL), and no deposition assessments of loadings to the land, water and vegetation
- LFV that extends into Whatcom County in Washington State. This area is home for 80% of the population of British Columbia (B.C.), estimated at over two million people
- Area where salmon migrate to the sea (Fraser River) as well as a major flight path for migratory birds.
- The LFV has a very diverse land use, ranging from dense urban (Vancouver), recreational (Coast Mountains) to agricultural (upper Fraser Valley area).

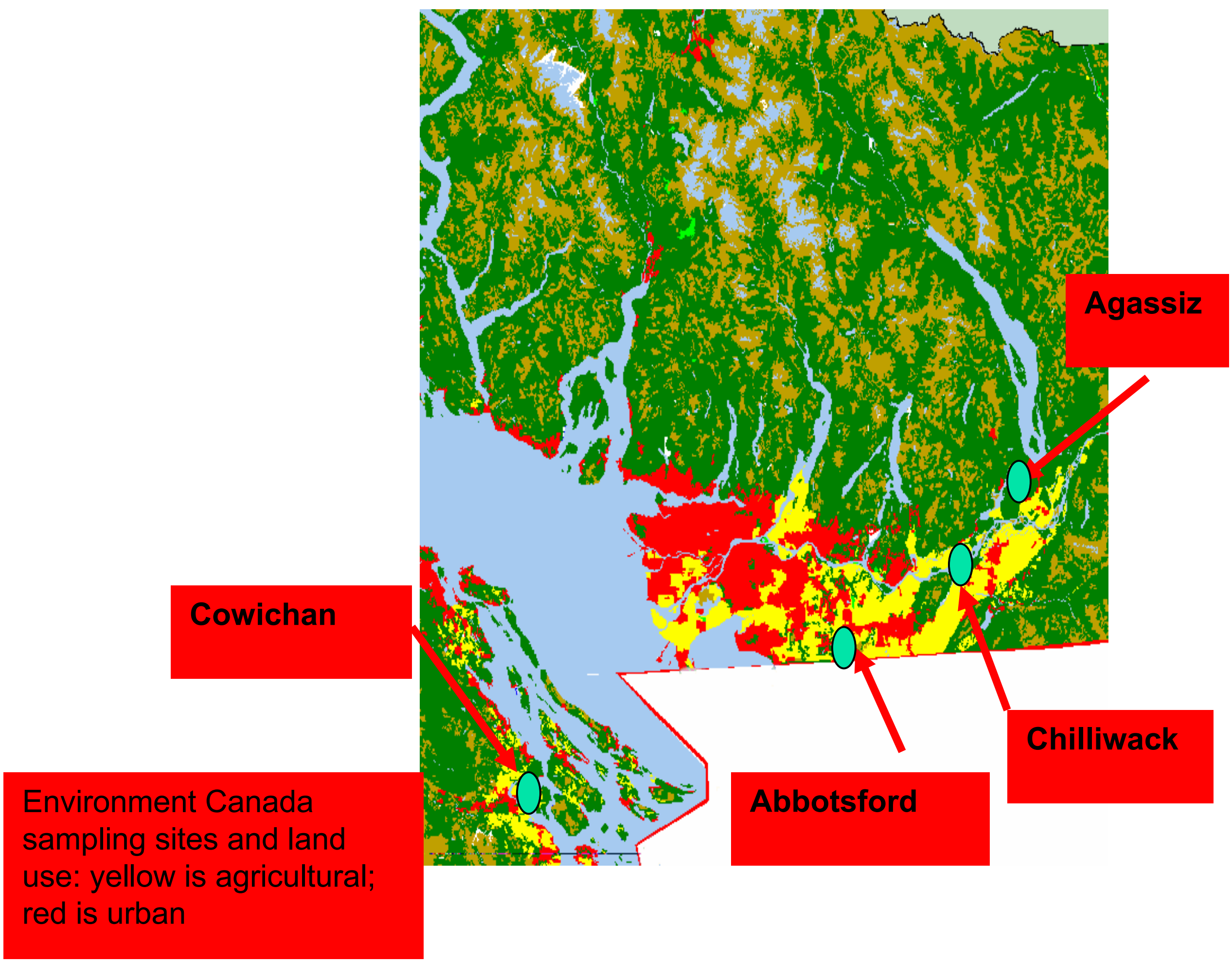
Sites

- GB/PS

Georgia
Basin
Whistler
Merritt
Campbell River
Powell River
Courtenay
Squamish
Fraser River
Hope
Strait of Georgia
Vancouver
Nanaimo
Bellingham
Victoria
Strait of Juan de Fuca
Puget
Sound
Pacific
Ocean
Port Angeles
Seattle
Tacoma
Olympia
20 0 20 40 60 Kilometers

Sites

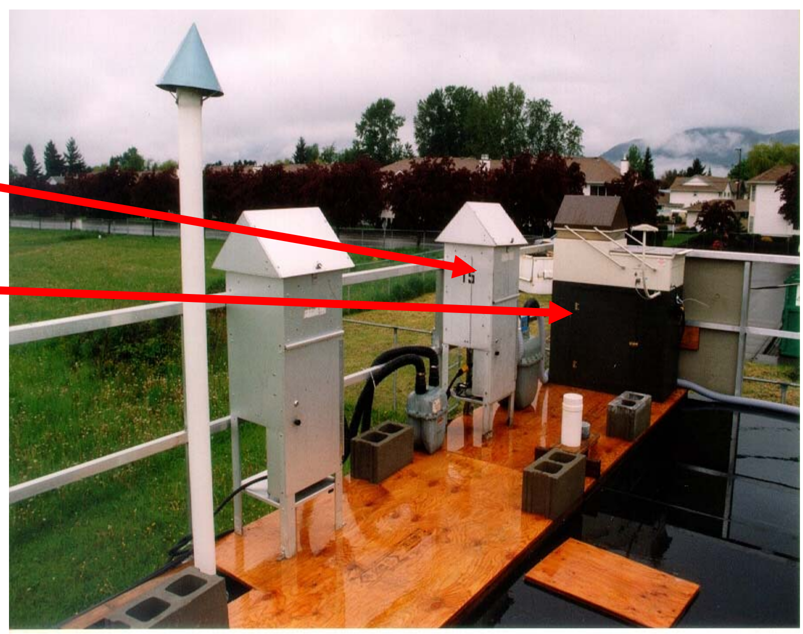
- Sites in LFV



Station

Sampling Procedures

- Equipment
  - HV/PUF
  - Rain-organic



Data and Discussion

- Analyses
  - Analytical Services Laboratory (ASL), was responsible for sample media preparation and sample analyses.
  - Organic Samples:
    - Submitted for analyses included rainwater samples collected on XAD-2 resin columns and
    - Dry-air samples taken on high volume filters and polyurethane foam plugs with an XAD-2 resin backup (HV/PUF).

QA

- Quality Assurance
  - Field Data
    - standard Environment Canada procedures for quality assurance
  - Lab Data
    - included method blanks, sample replicates, certified and standard reference materials and analyte or matrix spikes.

Concentration Data

- We get some chemicals at one site, and some at more than one.
  - Some sites did not have all analyses performed
  - Common Rainfall Sites:
    - **Captan** at Agassiz & Abbotsford
    - **HCB** at Agassiz & Chilliwack
    - **2,4-D** at Agassiz & Abbotsford
    - **Diazinon, Malathion** and **Dichlorvos** at Agassiz, Chilliwack and Abbotsford
    - **PAHs** are ubiquitous

Rainfall	Cowichan	Chilliwack	Abbotsford	Agassiz
Concentration (ug/L)	Apr 18/00 - Mar 6/01	May 18/99-Apr 8/00	Feb 6/96-Mar 4/97	Jan 17/97 to Feb 25/97
	Average	**Average**	**Average**	**Average**
Benzyl Butyl Phthalate	--	0.081	--	--
Bis(2-ethylhexyl) Phthalate	--	0.430	--	--
Di-n-butyl phthalate	--	0.275	--	--
Di-n-octyl phthalate	--	0.017	--	--
Diethyl phthalate	--	0.821	--	--
Dimethyl phthalate	--	0.060	--	--
2,6-Dichlorophenol	--	0.023	--	--
alpha-BHC	ND	ND	ND	0.038
Captan	ND	ND	1.397	0.132
cis-Chlordane (alpha)	ND	ND	0.057	ND
4,4'-DDT	ND	ND	ND	0.028
Dieldrin	ND	ND	ND	0.053
Endosulfan II	ND	0.002	ND	ND
Folpet	ND	ND	ND	0.083
Hexachlorobenzene	ND	0.001	ND	0.013
c-Permethrin	ND	ND	ND	0.014
t-Permethrin	ND	ND	ND	0.014
2,4-Dichlorophenoxy Acetic Acid	ND	ND	1.647	0.878
Chlorpyrifos	ND	0.003	ND	ND
Diazinon	ND	0.070	0.059	0.043
Dichlorovos	ND	0.029	0.049	0.036
Fensulfothion	ND	ND	ND	0.166
Malathion	ND	0.223	0.021	0.015
Mevinphos	ND	ND	ND	0.028
Phorate	ND	0.003	ND	--
Phenol	--	0.375	--	--
Aroclor 1248	0.0001	ND	--	--
Aroclor 1254	0.0001	ND	--	--
4-Chlorophenol	--	0.007	--	--
4-Chloro-3-methylphenol	--	0.007	--	--
2,4&2,5 Dichlorophenol	--	0.005	--	--
2,4,6-Trichlorophenol	--	0.001	--	--
2,3,4,6-Tetrachlorophenol	--	0.001	--	--
2,3,5,6-Tetrachlorophenol	--	0.000	--	--
Pentachlorophenol	--	0.019	--	--
Tetrachlorocatechol	--	0.000	--	--
4,6-Dichloroguaiacol	--	0.001	--	--
Acenaphthene	0.0001	0.0014	--	--
Acenaphthylene	0.0003	0.0056	--	--
Anthracene	0.0000	0.0006	--	--
Benz(a)anthracene	0.0000	0.0007	--	--
Benzo(a)pyrene	0.0001	0.0016	--	--
Benzo(b+j)fluoranthene	0.0002	0.0032	--	--
Benzo(c)phenanthrene	0.0000	0.0004	--	--
Benzo(e)pyrene	0.0001	0.0022	--	--
Benzo(g,h,i)perylene	0.0001	0.0018	--	--
Benzo(k)fluoranthene	0.0000	0.0008	--	--
Chrysene	0.0001	0.0024	--	--
Dibenz(a,c+a,h)anthracene	0.0000	0.0017	--	--
Dibenz(a,h)acridine	0.0001	--	--	--
Dibenzo(a,l)pyrene	0.0001	0.0011	--	--
Fluoranthene	0.0002	0.0059	--	--
Fluorene	0.0002	0.0029	--	--
Indeno(1,2,3-c,d)pyrene	0.0001	0.0014	--	--
Naphthalene	0.0013	0.0180	--	--
Perylene	0.0000	0.0007	--	--
Phenanthrene	0.0004	0.0106	--	--
Pyrene	0.0002	0.0049	--	--
Retene	0.0001	0.0047	--	--
1,4-Dichlorobenzene	--	0.0013	--	--

Concentration Data

- Common at Dryfall Sites:
  - **All sites**
    - Cis- and trans-Chlordane, HCB, Lindane
  - **Agassiz, Chilliwack and Abbotsford**
    - Dieldrin, Endosulfan 1& 2, Chlorpyrifos, Diazinon, Atrazine at Aldrin, Dinoseb, Dichlorvos, Fonofos, Parathion, Terbufos
  - **Agassiz & Chilliwack**
    - 4,4'-DDE
  - **Agassiz and Abbotsford**
    - Captan, Dachthal, Heptachlor, Heptachlor epoxide, t-Nanochlor, Oxychlordane, 2,4-D, 2,4,5-T

Organics - Dry-fall

HV PUF	Cowichan	Chilliwack	Abbotsford	Agassiz Site
Dry Concentrations	Apr 18/00 - Mar 6/01	May 18/99 - Feb 8/00	Feb 7/ 96 - Mar 4/ 97	Feb 20 /96 - May 21/ 96
Concentration (ng/m3)	Average	Average	Average	Average
Benzyl Butyl Phthalate	--	0.364	--	--
Bis(2-ethylhexyl) Phthalate	--	3.561	--	--
Di-n-butyl phthalate	--	5.699	--	--
Di-n-octyl phthalate	--	0.096	--	--
Diethyl phthalate	--	2.733	--	--
Dimethyl phthalate	--	0.472	--	--
Aldrin	ND	0.033	0.246	ND
Captan	ND	ND	1.823	1.448
cis-Chlordane (alpha)	0.002	0.013	0.188	0.226
trans-Chlordane (gamma)	0.003	0.011	0.102	0.260
2,4'-DDE	ND	0.028	ND	ND
4,4'-DDE	ND	0.051	ND	0.139
Dachthal	ND	ND	0.478	0.363
Dieldrin	ND	1.322	0.062	1.010
Endosulfan I	ND	1.945	0.620	0.708
Endosulfan II	ND	0.126	0.184	0.253
Heptachlor	ND	ND	1.024	0.148
Heptachlor Epoxide	ND	ND	0.131	0.288
Hexachlorobenzene	0.078	0.096	0.190	0.474
Lindane (gamma-BHC)	0.003	0.477	0.213	0.338
c-Nanochlor	ND	--	ND	0.184
t-Nanochlor	ND	--	0.077	0.217
Oxychlordane	ND	ND	0.244	0.278
2,4-Dichlorophenoxy Acetic Acid	ND	ND	2.301	6.646
Dicamba	ND	--	ND	1.708
Dinoseb	ND	0.206	4.770	ND
2,4,5-TP (Silvex)	ND	--	1.242	2.065
Chlorpyrifos	ND	5.720	0.666	0.612
Diazinon	ND	1.602	4.664	0.484
Dichlorovos	ND	ND	1.172	2.990
Dimethoate	ND	ND	ND	0.340
Fonofos	ND	ND	0.128	0.957
Malathion	ND	7.320	3.688	1.963
Mevinphos	ND	ND	5.556	ND
Parathion	ND	ND	0.418	0.157
Terbufos	ND	ND	1.246	0.512
Atrazine	ND	0.113	2.622	5.529
Phenol	--	16.579	--	--
Acenaphthene	2.271	1.928	--	--
Acenaphthylene	5.875	1.346	--	--
Anthracene	1.510	0.392	--	--
Benz(a)anthracene	0.583	0.171	--	--
Benzo(a)pyrene	0.655	0.183	--	--
Benzo(b+j)fluoranthene	1.300	0.460	--	--
Benzo(c)phenanthrene	0.176	0.079	--	--
Benzo(e)pyrene	0.516	0.253	--	--
Benzo(g,h,i)perylene	0.587	0.270	--	--
Benzo(k)fluoranthene	0.445	0.122	--	--
Chrysene	0.834	0.355	--	--
Dibenz(a,c+a,h)anthracene	0.098	0.041	--	--
Dibenz(a,h)acridine	0.144	0.028	--	--
Dibenzo(a,l)pyrene	0.260	0.167	--	--
Fluoranthene	2.323	1.680	--	--
Fluorene	3.827	2.711	--	--
Indeno(1,2,3-c,d)pyrene	0.695	0.197	--	--
Naphthalene	27.818	50.299	--	--
Perylene	0.213	0.077	--	--
Phenanthrene	9.988	6.958	--	--
Pyrene	2.098	1.505	--	--
Retene	2.698	1.060	--	--
1,4-Dichlorobenzene	--	2.655	--	--

Impacts

- Concentrations in rainfall may exceed "limits" in some jurisdictions
  - Agassiz
    - 4,4′-DDT
    - Dieldrin
    - HCB
    - Permethrin
    - Mevinphos
  - Chilliwack
    - HCB
    - Malathion
  - Abbotsford
    - Chlordane
  - Cowichan
    - Arochlors
- Local usage?

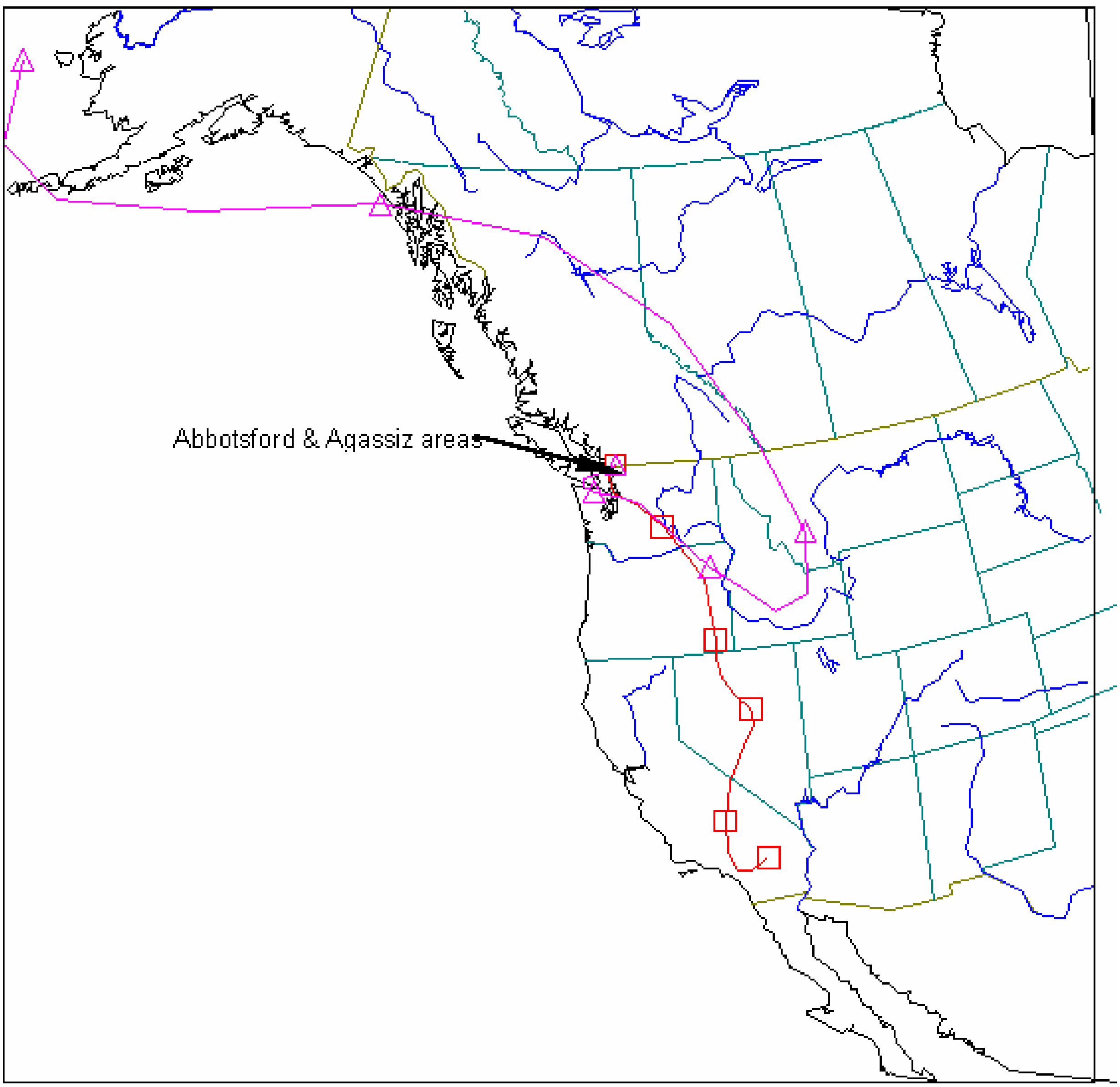
Impacts?

Rainfall										
Average	Apr 18/00 - Mar 6/01	May 18/99-Apr 8/00	Feb 6/96-Mar 4/97	Jan 17/97 to Feb 25/97						
Concentration (ug/L)	Cowichan	Chilliwack	Abbotsford	Agassiz	Value	Reg. Agency	Human Health Protection	Value	Reg. Agency	Aquatic Life Protection
cis-Chlordane (alpha)	ND	ND	0.05706	ND	0.00046	USEPA	Water for drinking, fish consumption	0.00053	Michigan	Cancer risk guideline
4,4'-DDT	ND	ND	ND	0.02775	0.000024	USEPA	Water for drinking, fish consumption	1.1	US	Criterion: Acute
Dieldrin	ND	ND	ND	0.05334	0.000071	USEPA	Water for drinking, fish consumption	0.0000315	Michigan	Cancer risk guideline
Endosulfan II	ND	0.0019	ND	ND	40	Australia	Raw waters for coarse screening	0.22	US	Criterion: Acute
Folpet	ND	ND	ND	0.08324	50	NY State	Standard	?		
Hexachlorobenzene	ND	0.0009	ND	0.01292	0.00072	USEPA	Ambient water quality criteria	0.0065	Ontario	Water Quality Objective
c-Permethrin	ND	ND	ND	0.01387	20	Quebec	Criterion for ingestion of water & aquatic organisms	0.0014	Netherlands	Dissolved ecotoxilogic value
t-Permethrin	ND	ND	ND	0.01387	20	Quebec	Criterion for ingestion of water & aquatic organisms	0.0014	Netherlands	Dissolved ecotoxilogic value
Chlorpyrifos	ND	0.0030	ND	ND	90	B.C.	Guideline	0.0035	Canada	Guideline
2,4-Dichlorophenoxy Acetic Acid	ND	ND	1.64728	0.87758	100	Oregon	Interim standard maximum	11	Netherlands	Dissolved ecotoxilogic value
Mevinphos	ND	ND	ND	0.02775	6	Australia	Raw waters for coarse screening	0.005	Netherlands	Dissolved ecotoxilogic value
Fensulfothion	ND	ND	ND	0.16648				?		
Malathion	ND	0.223	0.02069	0.01485	190	Canada	MAC	0.1	Ontario	Water Quality Objective
Aroclor 1248	0.0001	ND	--	--	0.000003	USEPA	Great Lakes Human cancer criterion(PCB total)	0.014	US	MAC 1 hr average
Aroclor 1254	0.0001	ND	--	--	0.000003	USEPA	Great Lakes Human cancer criterion(PCB total)	0.014	US	MAC 1 hr average
4-Chlorophenol	--	0.007	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.7	B.C.	Criterion - interim
2,4,6-Trichlorophenol	--	0.001	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.12	B.C.	Criterion - interim pH<7.5
2,3,4,6-Tetrachlorophenol	--	0.001	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.04	B.C.	Criterion - interim pH<7.1
2,3,5,6-Tetrachlorophenol	--	0.0002	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.02	B.C.	Criterion - interim pH<7.1
Pentachlorophenol	--	0.019	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.5	Ontario	Water Quality Objective
Tetrachlorocatechol	--	0.000	--	--	?			?		
2,4&2,5 Dichlorophenol	--	0.005	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.3	B.C.	Criterion - interim
2,3,4,6-Tetrachlorophenol	--	0.001	--	--	0.04	USEPA	Dist Columbia upper value raw water(phenol-tot chlorinated)	0.3	B.C.	Criterion - interim
Benzo(a)pyrene	0.0001	0.0016	--	--	0.01	Canada	Guidline MAC	0.015	Canada	Interim guideline
4,6-Dichloroguaiacol	--	0.001	--	--	?			?		
Acenaphthene	0.0001	0.001	--	--	20	USEPA	Max for organoleptic (tase & colour)	5.8	Canada	Interim guideline
Benzo(e)pyrene	0.0001	0.0022	--	--	?			0.0044	Netherlands	Ecolotoxicological value total
Benzo(g,h,i)perylene	0.0001	0.0018	--	--	?			0.0036	Netherlands	Ecolotoxicological value total
Benzo(k)fluoranthene	0.0000	0.0008	--	--	0.002	NY State	Guidance value; tumour causing substance	0.0041	Netherlands	Ecolotoxicological value total
Benz(a)anthracene	0.0000	0.001	--	--	?			0.018	Canada	Interim guideline
Benzo(b+j)fluoranthene	0.0002	0.003	--	--	?			?		
Benzo(c)phenanthrene	0.0000	0.000	--	--	?			?		
Dibenz(a,c+a,h)anthracene	0.0000	0.002	--	--	0.1	California	Proposed regulatory level	0.0018	Netherlands	ecolotoxicological value dissolved
Naphthalene	0.0013	0.0180	--	--	10	Road Island	Preventive action limit	1.1	Canada	Interim guideline
Perylene	0.0000	0.0007	--	--	?			?		
Dibenzo(a,l)pyrene	0.0001	0.001	--	--	?			?		
Fluoranthene	0.0002	0.006	--	--	?			0.058	Netherlands	ecolotoxicological value dissolved
Retene	0.0001	0.0047	--	--	?			?		
Perylene	0.0000	0.001	--	--	?			?		
1,4-Dichlorobenzene	--	0.001	--	--	<1	B.C.	Guideline aesthetic	26	Canada	Interim guideline

Concern

- Vagarities of Long Range and Short Range Transport
  - Winds.
  - February 1996
    - 2-4-D at both the Abbotsford and Agassiz sites; temperatures rose to approximately 20° C. The week before and the week after this sample period were periods of winter snowstorms.
  - A back-trajectory analysis of the winds showed
    - ground level winds (1000mb) came from southern California, near the Imperial Valley.
  - Confirmation
    - 2,4-D was used as a pre-emergent herbicide seed treatment, during the week.
  - Source
    - LTR from southern California.

Concern - LRT



Back trajectory - 2,4-D episode (1000 mb ■, and 850 mb Δ)

Summary

- The Georgia Basin area
  - has a diverse background concentration of organic chemicals.
- These substances vary in concentration
  - from background levels to peak amounts –
  - these increases may be due to local sources, or long-range transport.
- Impacts
  - To be determined

The End

- Thank you!

Pesticide exposure and effect in amphibians using agricultural habitat, South Okanagan, British Columbia

Sara L. Ashpole[1], Christine A. Bishop[2], John Elliott[2] and Laurie Wilson[2]

[1]Dept.of Zoology, University of Guelph, Guelph. Ontario, N1G 2W1, Canada. sashpole@uoguelph.ca), [2]Canadian Wildlife Service. 5421 Robertson Rd. Delta, British Columbia, V4K 3N2 (CAB.Bishop@ec.gc.ca; jelliott@ec.gc.ca; lwilson@ec.gc.ca)

Abstract

Many species of amphibians are the subject of serious conservation concern in Canada and elsewhere due to habitat loss and exposure to other anthropogenic stressors especially pesticide exposure. The Okanagan valley in BC is an intensive agricultural area where 80% of the natural wetlands and riparian areas have been developed. Yet due to the southerly location of this area, it also supports abundant and diverse amphibian populations that are known to use ponds and irrigated areas in agricultural lands. In the Okanagan valley, nationally endangered species (Tiger Salamander, *Ambystoma tigrinum*), threatened species (Great Basin Spade Foot Toad, *Spea intermontana*), and species of special concern (Western Toad *Bufo boreas*) still occur. Furthermore, the Northern Leopard Frog (*Rana pipiens*) has been extirpated from the South Okanagan for no known reason. Due to the presence of many rare species and the high potential for exposure to pesticides and the lack of natural habitat, it is necessary to assess the risk of amphibian populations to the impact of pesticides. In 2003, 15 conventional and nine organic farming ponds were surveyed for breeding adults and larval productivity to determine relative amphibian population densities. Habitat assessment, water chemistry, and sediment sampling was conducted at each site. All moribund and road-killed amphibians found in agricultural areas are to be analyzed for pesticides.

Assessment of pesticide exposure and effect in amphibians using agricultural habitat, South Okanagan, British Columbia

Sara Ashpole, Christine Bishop, Bruce Pauli, & John Elliott

The Southern Okanagan
Brief background

- Unique ecosystem in Canada
- 80% of wetlands lost
- Limited data on amphibian breeding sites
- Historic OC use high (DDT)
- Current pesticide use
- Effects on amphibians – limited data
- Species at risk

Amphibians of the South Okanagan

Nationally Endangered
- Tiger Salamander

Threatened species
- Great Basin Spade Foot Toad

Species of special concern
- Western Toad

Not At Risk
- Pacific Tree Frog
- Colombia Spotted Frog
- Long-Toed Salamander

Extirpated
- Northern Leopard Frog

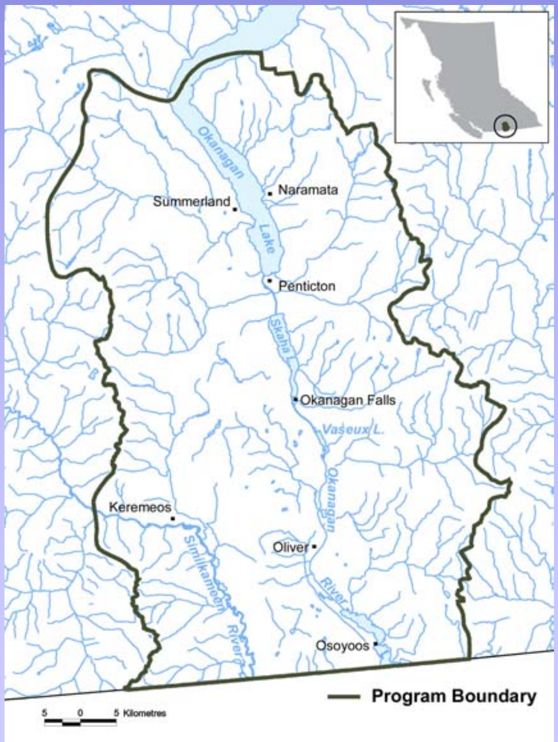
Introduced
- Bullfrog

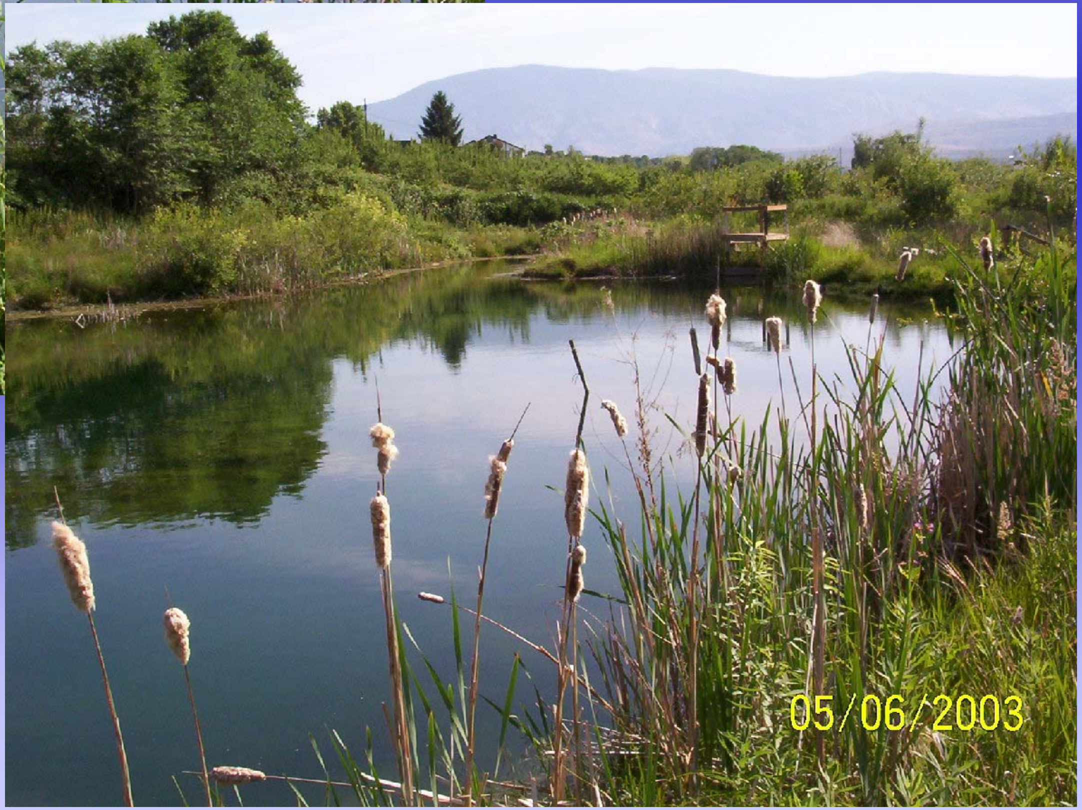
Project Purpose

Assess exposure and effects of pesticides on populations of amphibians, particularly listed species.

Methods
2003

- Identification of study ponds
- Survey for amphibian use
- Preliminary water, sediment & tissue sampling
- Habitat assessment




05/06/2003


30/06/2003

Results

- 84 sites surveyed, 24 used – most in valley bottom
  - many lost to in-filling (~22)
  - problems with fish predation and variation in amphibian density
- Farming practices
  - High density farming
  - Biodynamic farming
  - Integrated pest management
  - Pesticide management

Survey results

Species	Number of Sites Observed	
	Tadpole/Larvae	Any Stage
Tree Frog	13	20
Spade foot Toad	6	9
Western Toad	3	7
Columbia Spotted Frog	3	5
Tiger Salamander	3	4
Bull Frog	0	3
Long-toed salamander	1	1

2004 Field Season

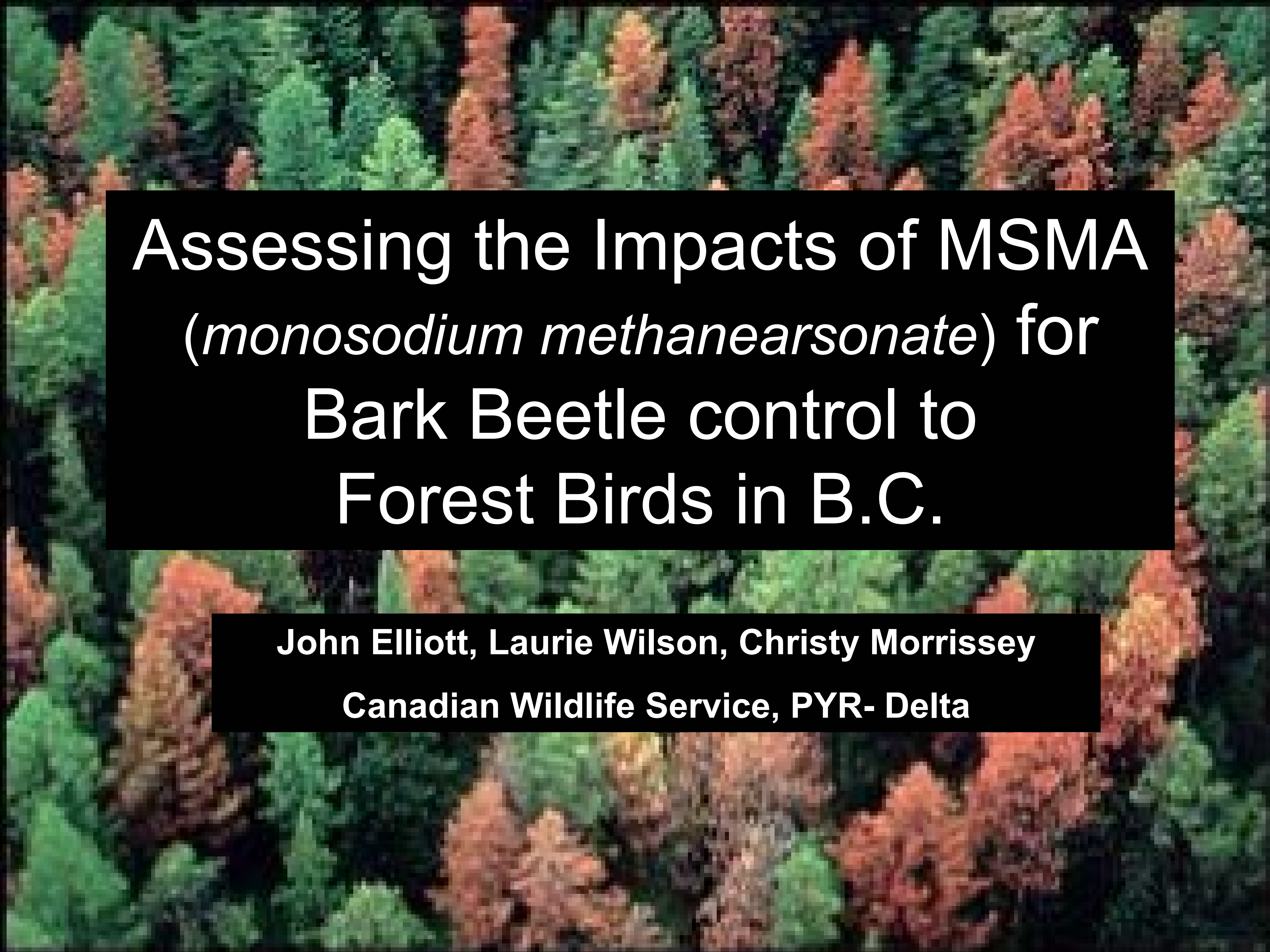
- Serial water chemistry sampling
- Closer monitoring for habitat changes
- Continue searching for sites
    - High elevation
    - Ranching effect
    - Logistics, size
- Cage studies to assess hatching success and deformities
- Genetic component

Assessing the impacts of MSMA (monosodium methanearsonate) for Bark Beetle control to forest birds in B.C.

John Elliott, Laurie Wilson and Christy Morrissey, Canadian Wildlife Service, PYR, Delta, B.C.

Abastract

Recent and historical outbreaks of the mountain pine beetle (*Dendroctonus ponderosae* Hopkins) have caused significant damage to forests in British Columbia through destruction of thousands of hectares of large diameter, mature and overmature lodgepole pine, ponderosa pine and white pine. Management strategies employ a variety of techniques to reduce losses from beetle outbreaks including the use of insecticides such as monosodium methanearsonate (MSMA). Given that insectivorous birds, particularly woodpeckers, can be attracted to beetle outbreak areas in forests due to increased food availability, these birds may be subsequently exposed to elevated concentrations of organic arsenicals in their invertebrate prey from MSMA treated trees. We assessed the risk to avian predators through analysis of bark beetles from different life stages and in trees with known MSMA treatment (4 weeks and 1 year after treatment) to determine levels of total arsenic and organic/inorganic arsenic speciation. MSMA metabolites were highest in adult mountain pine beetles relative to larval and pupal stages and other insects collected from trees 4 weeks and 1 year post treatment. Concentrations in adult mountain pine beetles from MSMA treated trees ranged from 55-82 µg/g dw with the organic metabolite monomethyl arsine (MMAA) contributing over 90 % to the total arsenic extracted. Mountain pine beetles from control trees rarely had detectable arsenic concentrations. Debarking indices indicated woodpecker foraging of MSMA treated trees was significantly lower than control trees likely due to mortality of beetles. However; approximately 30% of MSMA treated trees had some evidence of woodpecker use (5 % to 100% debarking). In general, there is a lack of data on the toxic effects of MSMA to wildlife, particularly birds. Given the extent of mountain pine beetle infestation and the increasing use of MSMA in British Columbia forests, this study addresses important knowledge gaps on woodpecker exposure to MSMA in areas with bark beetle infestation.



Assessing the Impacts of MSMA (*monosodium methanearsonate*) for Bark Beetle control to Forest Birds in B.C.

John Elliott, Laurie Wilson, Christy Morrissey

Canadian Wildlife Service, PYR- Delta

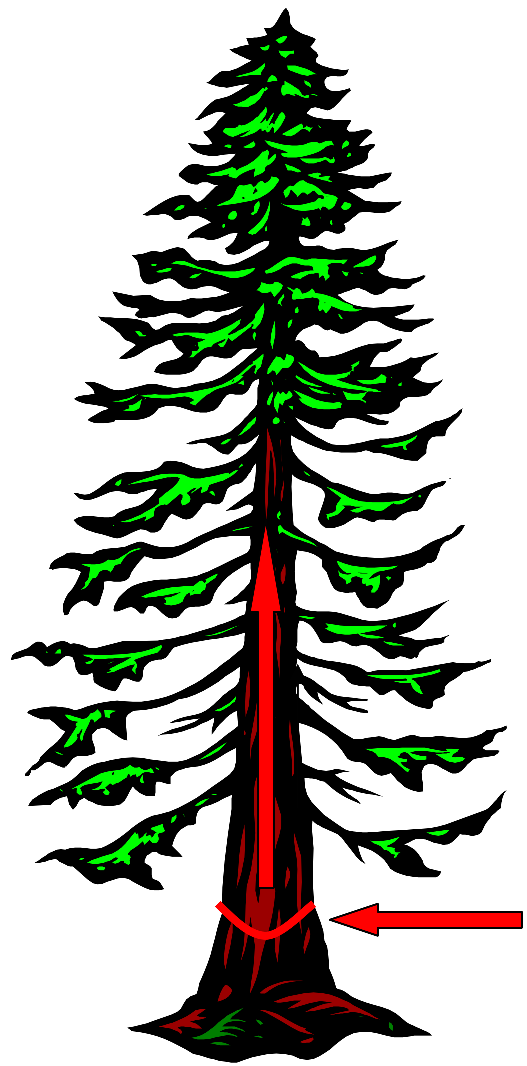
Mountain Pine Beetle (MPB) Outbreak in B.C.

- MPB attacks and kills large mature and overmature lodgepole pine, ponderosa pine and white pine.
- B.C.'s MPB infestations have increased exponentially in past 5 years.
- MPB red attack doubled in 2003 over 2002 (Approx. 4.2 million ha attacked in 2002).

MSMA treatment in B.C. Forests

(monosodium methanearsonate)

- Target stands are baited with pheromones to attract adult beetles in late summer.
- Trees are treated with MSMA within 3-4 wks post-attack.
- Shallow axe frill cut around circumference at the base of the tree.
- MSMA (Glowon®) is applied into frill at full strength at specified rate (1mL/ 2.5 cm of tree circumference).
- Treated trees are left standing allowing wildlife to forage on bark-boring insects.

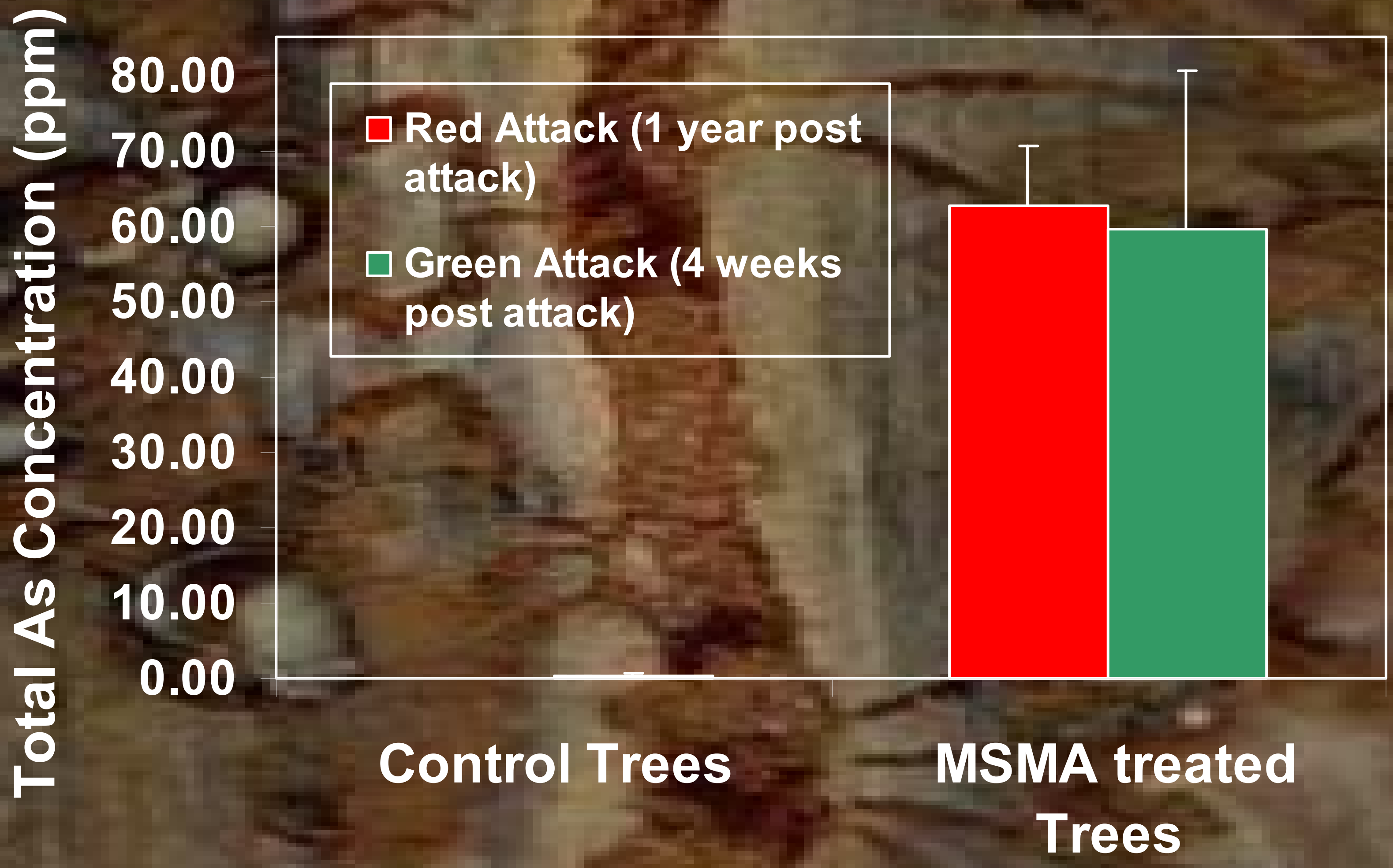


Study Objectives

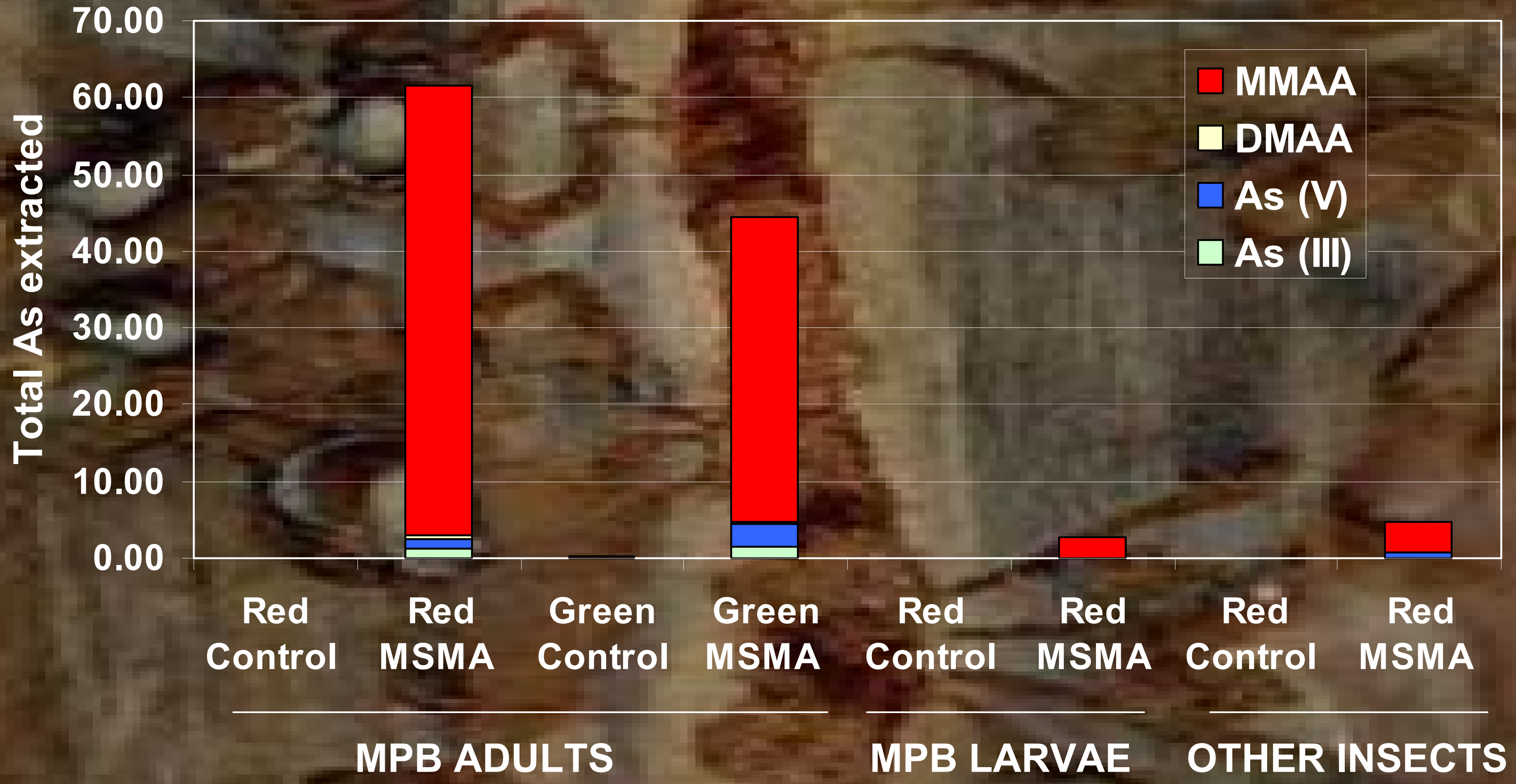
- **To assess As levels and As speciation in beetles and other insects of different life stages in trees with known MSMA treatment (4 wks and 1 yr post treatment);**

- **To determine woodpecker use of MSMA treated trees and control trees through debarking indices.**

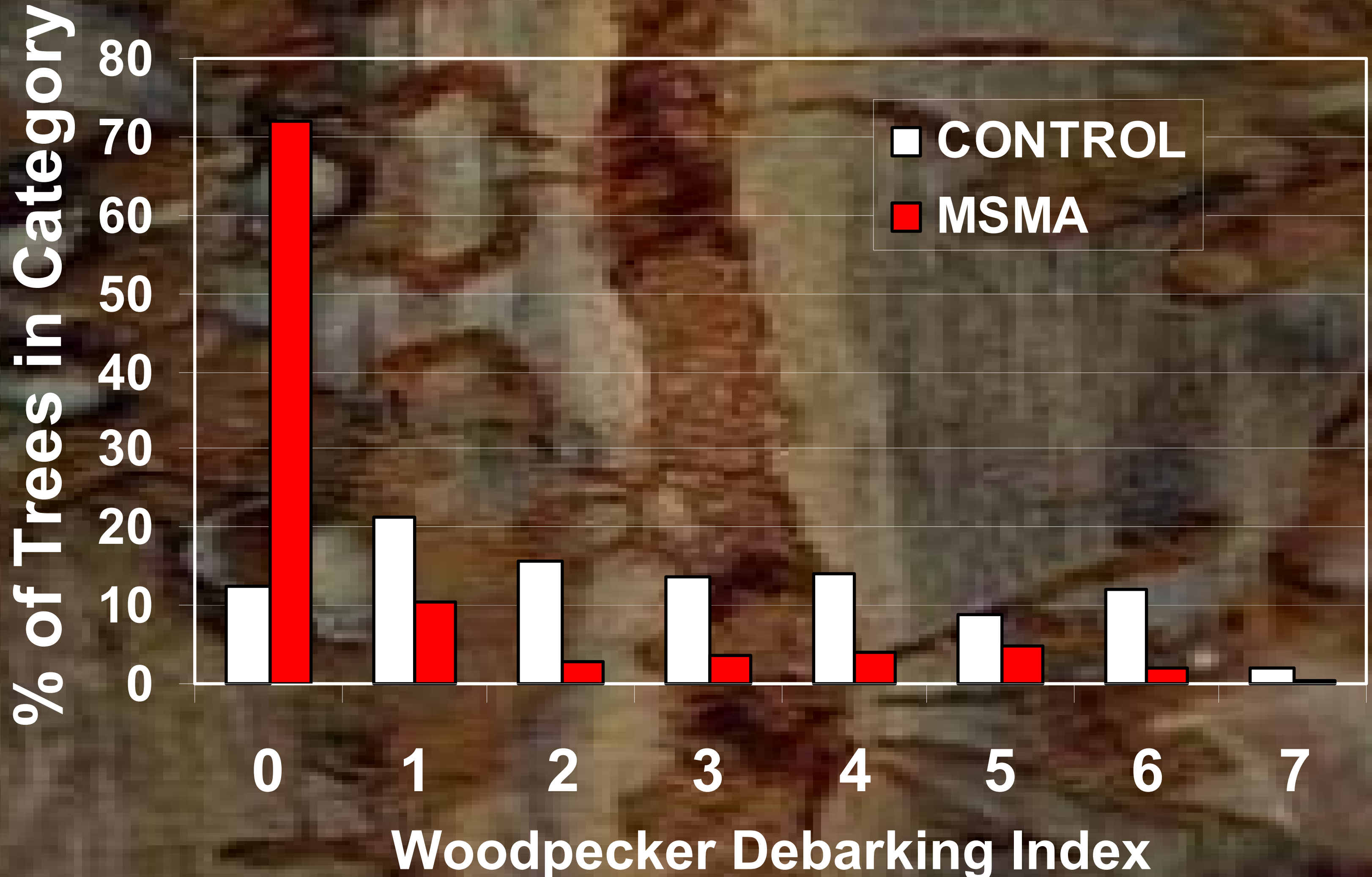
Total Arsenic in Adult Mountain Pine Beetles



Arsenic Speciation in Beetles



Woodpecker foraging of Red Attack Trees (1 year post infestation)



Summary

Availability

- MSMA metabolites present in bark beetles - predominantly MPB adults (range 55-82 µg/g).
- Beetle sampling repeated in 2003 from trees with different levels of debarking - *Results Pending*.

Exposure

- Woodpeckers known to aggregate in areas of MPB infestation.
- Evidence of woodpecker feeding of MSMA treated trees from debarking indices.

Toxicity

- Only a few studies of MSMA toxicity in captive birds- Low risk for acute toxicity (e.g. LD50 = 834 mg/kg for 17 wk old Bobwhite).
- Sublethal or chronic toxicity of MSMA to birds is unknown.
- No studies of toxic effects of MSMA in wild birds.

Future Work

- To determine woodpecker use of MSMA treated trees through radio telemetry methods and debarking indices;
- To determine key prey species by breeding woodpeckers through collection of nestling diet boluses and adult fecal samples (+As analysis);
- To assess reproductive and health effects of MSMA to woodpeckers (field) and model songbirds (laboratory).
- Potential study of wintering bird use of MSMA stands.

BC Provincial Pesticide Regulatory Reform

Presented by Dan Cronin, Pesticide Analyst and Rob Adams, Pesticide Licence Officer, Environmental Management Branch, Ministry of Water, land and Air Protection

Abstract

The BC Ministry of Water, Land and Air Protection is revising the legislation that it administers regulating pesticide use in BC. A new Act called the *Integrated Pest Management Act* was passed by the Legislature in October, 2003 and will be brought into force by regulations now under development, targeted for completion by summer, 2004.

The new Act introduces a new system that will replace permits now required for most pesticide uses on public land and private land used for forestry, public utilities, transportation and pipelines. Under the new system, proponents will need to: (a) prepare a pest management plan using principles of Integrated Pest Management, (b) submit a pesticide use notice to the ministry and (c) use pesticides according to the use notice and standards set by regulations. The Act also enhances compliance enforcement and gives powers to the minister and administrator under the Act to establish regulations.

The Ministry is conducting several phases of public consultation for the development of the regulations. A discussion document asking for comment by January 15, 2004 on general issues has been posted on the ministry web site at: http://wlapwww.gov.bc.ca/epd/epdpa/ipmp/pestact/index.html The issues for comment include the list of exempted pesticides, when a permit would still be required, the role of qualified monitors and consultation and notification requirements. There will be meetings with technical experts in January and February to develop draft standards for pesticide use for various industry sectors. A first draft of the regulatory provisions will be posted for public review in spring, 2004.

To facilitate the distribution of further information about the pesticide regulatory update, an e-mail service ('listserve') has been established. Subscribers will be notified when new information is posted on the ministry website. Anyone interested is invited to subscribe by following the steps outlined at the website address shown above.

Comments on the ministry proposals and discussion issues are welcomed.

BRITISH COLUMBIA

2003 Pesticide Information Exchange EC PYR

November 27, 2003
BC Provincial Pesticide Regulatory Reform

Dan Cronin and Rob Adams
Ministry of Water, Land and Air Protection
Environmental Management Branch
Integrated Pest Management Program

Integrated Pest Management Act, S.B.C. 2003, chapter 58 was proclaimed on October 23, 2003 and is expected to be enacted by passage of *IPMA* Regulation by summer of 2004.

Significant Changes

1. Reduce regulatory burden:

- Permits or pest management plans (PMPs) approvals for most pesticide uses on public and specified private lands will be eliminated.
- Only pesticide uses of 'high concern' prescribed by the minister will require approval by permit.
- New system will require a proponent to:
  - develop a PMP in accordance with the standards, using the principles of integrated pest management;
  - submit a notification document of the intended use of pesticides to the administrator (verified by a confirmation of receipt, issued by the ministry); and
  - use pesticides in accordance with the notice and standards set by the administrator for protecting human health and the environment.

British Columbia

2. Enhance compliance measures and enforcement powers:

- The IPM Act defines a category of person called a qualified monitor and gives power to the administrator to require a pesticide user to employ such a person to assess site conditions or monitor compliance with the Act.
- An administrative penalty system is introduced to reduce reliance on the courts.
- Penalties for offences under the Act are substantially increased, from a maximum first offence of $2,000 to $200,000, with further increases for subsequent or continuing offenses and higher fines for corporate offences.

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3. Allocate regulatory making power between the Lieutenant Governor in Council, the minister and the administrator:

- The Lieutenant Governor in Council is given the power to make a regulation under the IPM Act concerning municipal bylaws where broader provincial interests are involved.
- The minister will establish, by regulation, classes of pesticides, requirements for ministry authorizations to use or sell a pesticide, requirements for consultation and notification before pesticide use, requirements for records and monitoring and the various fees.
- Administrator will make regulations that include standards for protecting human health and the environment and assign pesticides to classes.

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IPM Legislation Consultation Process:

September 2002 – March 2003	Initial Discussion document and Consultation
October 2003	***Integrated Pest Management Act* – *Third Reading***
November 2003	IPM Regulation discussion document and questions
November 2003 – January 2004	Public comments and response; Technical group consultations
February 2004	**Draft Regulation** - **General provisions** - **Sector-specific standards**
March 2004	Posting and distribution for final public comment
	***Integrated Pest Management Act* and Regulation**

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Process for Ministry Consultation

- Proposed changes are to be posted on ministry web site:http://wlapwww.gov.bc.ca/
  epd/epdpa/ipmp/pestact/index.html
- Establish a list server (subscribe via web site)

Pesticide Categories

- Permit-Restricted
- Restricted
- Commercial
- Domestic
- Exempted
  - Traditional
  - Non-traditional

Requirement for a Permit

- Aerial application over residential areas
- Use of pesticides for predator control
- Use of pesticides for which no standards have been set

Requirement for Pesticide Use Notice and PMP

- Pesticide uses for which a permit is not required on:
  - Public land, except not landscape and structural pesticide uses
  - Private land used for forestry, public utilities, transportation or pipelines

Requirement for a Licence

- Business selling pesticides
- Business applying pesticides
- Landscape or structural pesticide use on public land
- Pesticide use on private land used for forestry, public utilities, transportation or pipelines

Roles of Qualified Monitors

- Development of PMP’s and IPM Monitoring
- Pre-treatment Assessments
- Compliance Assessment and Reporting

Qualifications of Qualified Monitors

- Applicator certification in appropriate category
- 2 years education or experience
- Post-secondary training on the ecology of biota that may be impacted
- Training to identify environmental risks, sensitive habitats and species at risk

Notification Requirements - Residences

- 72 hour notice to residents prior to pesticide use in residences
- 48 hour posting of notices prior to pesticide use in common areas

Pest Management Plan standards

- Consultation Requirements
- Notification Requirements
- Use of Qualified Monitors
- Content Requirements
- Pesticide Use Standards

Pesticide Use Standards e.g.:

- 10 m pesticide free zone adjacent to water bodies
- 30 m buffer zone adjacent to wells
- Nozzle pressure <275 kPa for herbicides
- Spot treatment <1.5 m from noxious weeds
- Wind speed < 8 km/hr for foliar sprays

Technical Committees

- Forest vegetation management
- Forest health
- Rights-of-way vegetation management
- Noxious weed control
- Mosquito control
- Wood pole treatment
- License standards for landscapes & structural pests

West Nile Virus - Environmental Implications of Associated Mosquito Abatement Programs

Presented by Rob Kent, Water Quality Monitoring Branch, National Water Research Institute, Gatineau, QC

Abstract
With its first North American appearance in 1999 and subsequent rapid spread across the continent, West Nile virus best highlights the issue of emerging infectious zoonotic diseases, claimed by many experts to be the predominant environmental and public health issue for the next decade. WNV remains in its epidemic stage of growth, with an understandably high public concern, as approximately 2000 human cases and 30 deaths have been recorded since its first detection in Canada in 2001. As a zoonotic disease, the importance of understanding its ecology and environmental dimensions is critical to assessing and managing their risks to human health. Unfortunately, the current WNV management response strategy and efforts to date have done little to profile or increase our understanding of the environmental implications of WNV, such as its significant direct impact to wildlife, vector/host ecology, and the hazards associated with WNV risk management measures such as mosquito abatement. Like the importance of education, communication and outreach in reducing human exposures, this paper emphasizes the need for information sharing and sound scientific guidance to promote the most environmentally sustainable use of pesticides in vector control. Fortunately, a variety of registered control agents are available for pre-emptive larval and post-outbreak adult mosquito control. The paper highlights the importance of supporting greater understanding of the comparative environmental hazards associated with each control product, support for more alternative controls, guidance on promoting compliance and addressing the potential conflict between public health and environmental protection, and lastly, identifies the key environmental science that is needed to enhance our understanding and management of WNV effects.

West Nile Virus:

Environmental Implications of Mosquito Abatement Programs

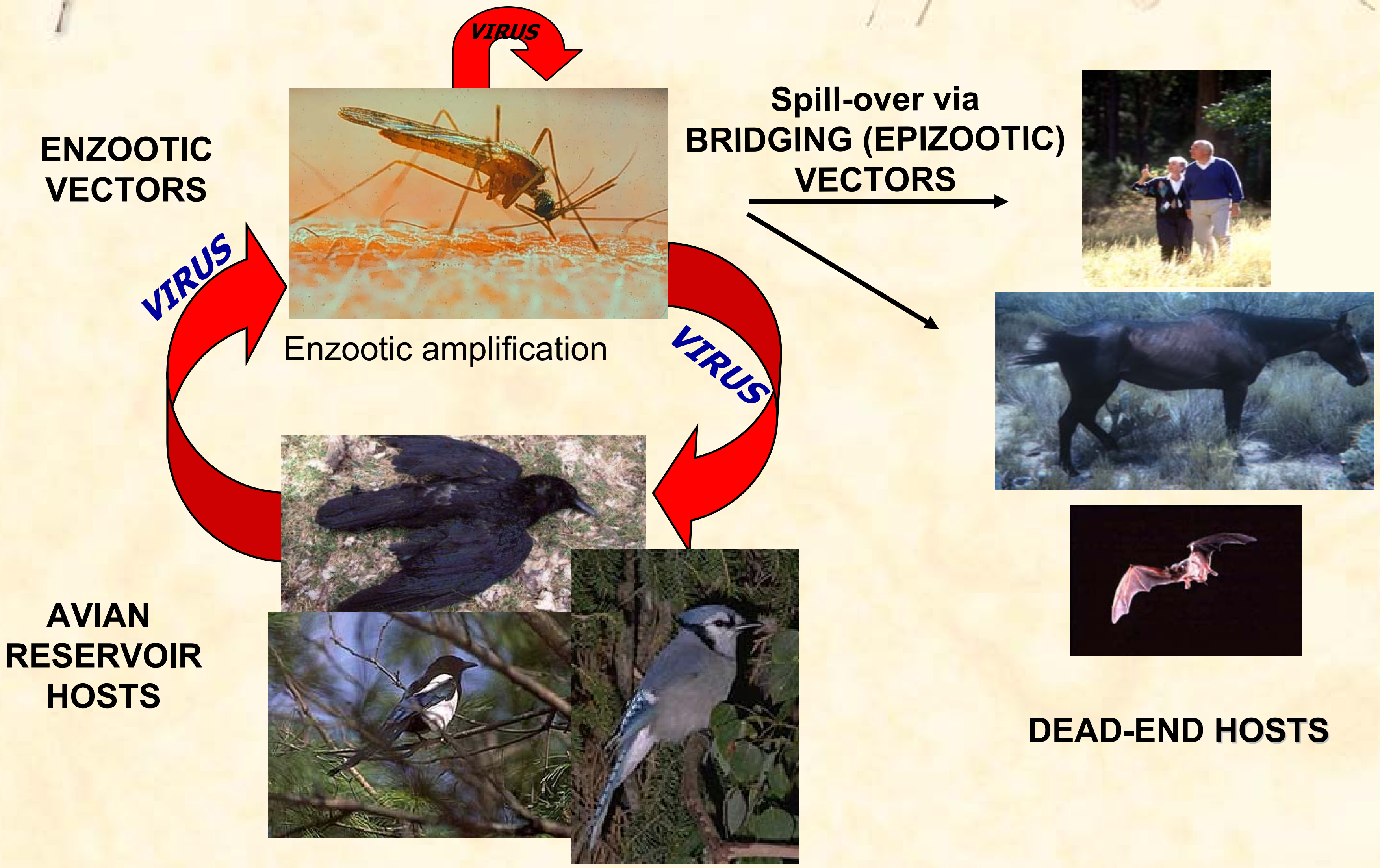
Rob Kent
Water Quality Monitoring Branch
National Water Research Institute
Environment Canada

2003 PYR Pesticide Information Exchange Workshop
November 27, 2003, Vancouver, B.C.

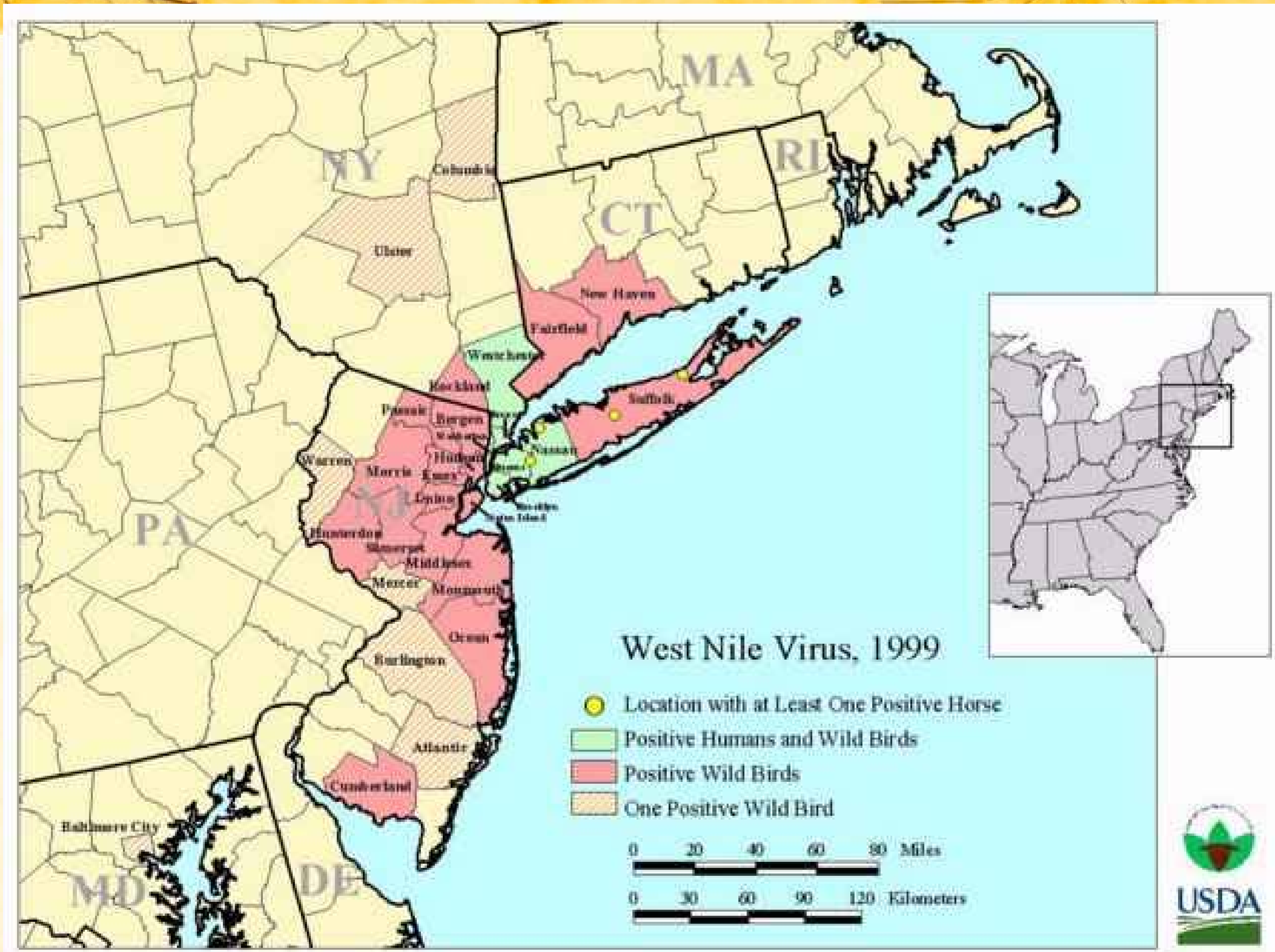
Presentation Overview

- Context and current scope
- Environmental dimensions of WNV
- Mosquito abatement programs
- Information / guidance and science directions

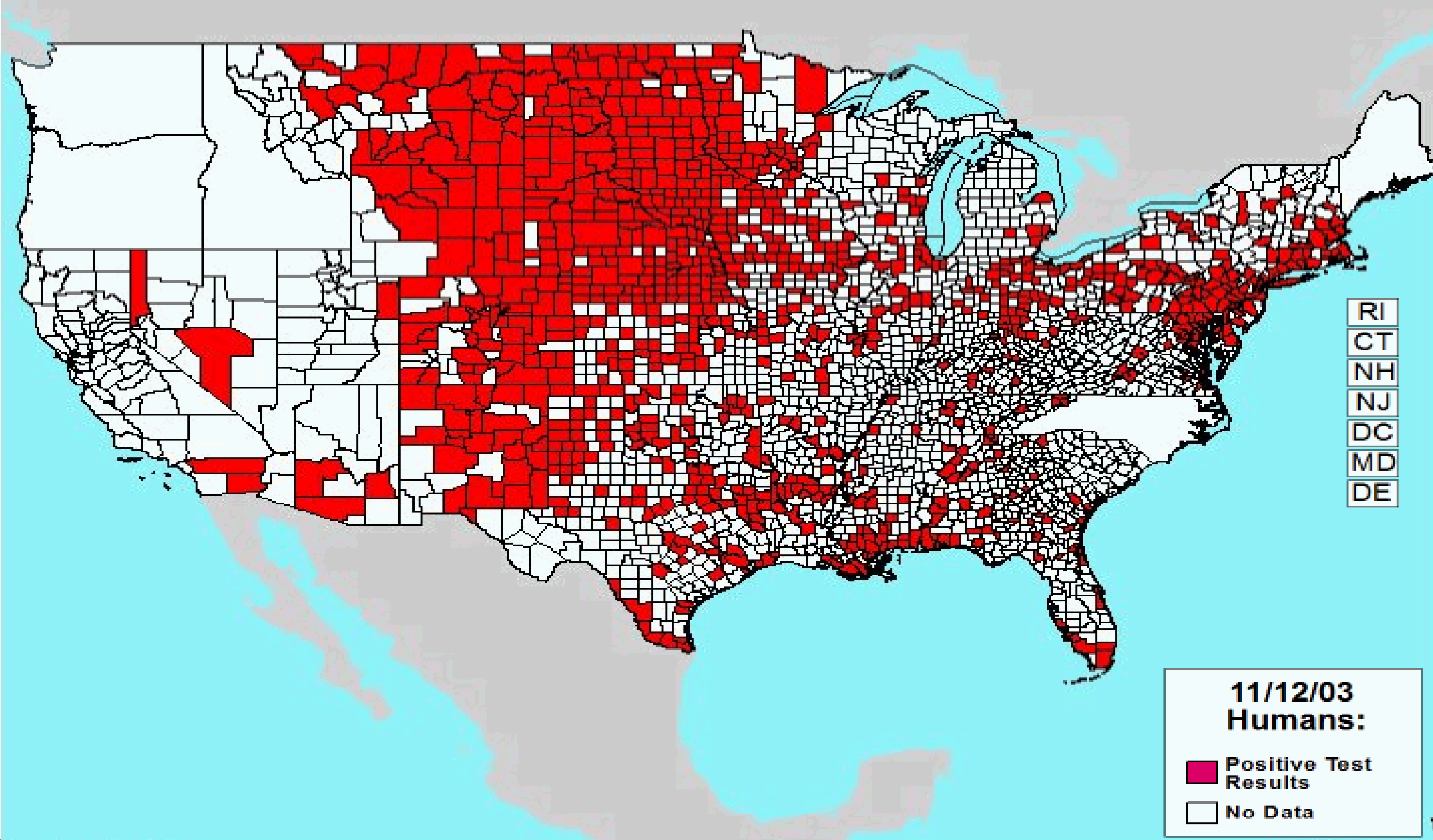
WNV Transmission Cycle



Introduction to North America



U.S. 2003

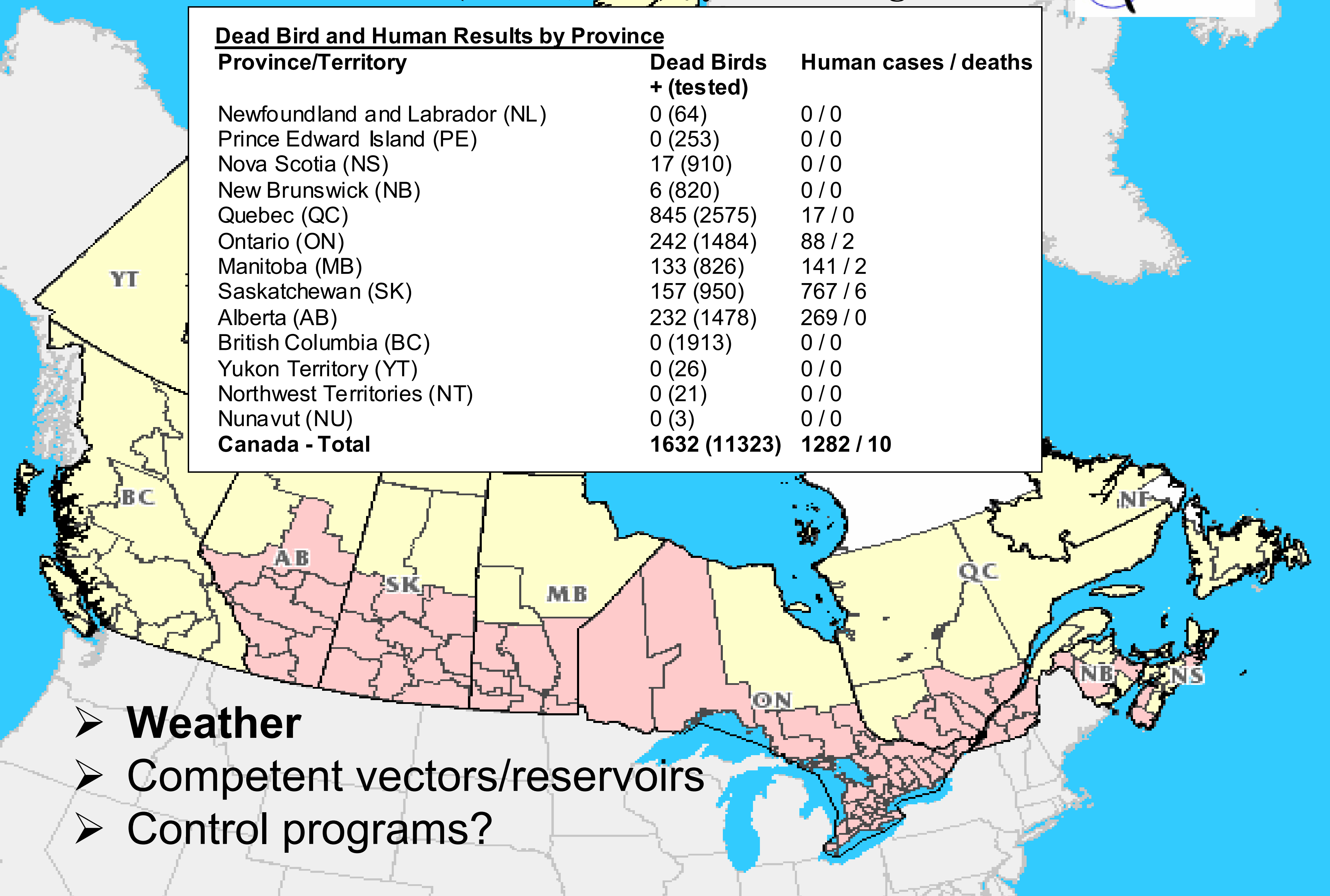

RI
CT
NH
NJ
DC
MD
DE
11/12/03
Humans:
Positive Test Results
No Data

West Nile Virus Activity - Dead Birds (Nov 21, 2003) and Human Surveillance (Oct 15, 2003) by Health Region

Canadian Cooperative Wildlife Health Center

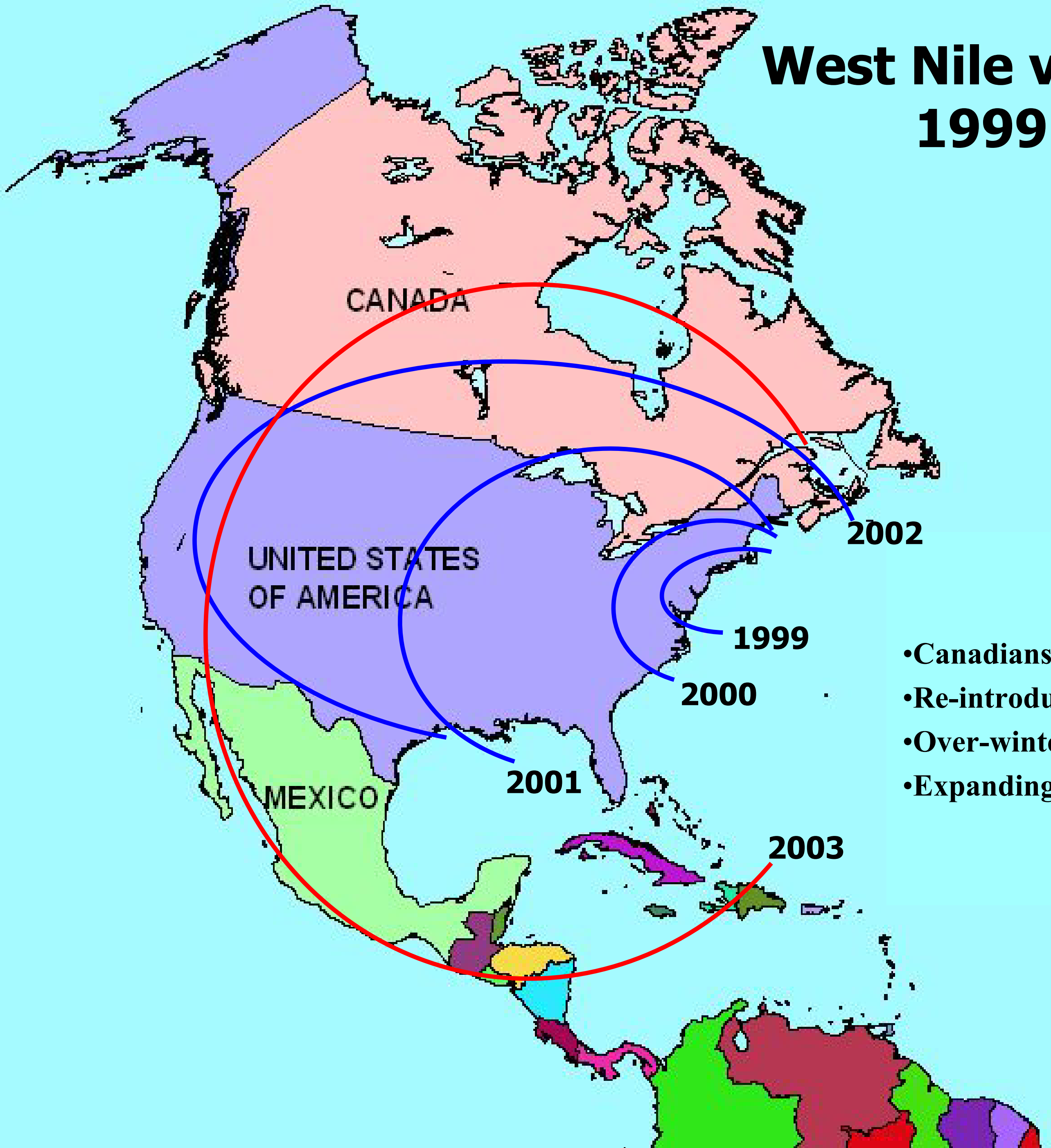
Dead Bird and Human Results by Province

Province/Territory	Dead Birds + (tested)	Human cases / deaths
Newfoundland and Labrador (NL)	0 (64)	0 / 0
Prince Edward Island (PE)	0 (253)	0 / 0
Nova Scotia (NS)	17 (910)	0 / 0
New Brunswick (NB)	6 (820)	0 / 0
Quebec (QC)	845 (2575)	17 / 0
Ontario (ON)	242 (1484)	88 / 2
Manitoba (MB)	133 (826)	141 / 2
Saskatchewan (SK)	157 (950)	767 / 6
Alberta (AB)	232 (1478)	269 / 0
British Columbia (BC)	0 (1913)	0 / 0
Yukon Territory (YT)	0 (26)	0 / 0
Northwest Territories (NT)	0 (21)	0 / 0
Nunavut (NU)	0 (3)	0 / 0
Canada - Total	**1632 (11323)**	**1282 / 10**



- **Weather**
- Competent vectors/reservoirs
- Control programs?

West Nile virus Spread: 1999 to 2003



- Canadians visiting endemic areas
- Re-introduction by migrating birds
- Over-wintering vectors
- Expanding vector competence

Message

WNV is a complex environmental health issue

Guidance, advice and information-sharing

Promoting understanding of:

the issue(s)

the management actions

the risks

Foundation for informed, environmentally sustainable decision-making

Issue(s)

- 2001 - detected in Canada (birds); QC, ON, MB, SK
- 2002 - human detection (466 cases; 20 deaths; NS, NB, QC, ON, MB, SK, AB
- 2003 (to date) – 1282 cases; 10 deaths; NS, NB, QC, ON, MB, SK, AB
- Earlier detections in vectors/reservoir hosts
- Full extent of human risks unknown
- Risk reduction strategies and measures varied - vector control is key component
- Significant socio-economic implications
- Program efficacy
- Environmental risks

Issue(s) cont.

WNV is a Wildlife Disease

- 162 bird species reported positive in N. America to date; corvids appear most susceptible; others….(raptors)
- Dead birds in Canada (surveillance spp.) 1632+ to date; likely 1000's are weakened and killed
- 20 animal species in N. America to date: domesticated: cat, dog, rabbit, horse, sheep; wild: alligator, chipmunk, skunk, squirrels, bats, alpaca, deer, goat, llama, wolf, harbor seal
- Risk to endangered species
- Long-term impact - unknown

RESPONSE: COORDINATED, MULTI-AGENCY, MULTI-DISCIPLINARY APPROACH

Partners in West Nile virus Surveillance and Response

Population and Public Health Branch
Pest Management Regulatory Agency
First Nations and Inuit Health Branch
Healthy Environments and Consumer Safety Branch
Health Products and Food Branch
Communications, Marketing and Consultation Directorate

Canadian Food Inspection Agency

Canadian Cooperative Wildlife Health Centre

Department of National Defence

Environment Canada

Blood Operators

Parks Canada

Health Professional Organizations

Provincial/Territorial Steering Committees

Municipalities / Regional Health Authorities

Medical Officers of Health

International Linkages

Current Management and Policy Framework

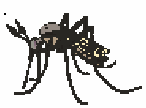
National Surveillance and Response Approach (facilitated through HC-led WNV National Steering Committee) :

- National surveillance (mosquitoes, birds, horses, human)
- Safety of blood system
- WNV testing
- Mosquito control and personal repellents
- **Communications and Outreach**
- First Nations Communities and Reserves

Communications and Outreach

Health Canada | Santé Canada

Effective Control of Mosquitos Around Your Home



Pest Note Pest Note Pest Note Pest Note Pest Note Pest Note Pest Note Pest Note

May 2003

Why Are Mosquitos of Concern?

Mosquitos are known carriers of many diseases globally including West Nile Virus. Currently, West Nile Virus is causing concern in the USA and Canada. For information on West Nile Virus, please refer to the following Health Canada fact sheets on the web site hosted by the Population and Public Health Branch's Centre for Infectious Disease Prevention and Control -

http://nile.healthcanada.net

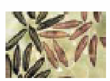
- West Nile Virus - The Facts
- West Nile Virus and You
- West Nile Virus: What's Being Done to Reduce the Risk
- Safety Tips on Using Personal Insect Repellents

The Life Cycle of Mosquitos

Because they are aquatic in their immature stages, all mosquitos must have water in which to develop. The larvae cannot develop in tall grass or shrubbery, although the adults may be found resting in these spots during the day.

Eggs

The females of some mosquito species lay their eggs directly on the surface of water, in a raft of between 100 and 400 eggs. The eggs hatch in a day or so into larvae. Other species leave their eggs in a spot that will flood later, such as mud at the edge of a drying pond.



Larvae

Mosquito larvae look like worms, with no legs or wings; they are often known as "wigglers". They need to breathe air, so they hang from the water surface and feed there by filtering small particles from the water, but will dive to the bottom for short periods to feed or escape capture. They grow rapidly during this stage, molting four times during the next few days. On the fourth molt, they become pupae, where they form legs and wings.

Pupae

The comma-shaped pupae are also known as "tumblers" because they somersault in the water when disturbed. They cannot eat and must breathe air through two tubes on their backs. The mosquitos grow inside the pupae. When they are ready, in about two days or so, they split the pupal skin and emerge as adults.

Adults

The adult mosquitos rest on the surface of the water until they are strong enough to fly, at which time they will search for something to eat. This entire life cycle from egg to adult can be completed in less than 10 days when the temperature is favorable.

Both male and female mosquitos feed on nectar from flowers for their energy, but male mosquitos feed exclusively on nectar, while the female must have blood to produce her eggs. Most mosquitos in the wild feed on animals found in their habitat and not on people. Some species prefer birds as hosts, while others accept many animals as hosts, including people. These species are considered pests whenever there are many of them in areas used by people, such as camp sites or picnic grounds. The female mosquito may live for as long as three weeks during the summer, and any female that lives long enough to feed on blood more than once has the potential to transmit blood-borne diseases from one animal or person to another.

The females are very specific about where they lay their eggs, and pick water suitable for their offspring. Although most mosquito species breed in clean water in the wild, many of the species that breed near your home tolerate polluted water.

Most of the 75 mosquito species found in Canada survive the winter as dormant, fertilized eggs but in a few species, such as Culex pipiens and Anopheles punctipennis, it is the fertilized females that survive the winter in cool, sheltered places such as caves, animal burrows, cellars and sewers, to take their first blood meals and lay eggs in the spring.

Mosquitos that Breed Around the Home

Mosquitos of some species can fly far from their breeding sites, so their presence in your neighbourhood does not always mean they have bred or will breed there. However, certain mosquitoes are considered domestic species because they breed around the home in small, artificial containers such as bird baths and eavestroughs. Females of some of them will feed on people, will enter your home for a meal and are significant pests.

Culex pipiens

The northern house mosquito, Culex pipiens is the most common mosquito in urban and suburban areas of eastern Canada and British Columbia. The larvae can be found in artificial containers and ditches, and also in natural rain puddles and ponds. They thrive in water polluted with organic wastes. The females feed mainly at night and mostly on birds, but they will also bite people both outdoors and indoors. The tendency of these females to feed on people or birds, the wild hosts of West Nile Virus, makes Cx. pipiens the most likely vector of West Nile Virus in North America, both from birds to birds and from birds to people. A closely related species, Cx. restuans, is found in eastern Canada and the prairie provinces. The larvae are found in similar sites, but the females less commonly bite people.

Ochlerotatus triseriatus

The eastern tree-hole mosquito, Aedes triseriatus, another fairly common pest around homes, lays its eggs in tree-holes in many hardwoods. The eggs are laid just above the water line in the tree-hole. When rain raises the water level, the eggs hatch. Tires containing decomposing organic material, such as leaves, can simulate this habitat and may be used by the eastern tree-hole mosquito as a breeding site. A single discarded tire in your yard can be the source of thousands of tree-hole mosquitos over a summer.

Other Species

Larvae of Ochlerotatus atropalpus, which normally live in rock pools, and those of Anopheles punctipennis, which normally live in ponds and marshes, are sometimes found in artificial containers near dwellings. Females of these species will bite people, and may be pests around your home. Larger bodies of water on residential properties, such as ponds, snowmelt pools and grassy ditches, may form breeding sites for many other species, too many to name here. Some of these species are significant pests; others never bite people.

What You Can Do Around Your Home and Community

You and your neighbours can do several things to prevent mosquitos from breeding near your homes and also to protect yourselves from mosquito bites.

Controlling Breeding Sites

Since mosquitos breed in stagnant water, and can do so even in very small quantities, remove any possible breeding areas where mosquitos could lay eggs.

- Eliminate sources of standing water in your yard (for example, flower pots, gardening cans, wheelbarrows, puddles) and store items upside down that must remain in your yard, such as boats and gardening containers.
- Empty tire swings of any water and, if possible, replace the swings with other types.
- Cover any garbage, recycling or composting containers, to prevent water from accumulating in them.
- Drill holes in the bottom of containers that must be left outdoors.
- Replace water in bird baths and outdoor pet dishes at least every week to help eliminate stagnant water in them and also provide fresh water.
- Empty your rain barrel if the water is more than a week old.

Environmental Issues

EC Situation Report (2003):

West Nile Virus in Canada:

Environmental Issues and Considerations

A Case Study on Wildlife-Related Diseases

- Wildlife impacts from WNV
- Wildlife as disease vectors
- Environmental implications of control programs
- WNV management of public lands
- Wetland habitat policy implications
- Occupational health and safety

MOSQUITO LARVICIDES: REGISTERED IN CANADA FOR LARGE SCALE CONTROL

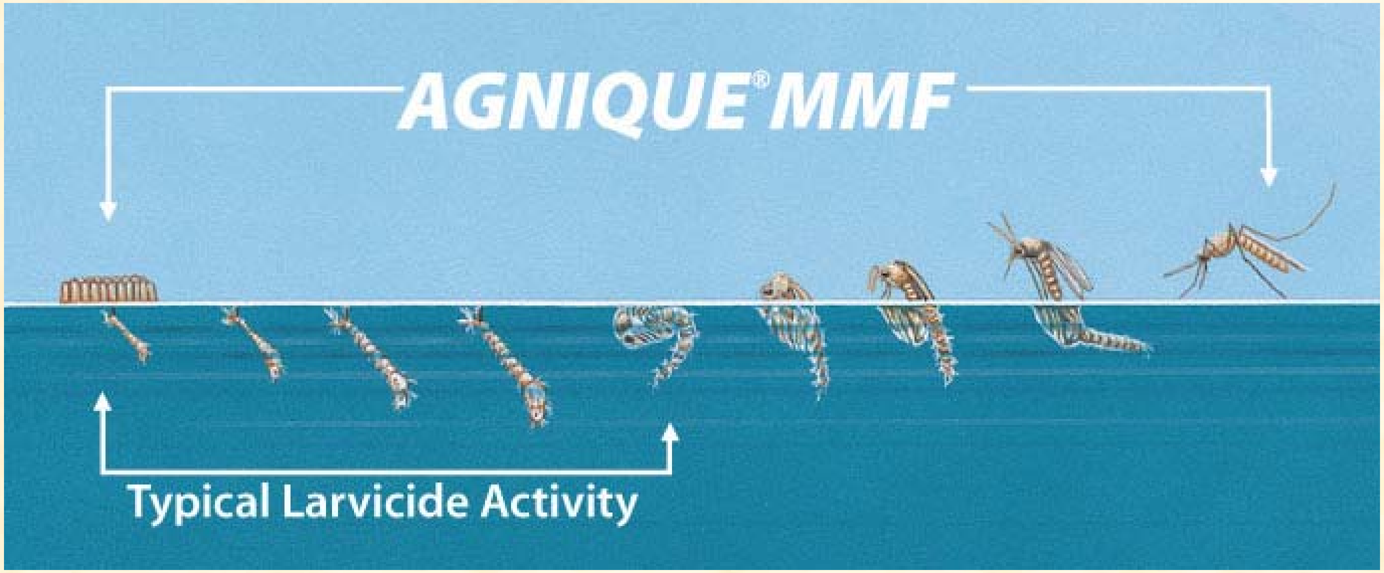
Active Ingredient	Pesticide Category	Regulatory Status
For aerial and ground equipment applications (refer to product label)		
Bacillus thuringiensis israelensis (**Bti**)	Biological	To be re-evaluated
Methoprene	Insect Growth Regulator	To be re-evaluated
Chlorpyrifos	Organophosphate	Under re-evaluation <u>Restrictions:</u> Not to be used in residential areas, school grounds, or parks.
Malathion	Organophosphate	Under re-evaluation
Diflubenzuron	Insect Growth Regulator	To be re-evaluated

MOSQUITO ADULTICIDES: REGISTERED IN CANADA FOR LARGE SCALE CONTROL

Active Ingredient	Pesticide Category	Regulatory Status
Ultra Low Volume (ULV) and/or non-ULV applications (Thermal Fogs and Vegetation Sprays)		
Malathion	Organophosphate	Under re-evaluation
Propoxur	Carbamate	Under re-evaluation
Dichlorvos	Organophosphate	Under re-evaluation
Resmethrin	Pyrethroid	To be re-evaluated
Pyrethrins (& synergists	Pyrethroid	To be re-evaluated
d-trans **Allethrin**	Pyrethroid	To be re-evaluated
Chlorpyrifos	Organophospate	Under re-evaluation
Methoxychlor	Organochlorine	Phase-out by 2006
Naled	Organophosphate	Under re-evaluation

Alternative Controls - Growing Demand

- Other formulations (e.g., 150d Altosid, duplexed)
- Other biologicals (*e.g., Bacillus sphaericus,* Vectolex*)*
- Baculoviruses
- Predators (larvivorous fish, Odonates, bats, birds)
- Clothing treatments (*e.g.,* permethrin)
- Surface films and oils (natural and synthetic)



Mosquito Control

- Historical precedence - <u>nuisance control programs</u>
- Surveillance, identification, application, results monitoring
- Governance:
  - Health officers
  - WNV response and advisory committees (local, regional, prov., National Steering Comm)
  - NSC Mosquito Surveillance and Control subcommittee
  - Provincial permitting, applicator licensing etc.

<u>Multiple sources of information / messages</u>

Action points for mosquito control

I. Control prior to confirmed activity (birds or mosquitoes); areas with confirmed cases in previous season? (Primarily larviciding)

II. Control only when WN virus confirmed in birds; Opportunities for larviciding may be limited (most HU with cases, infected birds initially detected mid- to late July)

III. Control only when confirmed in birdfeeding enzootic vectors (e.g., *Culex)*; Same as in II. (adulticiding likely required)

IV. Control only when confirmed in bridging vectors Likely only adulticiding an option

Larviciding *vs* Adulticiding

Mosquito Control Programs in Canada 2003

Jurisdiction	Larviciding	Adulticiding
Newfoundland and Lab.	Bti (nuisance control)	None
PEI	Bti (nuisance control)	None
New Brunswick	No new vector control programs implemented to address WNV; Longstanding Bti nuisance control program	Historically there has been limited adulticiding, still trying to get confirmation for 2003
Nova Scotia	None (Plan for Bti and methoprene)	None
Quebec	Bti nuisance control in Laurentians and Montreal area. Methoprene and Bti used for WNV vector control in Montreal-area communities	None
Ontario	Extensive Bti and methoprene use in southern Ont. Municipalities	None
Manitoba	Bti, methoprene use in muncipalities; Chlorpyrifos use outside residential areas; 70-80% of larviciding in Winnipeg area)	Malathion
Saskatchewan	Bti (vast majority of cases), methoprene (small number of cases) and chlorpyrifos (one community only)	None
Alberta	Bti, methoprene, and chlorpyrifos; Temephos was historical preferrence, deregistered in Dec 2000. Chlorpyrifos most widely used larvicide.	Malathion and propoxur used in southern (irrigation) regions having historical adulticide nuisance control program
British Columbia	Bti nuisance control programs in several regions	None

Guidance and Advice

Municipal
Mosquito Control
Guidelines

PREPARED BY:

Roy Ellis
Prairie Pest Management

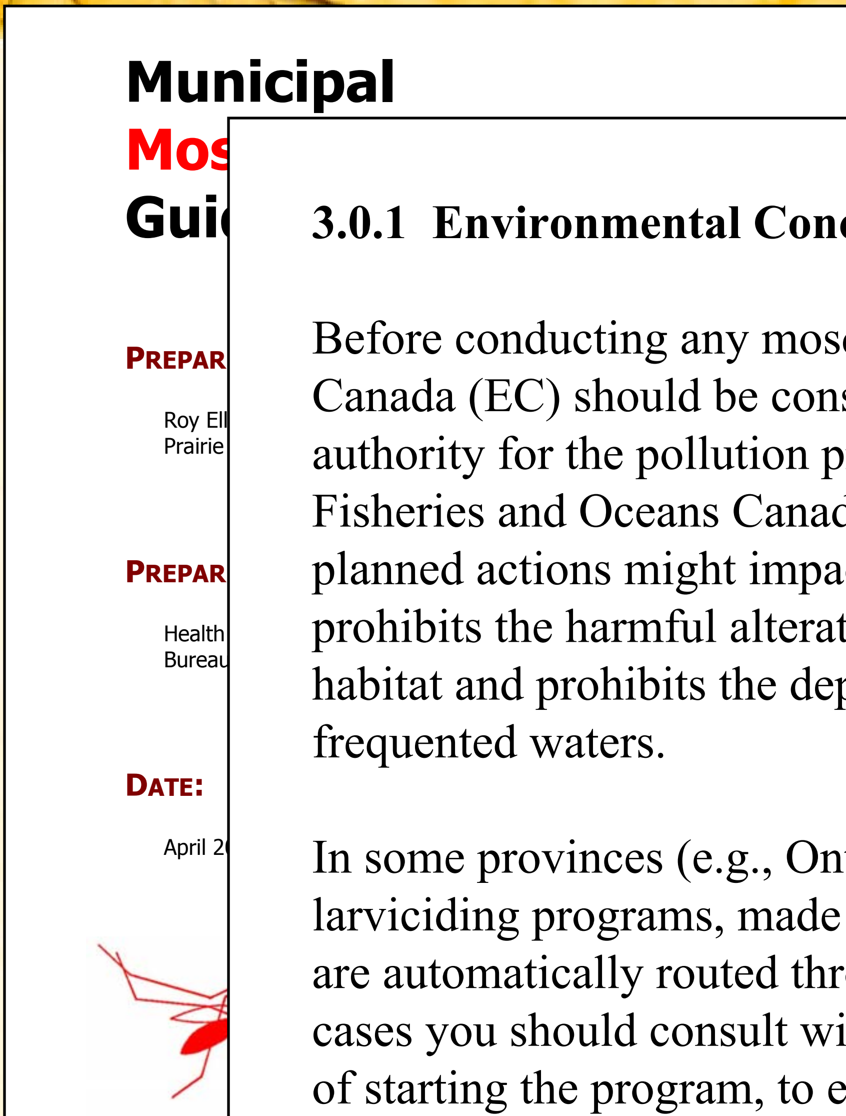
PREPARED FOR:

Health Canada
Bureau of Infectious Diseases

DATE:

April 2003 (Revised)

Guidance and Advice cont.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Health
Bureau
DATE:
April 2

3.0.1 Environmental Concerns

Before conducting any mosquito control program, Environment Canada (EC) should be consulted. EC has the lead administrative authority for the pollution prevention provisions of the *Fisheries Act*. Fisheries and Oceans Canada (FOC) should be consulted where any planned actions might impact local fish habitat. The *Fisheries Act* prohibits the harmful alteration, disruption, or destruction of fish habitat and prohibits the deposit of deleterious substances into fish-frequented waters.

In some provinces (e.g., Ontario), permit applications for mosquito larviciding programs, made to provincial environment departments, are automatically routed through federal EC officials for review. In all cases you should consult with regional EC officials well in advance of starting the program, to ensure that you understand your legal obligations under the *Fisheries Act*.

Guidance and Advice cont.

Information to Medical Health Officers in Canada regarding potential impacts on fish and fish habitat while controlling mosquito-borne West Nile Virus

Fisheries and Oceans Canada (DFO) and Environment Canada (EC) recognise that the West Nile virus is a significant and growing public health concern. Protection of the public from the West Nile virus is the number one priority, and may require measures that could, in some instances, impact on fish and their habitat.

The two departments would urge Medical Officers of Health and other provincial, and local officials to work together to satisfy in the best manner both mandates.

The departments encourage officials performing mosquito control activities to contact and work with federal officials to harmonise activities with the requirements of the federal *Fisheries Act*, while protecting human health

- Subsection 35(1) of the *Fisheries Act* prohibits the harmful alteration, disruption or destruction of fish habitat unless authorized by the Minister.
- Subsection 36(3) of the *Fisheries Act* prohibits the deposit of a deleterious substance in water frequented by fish, or where it can enter such water.

For more information you should contact regional officials of DFO and EC. The Pest Management Regulatory Agency (PMRA) is the lead federal agency regulating the use of pesticides, and should also be involved in the discussions.
EC's regional offices are listed on the following website: http://www.ec.gc.ca/commentreg_e.html

- DFO's contacts are listed by region on the following website: http://www.dfo-mpo.gc.ca/canwaters-eauxcan/water-eau/contact-regions/index_e.asp
- The PMRA can be reached by phone in Ottawa at (613) 736-3682.

Thank you for your co-operation.

17-APR-2003

AQUABAC™ 200G

Biological larvicide

For the control of mosquito larvae

Granules (10/14)

DOMESTIC

CAUTION EYE IRRITANT
POTENTIAL SENSITIZER
READ THE LABEL BEFORE USING
KEEP OUT OF REACH OF CHILDREN
GUARANTEE:
Bacillus thuringiensis subspecies *israelensis*

DIRECTIONS FOR USE

………AQUABAC 200G Biological Larvicide 10/14 is for use solely in standing waters wholly contained on homeowner's / rural dweller's / cottage owner's property, **where mosquito larvae are present (e.g., rain gutters, discarded tires, ornamental ponds, semi-permanent puddles, rain barrels, flood water, roadside ditches, snow melt pools**). Do not apply to treated, finished drinking water reservoirs, drinking receptacles and wading pools…………

0.50 kg,

Lot no:

Canada H3B 5C9

Date of manufacture:

Comparative Hazard Assessments

Mosquito larvicides to fish and invertebrates
(compiled by Roe and Kent 2003)

(median lethality thresholds)

B.t.i
(fish: non toxic)
(inverts: low toxicity)

methoprene
(~1000 ug/L)
(inverts: ~20 ug/L)

diflubenzuron
(fish: 135 - 560 ug/L)
(inverts: 0.062-2.6 ug/L)

Methoxychlor
(fish: 20-65ug/L)
inverts: <100ug/L)

Temephos
(fish: 160 ug/L)
(inverts: ~10 ug/L)

malathion
(fish: ~3 ug/L)
(inverts: 1-2 ug/L)

chlorpyrifos
(fish: <10 ug/L)
(inverts: 0.04-1 ug/L)

INCREASING HAZARD

Comparative Hazard Assessments

Mosquito larvicides to larval amphibians
(compiled by Pauli 2000)

(median lethality thresholds)

B.t.i
(> 10g/L)

diflubenzuron
(> 5mg/L)

methoprene
(> 125 and < 500 ug/L)

malathion
(170 ug/L)

chlorpyrifos
(1 ug/L)

INCREASING HAZARD

Comparative Hazard Assessments

Mosquito adulticides to birds
(Mineau et. al., 2000)

(Acute Hazard Index = HD_5 / m^2)

HD_5 - Dose likely to exceed median acute lethality (LD_{50}) in at least 5% of bird species

Index is number of HD5 values for 1kg bird per square meter of sprayed area

Pyrethrins
(very low)
Methoxychlor
(0.07-0.09)
malathion
(0.01-0.38)
Dichlorvos
(0.97-2.7)
chlorpyrifos
(0.69 - 1.4)
propoxur
(1.2 - 11)
Naled
6.4-16

INCREASING HAZARD

Comparative Hazard Assessments

Mosquito larvicides to birds
(Mineau et. al., 2000)
(Acute Hazard Index)

Liquids

B.t.i
(<0.01)

diflubenzuron
(<0.01)

methoxychlor
(0.01-0.45)

malathion
(0.19-0.40)

temephos
(0.19-0.55)

chlorpyrifos
(0.35-1.4)

INCREASING HAZARD

Granules / Pellets

methoprene
(0.04-0.09)

temephos
(0.63-1.6)

chlorpyrifos
(0.8 - 1.6)

Scientific Considerations - Future Developments

- Range of control strategies and pest control products available (IPM, reduced risk products)
- Established knowledge base on *Bt* use (agriculture, forestry, nuisance control) and conventional chemical products;
- Methoprene knowledge base growing, outstanding questions (persistence, retention at target site, amphibians, sensitive invertebrates?…)
- National issue: opportunities for coordinated environmental surveillance and impact investigations
- Promotion of alternative controls and products
- Efficacy assessments $\rightarrow$ refinements in control

Predictions

- Expansion: increased burden, geographic distribution, infection season
- Understanding of WNV ecology (e.g., over-wintering, vector competence, other transmission routes, migratory avian reservoirs)
- Ecological significance of impacts on wildlife
- Virus likely to become endemic in some regions
- **Increase in pesticide-based vector control and need for associated science, information and guidance**

West Nile Virus – BC's Preparations

Presented by David Fishwick, B.C. Ministry of Health Planning

Abstract

West Nile Virus is transmitted to humans through bites by infected mosquitoes. These mosquitoes may cause West Nile Virus infections in humans that can lead to serious illness or death. West Nile Virus has been spreading westward across North America since the first outbreak of illness in New York in 1999. According to the BC Centre for Disease Control, there were a total of 1200 cases of illness due to west nile virus in Canada this year, including 10 deaths. The US Center for Disease Control reports west nile virus caused over 7718 cases of illness in the USA in 2003, including 166 deaths.

At this time the virus has not been found in BC, although it has recently been found in Alberta and it is expected to be found in BC within the next year. BC is taking steps to ensure that actions can be taken when the virus does arrive in BC.

Whether West Nile Virus becomes a significant health threat in BC depends on a number of conditions including:

a) The introduction of the virus into BC bird and mosquito populations
b) Meteorological conditions and other natural factors, locally or province-wide that allow infected mosquitoes to proliferate and infect people

The British Columbia Centre for Disease Control (BCCDC), in cooperation with BC's health authorities have established an extensive surveillance program to test mosquitoes and dead crows, ravens, magpies and jays (the family of birds most susceptible to the disease) for West Nile Virus. This will ensure public health officials, and the public, are alerted as soon as the virus is found in BC.

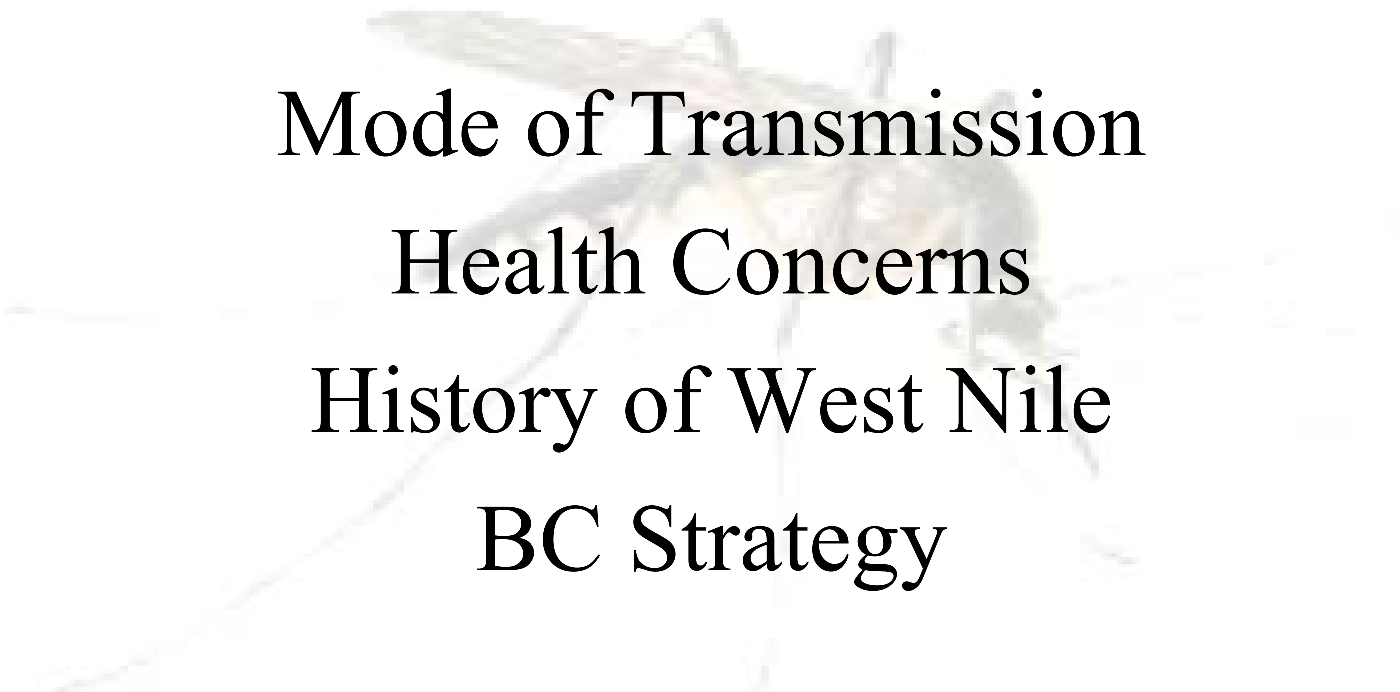
The Minister of Helath has taken out a permit is to ensure that there is a legal mechanism in place to allow appropriate action to be taken to control mosquitoes should surveillance show that West Nile Virus poses a threat to the health of British Columbians. As the permit process is time consuming, it is prudent that a permit be taken out well in advance of any real threat. The permit does not mean the province willing to embark on a wide scale application of pesticides, nor would it serve as a means to control nuisance mosquitoes. Unlike gypsy moth spraying that took place several years ago, which was done for reasons unrelated to health, measures to control West Nile Virus may be required to protect human health.

The British Columbia Centre for Disease Control (BCCDC) has developed "Arbovirus Surveillance and Response Guidelines for British Columbia" which is a guide to the surveillance, response and control activities for West Nile Virus in BC. The guideline is based on the experience in other provinces, particularly Ontario. The guidelines suggest that control measures using pesticides may

need to be taken if it is determined through animal, mosquito, and human surveillance that West Nile Virus poses, or is likely to pose, a significant health threat to the residents of BC. The guidelines have been endorsed by the Environmental Health Committee of the BC Medical Association.

Applications of pesticides would only occur on the recommendation of the medical health officer, who would consult with the Provincial Health Officer, in consultations with local communities and other ministries such as WLAP.

West Nile Virus – BC’s Preparations



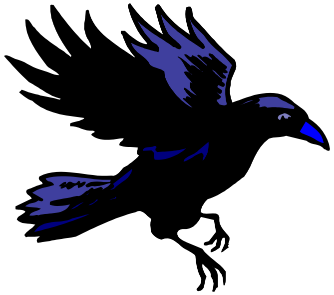
Mode of Transmission

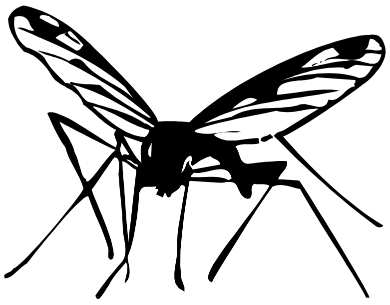
Health Concerns

History of West Nile

BC Strategy

West Nile Virus (WNV)





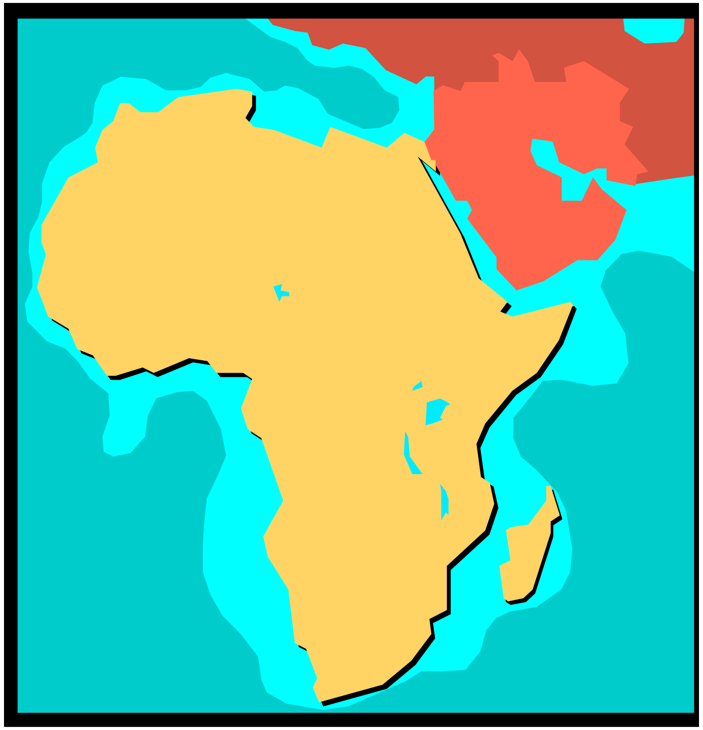
- WNV Life Cycle usually passed between mosquitoes and birds
- WNV can be transmitted to humans or other mammals by infected mosquitoes

Health Concerns

- Persons bit by WNV infected mosquitoes are at risk of becoming infected.
- 80% of those infected will not become sick.
- 20% of those infected may develop West Nile Fever, which resembles the Flu.
- 0.7% of those infected may develop the more serious symptoms (WN encephalitis) requiring hospitalization, and 10% of these people may die.

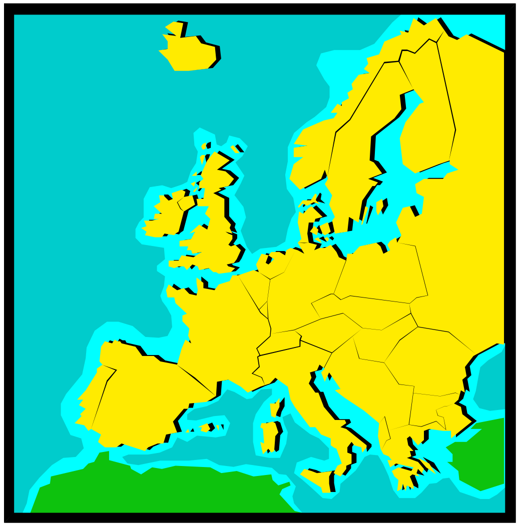
WNV History - Africa

- 1937 Uganda
- 1950s Egypt

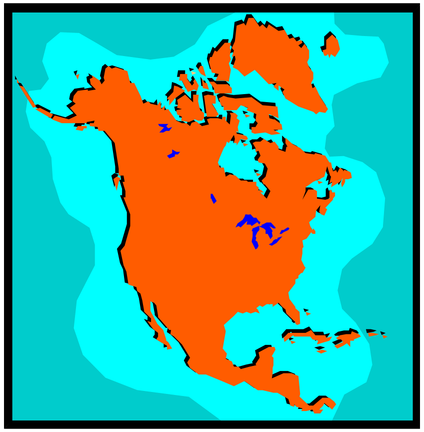


WNV - Europe

- 1960s-1980s – Former Soviet Union
- 1996 Romania – Thousands of cases
- 1997 Czech Republic
- 1998 Italy
- 2000 France



WNV - North America



- 1999 New York, USA
- Has gradually radiated across the continent from here
- Several Thousand US cases to date
- 2001 Canada
- Moved into Canada.
- Several hundred cases to date
- Not a question of if WNV will reach BC, but a question of when.
- Speculated we would see WNV as early as August 2003, and began planning for this date

BC Strategy

- BCCDC Developed the “Arbovirus Surveillance and Response Guidelines”
  - Surveillance
  - Education
  - Control Measures
- Coordinated Multi-Agency approach required

BC Strategy

- Responsibilities divided:
- Health Authorities – Collection and Submitting Corvids and Mosquitoes. Public Education, Decision on pesticide application.
- BCCDC –Testing and surveillance of Humans, Animals and Mosquitoes., Epidemiology, Public Education
- Local Governments – Undertaking Mosquito Control/Abatement Measures, Public Education

Responsibilities….cont.

- PHOs Office – Advising MHOs, Public Education
- MOHP/MOHS – Ensuring a legal mechanism is in place to allow the application of pesticides across BC.
- MWLAP - Pesticide Permit issuer
- MCAWS – Assisting local governments to respond to requests to apply pesticides.

BCCDC Guidelines

Appropriate responses depend on the the risk at any given time. Appropriate responses can include any or all of:

- Surveillance
- Education
- Mosquito control and abatement

Surveillance

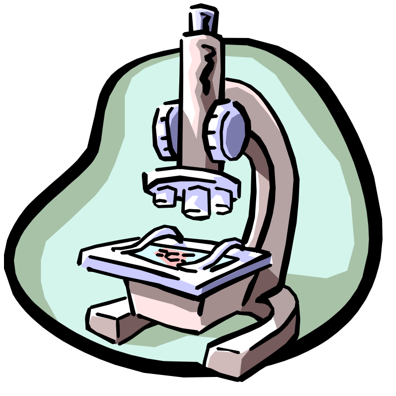
Relative risk to the community will be determined using result of surveillance of populations of:

Birds,

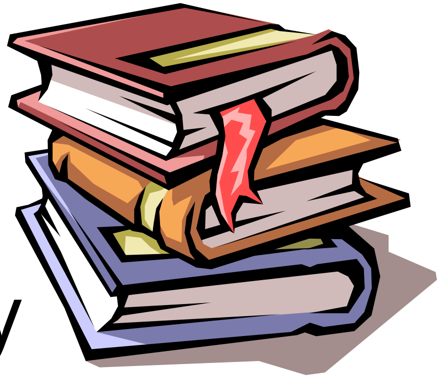
Mosquitoes,

Horses,

Humans



Education:



- Personal Protection
- Notification of Virus Activity
- Encourage Habitat Reduction
- Public Advisories regarding pesticide application

Mosquito control:

Could include some or all of:

- Habitat Reduction
- Larvicide
- Adulticide

Considerations for Mosquito Control:

- Impractical, impossible and undesirable to kill all of BC's Mosquitoes. So where will WNV Control be needed?
  - Consider risk to human health of applying pesticides
  - Consider risk to human health of not applying pesticides
  - Consider risks to other species of applying pesticides
- Pesticide Permits must be taken out.
  - Who can legally take out a Province wide pesticide permit?
  - Who will be applying pesticides?
- What are the criteria that ensure this permit is not used inappropriately?

BC Strategy

Any decision to begin mosquito reduction would be based on:

- The Arbovirus Surveillance and Response Guidelines (Developed by BCCDC, in conjunction with the Canadian National WNV Steering Committee).

- Decision of the local MHO, made in conjunction with the PHO, local community as to what control measures are warranted.

Response Levels to Trigger Consideration of Pesticide Controls

- Level 0, Level 1 – Surveillance shows no evidence of WNV in bird, animal or mosquito
- Level 11a - Surveillance shows WNV in bird, animal or mosquito in previous year, or in neighboring jurisdiction in current year
  - For these levels of response, only non pesticide control measures to be considered

Response Levels to Trigger Consideration of Pesticide Controls

- Level 11b - Surveillance shows WNV in bird, animal or mosquito in current year, or in neighboring jurisdiction in current year.
  - Larvicide programs to be considered.
- Level 111 - Surveillance shows one or more locally acquired cases of WNV humans in current year.
  - Larvicide and Adulticide programs to be considered.

Response Levels to Trigger Consideration of Pesticide Controls

"Any decision made as to commence a pesticide control program would be done on recommendation by the local medical health officer in consultation with the PHO, the local community, WLAP, the local pesticide manager and local governments based on information provided by the BCCDC"

What Happened in 2003

- Seven probable and twelve confirmed human cases in BC, all attributed to travel outside of BC.
- Surveillance found no evidence of WNV in BC. No WNV found in either Washington or Oregon, or Idaho.
- No pesticides applied in BC.
- In Canada, there were 1200 cases, including 10 deaths. 60% were from Saskatchewan.
- In the USA, there were over 6957 cases. Colorado was most effected with 2170 cases, including 44 deaths.

Conclusions

- As evidenced by numbers of cases in Saskatchewan and Colorado, WNV can potentially affect significant numbers of people
- Still have reason to believe that WNV will reach BC next year.
- Active mosquito season is over, but we can now can incorporate lessons learned from other provinces/states for next year.
- The ability to take reasonable actions to control mosquitoes may be warranted and appropriate preparations should be taken.

Economic Strategy for Agriculture in the Lower Mainland

Presented by Theresa Duynstee, P.Ag., Greater Vancouver Regional District

Abstract

The *Economic Strategy for Agriculture* aims to ensure an economically viable industry that is organized, proactive, and sustainable over the long term. It was proposed by the Greater Vancouver Regional District's (GVRD) Agricultural Advisory Committee (AAC), and undertaken as a partnership project by the GVRD, the Fraser Valley Regional District, the Provincial Agricultural Land Commission, BC Ministry of Agriculture, Food and Fisheries, and the Investment Agriculture Foundation of British Columbia (funded by Agriculture and Agri-Food Canada).

As a multi-agency partnership, the project was implemented under the direction of a steering committee composed of agency partners and AAC members. The strategy was developed in a research and consultative process over a two year period lead by Artemis Holding Ltd., and was completed in July 2002. It is intended to serve as a guide of actions that could be implemented by agriculture stakeholders. Strategy partners encourage the private sector to be proactive and lead implementation, as this is not a government strategy. Nevertheless, the considerable influence governments exert over agriculture means that most of the recommendations require action by both the private and public sectors.

This presentation provides background information on how the strategy was developed, the key results, and the status of implementation. A copy of the strategy and supplementary reports are available on the GVRD website at http://www.gvrd.bc.ca/agriculture/strategy.htm.

Economic Strategy for Agriculture in the Lower Mainland

Presented to the
Pesticide Information Exchange
Environment Canada
November 27, 2003

By Theresa Duynstee, P.Ag.
Greater Vancouver Regional District (GVRD)

Presentation Outline

- Purpose of Strategy
- Background
- Key Strategies
- Implementation
- Next Steps

Economic Strategy for Agriculture

- Aims to ensure

  "an economically viable Lower Mainland agriculture industry that is organized, proactive, and sustainable over the long term"

- The purpose of the strategy is to encourage actions, plans and policies to maintain agriculture viability

Background

GVRD Agricultural Advisory Committee (AAC) initiated the Economic Strategy for Agriculture

- Highlighted problems in, "*Farming in an Urbanized Area*"
- Proposed an economic strategy to address these problems
- Established partnerships and steering committee

Background cont..

Project Partners

- Greater Vancouver Regional District
- Fraser Valley Regional District
- Agricultural Land Commission
- BC Ministry of Agriculture, Food and Fisheries
- Investment Agriculture Foundation of British Columbia in association with Agriculture Canada

This is a multi agency partnership

(not a GVRD Strategy)

Background cont..

- Dec 2000 – Artemis Agri-Strategy Group hired
- 2001-2002 – Research, focus groups and interviews
- July 2002 – Strategy sign off by partners
- March 2003 – Implementation Workshop

Agriculture in the Lower Mainland

- 10,000 farms feel pressure from urbanization
- Economics favor large scale operations, yet smaller farms dominate
- Four levels of government administer a complex web of regulations
- Increase in value-added, intensive farming

Reports Available

- Main Document and Executive Summary *(July 2002)*
- *Economic Profile of Agriculture (Nov 2001)*
- Focus Group Reports
- Strategy Development Process
  - *Farming in an Urbanized Area (1999)*

Available on GVRD website
http://www.gvrd.bc.ca/agriculture/strategy.htm

Key Strategies
with examples of strategic options

1. Protect the agricultural land base
   - Manage urban rural conflicts
   - Form municipal agricultural advisory committees
2. Streamline the regulatory process
   - Bylaw information and review
   - One window approach to enforcement
3. Ensure availability of labour
   - Develop a labour supply initiative

Six Key Strategies cont..

4. Develop supportive policies and plans
   - Drainage and water use allocations
   - Impacts from new developments
5. Support an expanded industry image
   - Ag Aware education program
   - Farm markets and conferences
6. Become market oriented and proactive
   - Target niche and specialty products
   - Market research and education

Implementation

Workshop held March 2003

- Reviewed recent legislative and regulatory events
- Attempted to define priorities, critical issues, recommend action items, and identify leading agency, group or individual

Next Steps

- Problem: No obvious leader
- GVRD AAC prepared report, *Next Steps in the Economic Strategy for Agriculture in the Lower Mainland.*
- Two key priorities are:
  1. Help facilitate a coordinated implementation and monitoring process with partners
  2. Develop framework to help streamline regulatory process

2003 Pesticide Inventory

Presented by Gevan Mattu, Commercial Chemicals Division, Environment Canada

Abstract

The last *Survey of Pesticide Use in British Columbia* was conducted in 1999. It is available on the internet at http://www.pyr.ec.gc.ca/georgiabasin/reports/Pesticide_Use_BC/summary_e.htm The fourth pesticide survey (for the calendar year 2003) will be conducted in 2004, with a report available in early 2005. The project will be led by Environment Canada and the BC Ministry of Water, Land and Air Protection. EC and WLAP invite input into the survey design and scope. For more information, contact:

Gevan Mattu
Senior Compliance Promotion Scientist
Commercial Chemicals Division
Environment Canada
#201 - 401 Burrard St.
Vancouver, BC V6C 3S5
Phone: 604-666-3198 Fax: 604-666-6800
Email: ***gevan.mattu@ec.gc.ca***

2003 Pesticide Inventory

Gevan Mattu
Commercial Chemicals Division
Environment Canada

Fraser River Action Plan

A Comprehensive Survey of Pesticide Use in British Columbia: 1991

CANADA'S GREEN PLAN
LE PLAN VERT DU CANADA

Canada

DOE FRAP 1993-35

Ministry of
Environment,
Lands and Parks

Environment Canada | Environnement Canada

BC Environment

A COMPREHENSIVE SURVEY OF PESTICIDE USE IN BRITISH COLUMBIA: 1991

Environment Canada

Environnement Canada

Ministry of Environment, Lands and Parks

SURVEY OF PESTICIDE USE

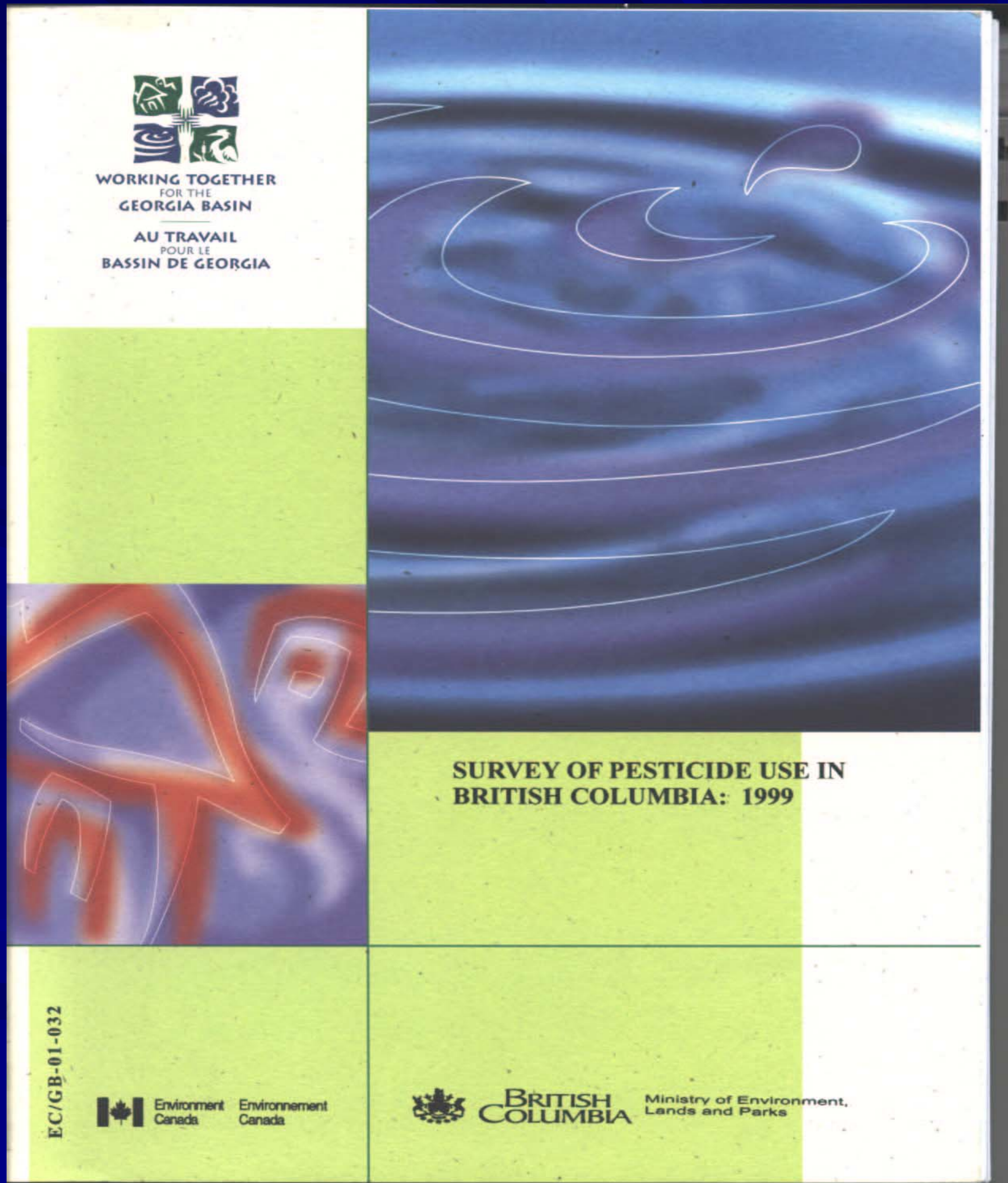
IN

BRITISH COLUMBIA: 1995

Environment Canada
FRASER RIVER ACTION PLAN

Environnement Canada
PLAN D'ACTION DU FRASER

British Columbia
Ministry of Environment
Lands and Parks



WORKING TOGETHER
FOR THE
GEORGIA BASIN

AU TRAVAIL
POUR LE
BASSIN DE GEORGIA

SURVEY OF PESTICIDE USE IN BRITISH COLUMBIA: 1999

EC/GB-01-032

Environment Canada Environnement Canada

British Columbia Ministry of Environment, Lands and Parks

Purpose and Objectives of Surveys

- Long-term objective is to determine trends in BC pesticide sale and use

- To encourage and promote adoption of IPM to reduce reliance on pesticides and eliminate unnecessary pesticide use

1999 Survey Results

- 8 million kg of pesticide active ingredients were purchased or used in 1999 excluding most domestic label pesticides
- 7 million kg were anti-microbial chemicals, primarily commercially applied wood preservatives
- and anti-sapstain chemicals
- 5 % were insecticides
- 4 % were herbicides
- 3 % were fungicides
- remaining pesticides included fumigants, plant and insect growth regulators, slug baits and vertebrate control products

1999 Survey Results cont

- In BC 286 active ingredients were used
- 20 a.i. accounted for 95% of pesticides sold
  - Creosote 65%
  - Chromated copper arsenate (CCA) 11%
  - DDAC 4%
- 19% increase in pesticide sales from 1991-1999

1999 Survey Results cont

- Substantial increase in sales of mineral oil (insecticidal or adjuvant), chlorothalonil, formaldehyde, Bti and Btk
- Decrease in sales of ethalfluralin and atrazine
- Decrease in sales of federally labelled Restricted pesticides
- Use of pesticides by landscape services in the Lower Mainland decreased by 40%

2003 Inventory

- EC and WLAP will be conducting the 4th survey
- Meeting of interested partners early 2004
  - Input
  - Funding
  - ToR / scope (what do you want in the survey)
- Contract April 2004
- Report by early 2005

Contact Info

Gevan Mattu
Commercial Chemicals Division
Environment Canada
gevan.mattu@ec.gc.ca
604 666-3198

Species at Risk and Pesticides: The Road Ahead

P. Delorme, C. Kriz, F. Wandelmaier

Abstract

The introduction of the new Species at Risk Act (SARA) brings with it additional responsibilities for government bodies with an environmental protection mandate. The purpose of SARA is to prevent wildlife species from being extirpated or becoming extinct, to provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity and to manage species of special concern to prevent them from becoming endangered or threatened.

For the PMRA there is an expectation and a responsibility to consider in assessments and regulatory decisions under the PCPA the potential harm to wildlife species as defined under SARA. The PMRA has started to examine different aspects of this issue, including legal responsibilities, implications for risk assessment and risk management and communications and consultations with other stakeholders. This presentation will provide some background on the issue and discuss the PMRAs activities with respect to SARA.

Species at Risk and Pesticides
The Road Ahead

Outline

- The Two Acts
- Agency Activities
- Responsibilities
- Risk Assessment & Management
- Consultations & Communications

SARA - Purpose

- To prevent wildlife species from being extirpated or becoming extinct,
- To provide for the recovery of wildlife species that are extirpated, endangered or threatened as a result of human activity
- To manage species of special concern to prevent them from becoming endangered or threatened.

SARA

- In the new SARA, pesticides are not specifically mentioned.
- Nor are species at risk specifically referred to in the new PCPA.
- SARA sets a federal policy and standard that PMRA must respect.

PCPA

- Act designed to protect human health, safety and the environment by regulating products used for pest control

PCPA

- PMRA has an environmental protection mandate
- Includes the consideration of all wildlife, including species at risk in our assessment and risk management process.

PCPA

- Prior to new PCPA and SARA, PMRA was not legally obligated to take species at risk as such into consideration in our assessment & management process.
- However, consideration was given in those instances where there was an obvious risk (e.g. use of rodenticidal baits).

PCPA + SARA = ?

- The two acts are independent.
- Complying with a pesticide label would constitute “due diligence” to a charge under PCPA, but may not under SARA.

PCPA + SARA = ?

- Users will need to ensure they comply with both acts. Because the PMRA cannot authorize the use of a pest control product in contravention of other applicable legislation
- Must take all reasonable measures to determine that use of a pest control product according to the label would not result in harm to species at risk as outlined in the general prohibitions section of SARA.

PMRA Activities

- Working on development of an implementation framework & timelines
- Have formed a WG to address the issue
- Agency working on three basic aspects:
    - Identification of Responsibilities
    - Assessment & Risk Management
    - Consultation & Communication

Responsibilities

- Understanding our legal responsibilities under the PCPA in relation to SARA.
- Understanding interactions between other responsible parties including other federal departments, the provinces and other stakeholders (eg. users).

Responsibilities

- Ensuring appropriate assessment processes are in place to consider SAR
- Development of MOU's when & where necessary.

Environmental Assessment

- Currently PMRA identifies hazards to the environment by taking into account the most sensitive species tested and using relatively conservative exposure scenarios.
- Required toxicity tests cover a broad range of indicator species for environmental assessments of pesticides e.g.,birds, fish, mammals, beneficial insects, aquatic invertebrates, non-target plants.

Environmental Assessment

- PMRA is in the process of developing approaches to enhance risk assessments and mitigation measures to take into consideration the Species at Risk Act
- Ensure risk assessments identify potential hazards to SAR
- Ensure appropriate assessment endpoints are chosen.

Environmental Assessment

- Eg. a GIS based map of the distribution of endangered species in Canada is now available.
- Can identify potential areas of overlap between pesticide use and occurrence of species at risk.
- Examine approaches in other jurisdictions (e.g. US- EPA, EU).

Risk Management

- Development of standards of acceptability for risk management decisions.
- Identify appropriate risk management tools.

Risk Management

- Environmental Risk - in respect of a pest control product, means the possibility of harmto the environment, including its biological diversity, resulting from exposure to or use of the product, taking into account its conditions or proposed conditions of registration.

Communications & Consultation

- We are at the beginning of this process.
- PMRA will be consulting with EC, the provinces and other stakeholders on our approach to protecting listed species and their critical habitat.
- Development of strategy to communicate identified risks to stakeholders (OGDs, Provinces, users).

Communications & Consultation

- Co-operation between all concerned parties will be needed.
- When necessary PMRA should be involved in development of action plans and recovery strategies

Pesticide Management as Part of Environmental Farm Plans

Presented by Madeline Waring, Pesticide Specialist, BC Ministry of Agriculture, Food and Fisheries

Abstract

The BC Agriculture Council in developing an Environmental Farm Plan (EFP) program in conjunction with other agencies. The EFP is a process for producers to assess environmental risks on their farms. One component being assessed as part of the EFP program is pesticide management. The EFP process assesses the producer's knowledge of risks associated with pesticide use, pesticide transport and storage practices followed, mixing and application practices, procedures for the disposal of containers and pesticides, the existence and quality of contingency plans, and the use of integrated pest management. Implementation of the EFP program will reduce environmental risks from pesticides on farms and ranches.

Pesticide Management as part of Environmental Farm Plans

Madeline Waring
Pesticide Specialist
BC Ministry of Agriculture, Food & Fisheries

Environmental Farm Plan Program

- A process for producers to assess environmental risks on their farms
- BC Agricultural Council program developed in partnership with various agencies

Environmental Farm Plan Program

Looks at risk related to:

- Farmstead
- Livestock
- Crops
- Pest Management
- Soil Amendments
- Stewardship Areas
- Soil
- Water
- Air
- Biodiversity

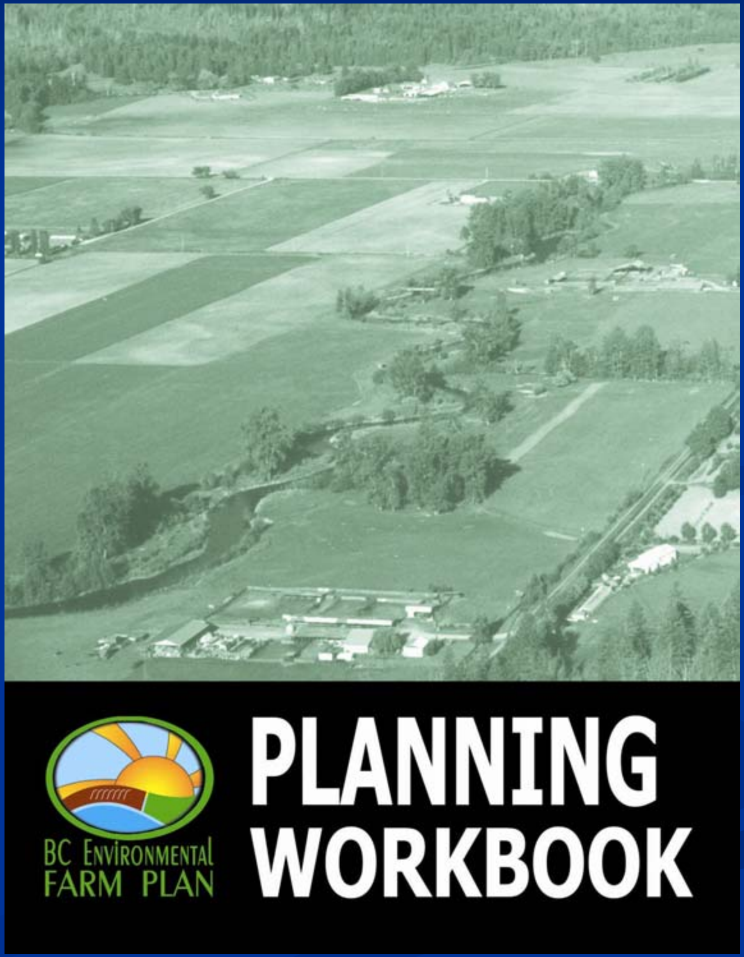
Pesticide Risk Assessment

Examines:

- Knowledge about risks
- Transportation
- Storage
- Mixing & using
- Disposing of containers & pesticides
- Contingency plans
- Use of Integrated Pest Management

Environmental Farm Plan Planning Workbook

- Guides the risk assessment by asking questions on various topics



Pesticide Worksheet

Refer to *Reference Guide* for → Concerns – page 97 Legislation – page 97 BMP's – page 100

#	Legislation	Knowing the Risks of Pesticides — This part does not apply to my operation	Yes	No	?	N/A
170		Do you understand the potential risks from improper pesticide use?				
		Transporting and Storing Pesticides — This part does not apply to my operation				
171	Sanitary 42	***Are pesticides stored at least 30 m [100 ft] from any well?***				
172	Building 4.1.4. Pesticide	***Are pesticides stored in a dry, well-ventilated storage that is locked, has a warning sign and can contain spills?***				
173		Are pesticides transported in undamaged, labeled, closed and secured containers?				
174		Are pesticides stored at least 15 m [50 ft] from any watercourse?		1,3		
175		Are pesticides stored in tightly closed containers, and according to label directions?				
176		Are herbicides stored separate from other pesticides?				
177		Are pesticide-treated seeds stored to keep out animals including wildlife?				

24					
		Mixing and Using Pesticides This part does not apply to my operation			
25	Pesticide	*Are pesticides only applied in weather conditions that will not result in unreasonable adverse effects due to drift or pesticide-contaminated water movement?*			
26	Pesticide	*Where required, does the pesticide applicator have a valid Pesticide Applicators Certificate?*			
27	Pesticide	*Are pesticides used according to ALL label directions?*			
28	Sanitary 42	*Are sprayer filling and cleaning done at least 30.5 m [100 ft] from any well?*			
29	Pesticide Special Waste	*Is sprayer wash water collected and applied to land as a pesticide?*			
30	Pesticide	*Is a MWLAP permit obtained prior to applying pesticides to a watercourse (unless a man made, self-contained body of water on private land)?*			
31		Considering topography and soil type, is the pesticide mixing site located and managed, and application site managed to prevent pesticide and/or its leachate from contaminating watercourses?		1+6	
32		Considering depth to the water table and soil type, is the pesticide mixing site located and managed, to prevent leachate from contaminating groundwater?		1+7	
33		Considering local condition (such as wind speed and direction) is application equipment selected and operated to prevent drift into sensitive areas?		5	
34		When filling, is a 30 cm [12 in] air gap maintained between the water supply line and the sprayer tank, or is a backflow prevention device installed in the water supply line?			
35		Has the application equipment been serviced and calibrated (see Reference Guide Glossary) this year?			

		Disposing of Containers and Pesticides This part does not apply to my operation			
36	Special Waste	***Are containers pressure rinsed for 30 seconds, or singled rinsed three times and then the rinsed contents poured into the sprayer?***			
37		Are the containers crushed or punctured so they cannot be reused?			
38		Are the washed and rinsed containers delivered to a recycling site or permitted landfill?			
39		Are pesticide purchases planned to minimize the amount of pesticides stored and the accumulation of unwanted pesticides?			
40		Have unwanted pesticides been disposed of in an approved manner?			
		Pesticide Contingency Plan This part does not apply to my operation			
41	Spill	***Do you have emergency names and contact numbers to report pesticide spills?***			
42		Has a contingency plan been developed to deal with pesticide spills, fires, application errors, flooding?			

PEST MANAGEMENT WORKSHEET

Refer to *Reference Guide* for →	Concerns – page 84	Legislation – page 84	BMP's – page 85

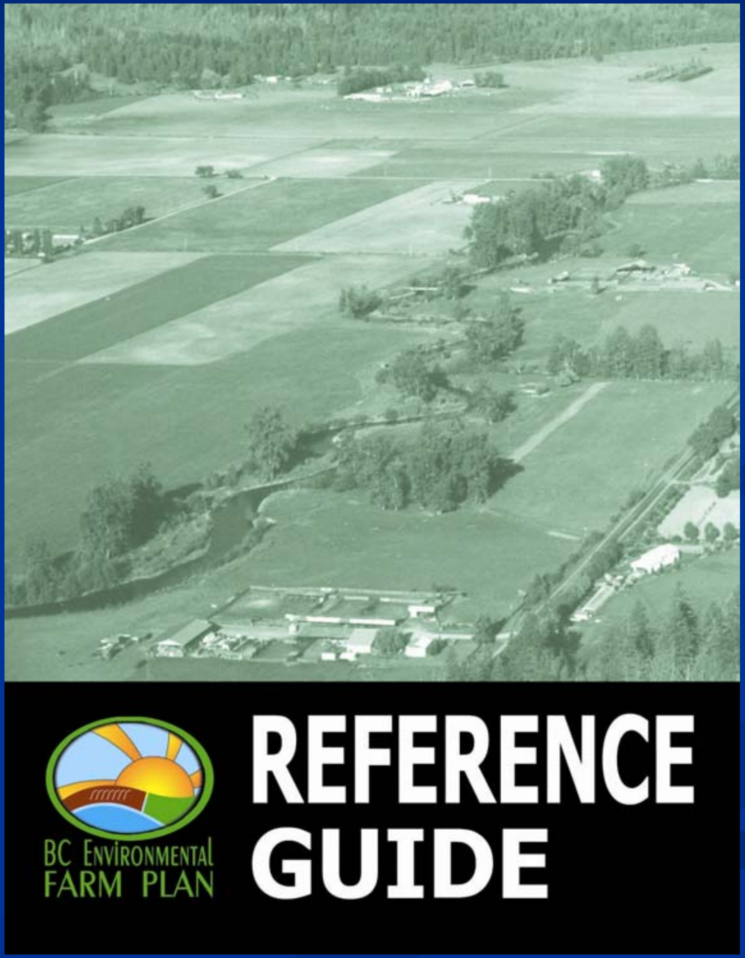
#	Legislation	Pest Management — This part does not apply to my operation	Yes	No	?	N
164		Integrated Pest Management (IPM) needs to be followed if answering "No" to any of the sub-questions below.				
		• Is crop and animal production managed to keep pests from becoming a problem?				
		• Can pests and their damage be identified and is their lifecycle understood?				
		• Are pest and beneficial organism populations, crop damage and weather monitored?				
		• Are thresholds used to decide if and when to control pests?				
		• Is a combination of appropriate control methods considered (biological, cultural, mechanical, behavioral or chemical) before action is taken?				
		• Do you maintain records on pest monitoring and control methods used?				
		• Do you evaluate the effectiveness of your control methods?				
		Steps in an IPM Program are outlined in the **Reference Guide**, Table 5.1, page 86. Specific IPM Programs are described in detail in **Crop Production Guides** and **Weed Management Guide** publications.				
165		If noise makers are used for bird control, are they operated in accordance to the BC Ministry of Agriculture, Food and Fisheries - Wildlife Damage Control Guidelines?				
166		Are plants, plant material and animals managed to prevent the introduction of invasive or exotic pests to the farm (insects, weeds, animals and diseases)?				
167		Are different crops used in rotation for pest management?				

Long term a solution is adequate in up to 5 years (i.e. adopting other beneficial management practices)

	FARM ACTION PLAN WORKSHEET			Page 1 of
	Farm:	Developed By:		Date Developed:
Question # (from the Review Worksheets)	Proposed Action (changes required to address concern)	Proposed Monitoring (where applicable)	Priority (immediate; short, medium, or long term)	Date Action Completed

Environmental Farm Plan Reference Guide

- Assists producers developing an EFP
- Summarizes legislation and beneficial management practices



Producers can also get help from "Planners"

Consultants are being trained as Planners to help producers complete their Environmental Farm Plans

Environmental Farm Plan Program

- ✓ Identify potential environmental pesticide risks on farms
- ✓ Suggest actions to address these risks
- ✓ Prioritize the actions

Pesticide Risk Reduction and Minor Use Program

Presented by V.R. Brookes, AAFC

Abstract

Major changes within Agriculture and Agri-Food Canada (AAFC) and the Pest Management Regulatory Agency (PMRA) of Health Canada have occurred due to several recent ministerial announcements. In May 2002 a program for Pesticide Risk Reduction was announced, followed in June 2002 with information on how it was to be funded. Also in December 2002 a new Pest Control Products Act was passed. This will result in an increase in lower risk products being available and reducing the time line requirements for reviews.

To facilitate these goals a new "Minor Use Centre" has been established in Ottawa and building space allocated in Ottawa. As well, 10 AAFC sites across Canada have been designated to work on this program. AAFC will receive approximately $10 M / year and PMRA approximately $8 M / year in more funding as well as increased funding for CFIA, DFO, NRCan and EC. In addition to these departments being partnered, provincial governments will also be included with representation by the Provincial minor use coordinators and also industry (both registrants and grower groups). CFS has seconded Dr. Shiyou Li to be their minor use representative. An executive director will be appointed by the end of 2003. A website and brochures will be available soon. An AAFC and PMRA working group has been established and an Advisory Committee has been appointed. A manager has been identified for the Risk reduction section and research projects are in the review process and as well crop profiles are being developed. The 10 AAFC sites and their residue trial zones are: Agassiz, B.C. (12), Summerland, B.C. (11), Scott, Sask. (7, 7A, 14), Harrow, Ont. (5, 5A), Delhi, Ont. (5, 5A), Vineland, Ont. (5,5A), St. Jean-sur-Richelieu, Que. (5A, 5B), Kentville, N.S. (1A) and Bouctouche, N.B. (1). Four of the sites now have GLP status and the other 6 are in process (needed to carry out residue trials).

Various local commodity committees linked with national committees are being established, if not already in place. The cost of minor use registrations can vary between $154 (if all required data is available) to approximately $40,000 if little or no existing data. An annual priority meeting will be held (first one took place in March 2003) similar to the U.S. IR-4 (American minor use program) to determine projects for following year. 35 projects selected (10 fungicide, 10 insecticide, 10 herbicide + 5 regional upgrades).

In 2004 all existing (termed historical projects) and all new projects will be reviewed. Since 1999 have annually done a few joint projects with IR-4, about 30 in 2003 and about 60 planned for 2004.

Pesticide Risk Reduction and Minor Use Programs

Victoria Brookes

Agriculture and Agri-food Canada

November, 2003

Ministerial Announcements

- May 23, 2002 Pesticide Risk Reduction (jointly affects AAFC & HC-PMRA)
- June 24, 2002 Bridge Financing to create the new Minor Use Program
- Pest Control Products Act, C-53 passed December 2002

Drivers for New Pesticide Minor Use Program

- Increase lower risk product availability
- Reduce the time line requirements for PMRA reviews for registrations

Consequences of Announcements

- Establishment of minor use centre in Ottawa
- Meetings with partners to determine roles
- Increased cooperation with the U.S. IR-4 program
- Development of National Priority list
- Establishment of 10 AAFC hubs in regions to meet the commitments to Minor Use Program

How do the Government Pieces Fit Together

- AAFC Plant Pest Research ~30 m/yr

- NEW MONEY FOR
  - AAFC Minor Use Program Initiative ~10 M/yr
  - PMRA Minor Use Program Initiative ~ 8 M/yr

  - SOME NEW MONEY AS WELL FOR
  - CFIA
  - DFO
  - NRCan
  - EC

Pesticide Minor Use Partners Are:

- Government
  - AAFC
  - PMRA
  - CFIA, EC, NRCan (CFS), DFO
  - IR-4
  - Provincial Minor Use Coordinators (provincial governments)
- Industry
  - Industry (registrants/manufacturers)
  - Industry (growers and grower organizations)

2002-2003 Risk Reduction Achievements

A: Risk Reduction (RR)

- Staffing of RR Manager and 2 assistants
- 26 RR research projects under review for funding
- Crop profiles - review of available profiles, and development of new ones

2002-2003 Minor Use Research Achievements

B: Minor Use

- 15 proposals reviewed fall 2003
- Budgets in place to support 4 years research

AAFC Minor Use Centres

- Agassiz, B.C. (12)
- Summerland, B.C. (11)
- Scott, Sask. (7, 7A, 14)
- Harrow, Ont (5, 5A)
- Delhi, Ont (5, 5A)
- Vineland, Ont (5, 5A)
- St. Jean-sur-Richelieu, Que (5A, 5B)
- Kentville, N.S. (1A)
- Bouctouche, N.B. (1)

PMRA Canadian Crop Zones

- 1, 1A, 5, 5A, 5B, 7, 7A, 9, 11, 12 and 14
- Overlap with U.S. on 1, 5, 7, 9, 11 and 12

Local Committees

- Set key problems and possible solutions identified by committees
- Local committees will correspond with other groups across Canada either directly or through provincial extension workers and provincial minor use coordinators to compare problems

Cost of Projects

- Varies from $154 if all required data is available and only label amendment cost must be paid to ~$40,000
- Completely dependent on amount of data needed. Generally requirements for minor use registrations are efficacy, tolerance and residue

National Priority Setting Meeting

- Very important part of the process
- Inputs from various groups including growers, grower groups, provincial minor use coordinators, researchers, registrants

Annual Priorities

- Total of 35 priorities set per year

- Fungicides – 10
- Insecticides – 10
- Herbicides – 10
- Regional upgrade – 5 (one for each of 5 regions across Canada)

Pesticide Minor Use Achievements

- Action plan for clean-up of " historical" URMULE list at March, 2004 Priority Setting Meeting
- 2004 Minor Use Pesticide Priority Setting Workshop being planned
- Proposed URMULE submission time lines for PMRA/AAFC/Crop Life/PMUCs being negotiated
- New URMULE submission form developing
- Definition of roles of the Provincial Minor Use Coordinators (PMUCs) in AAFC Pesticide Risk Reduction and Minor Use Programs underway

Pesticide Minor Use Achievements

- Since 1999 a few joint trials with IR-4 have been carried out annually– in 2003 more than 30 and expect about 60 in 2004
- 2 Study Directors hired and more in process
- QA Manager hired; assistant QA to be hired and regional QA in process

Pesticide Minor Use Developments

- Ottawa Minor Use staff to move to new building by December 2003 so that all in same building
- All HQ staff GLP trained in November
- AAFC “all-sites” meeting to be held in Jan
- 4 AAFC sites now GLP compliant and other 6 in process

Pesticide Minor Use Developments

- CFS has seconded Dr Shiyou Li as their key contact for Minor Use and joined AAFC on October 10

Other Updates Pesticide Risk Reduction and Minor Use Programs

- **Headquarters**
  - **New name - “Pest Management Centre”**
  - **Staffing Processes**
    - Executive Director to be announced
    - Study Directors
    - QA assistant
  - **Communication activities (Website, brochure, etc.)**
  - **AAFC-PMRA Working Groups (2 meetings so far)**

Other Recent Achievements (*Headquarters)*

- **Advisory Committee** **(governance & accountability – composed of representatives from federal, industry, provincial and producer groups)**
  - **June 2003 meeting & Membership**
    - **Membership**
      - **Chair and Vice-Chair**
    - **Terms of reference**
      - **Mandate**
      - **Operation**
    - **Outcome**
      - **Technical and scientific sub-committees**

IR-4 Developments

- **Projects for 2004 near completion**
- **Shirley Archambault appointed IR-4 contact**
- **IR-4 joint meetings with AAFC**
  - July 10th Meeting in Ottawa
  - 2004 Plans Portland, OR in Sept
  - Food Use Planning Meeting, NJ, Oct

Finis

Local Government Approaches to Restricting Non-essential Pesticide Use

Presented by Patricia Bell and Nancy Grenier, Demand Side Management Division, GVRD

Abstract

The preparation of this Greater Vancouver Regional District staff report was driven by concern over the possible impacts of urban pesticide use for compost production and storm water management, and a need for clarification on the jurisdictional authority for pesticide management on private residential lands in the GVRD

In broad terms, the studies referenced in the report indicated that pesticide use on private residential land frequently exceeds recommended concentrations. Studies also showed that residues of two pesticides were found in compost in the U.S. at levels harmful to certain plants, resulting in extra costs and lost revenues for composting programs. Fairly high levels of pesticide residues have been found in urban streams, sometimes at levels considered harmful to aquatic life. Finally, people in the GVRD and elsewhere are concerned over the possible health and environmental consequences of pesticide use.

Several municipalities across Canada are considering banning or have banned non-essential pesticide use on private residential land. These bans are within the jurisdictional authority of municipalities within the province of Quebec but may be beyond the jurisdiction of municipalities in other provinces. The report includes some comments about the successes and difficulties associated with bans; outlines the legislative context for banning non-essential pesticide use on private residential land in British Columbia; and provides an update on actions being taken in the GVRD related to this issue.

The GVRD is also active in the delivery of various public education programs as an alternative to regulatory measures. District and municipal staff share resources and research in the development of 'natural yard care' material, and forming delivery partnerships with community-based groups for a regionally-tailored approach to integrated pest management.

The GVRD report titled "Local Government Approaches to Restricting Non-essential Pesticide Use" can be found at:
www.gvrd.bc.ca/board/agendas/03comagendas/planning/0709/agenda.htm

Local Government approaches to restricting non-essential pesticide use in the GVRD

- Outline:
  - Drivers for the report
  - Municipal bans
  - The shifting legislative context for pesticide management in BC
  - What GVRD municipalities are doing
  - Outreach efforts in the GVRD
  - Where are we now?

Intensity of pesticide use in urban areas

- Pesticides are frequently applied at higher levels and concentrations than necessary, mostly because of a lack of appreciation for the correct application level

  - Sources:
  - 2002 Omnibus Survey
  - North Shore Recycling Program Survey
  - Toronto Public Health Survey
  - Puget Sound Water Quality Agency
  - Vancouver Health Authority
  - Canadian Environmental Law Association

Pesticide residues in compost

- The composting process degrades most pesticides within 90 days
- Clopyralid and picloram caused problems in the U.S.
- Even low levels of some pesticides are toxic to certain plants; this has implications for the development and sale of compost
- Pesticide risk assessment should include an assessment of risk to composting programs

    - Sources:
    - Carolina Recycling Association
    - California Integrated Waste Management Board

Pesticide residues in receiving waters

- Canadian and U.S. studies identified high level of residues in urban streams
- Residue levels were below standards and guidelines for drinking water, but sometimes exceeded standards for the protection of aquatic life
- Determining the full extent of adverse effects on receiving waters requires further study

  - Sources:
  - U.S. EPA
  - United States Geological Survey
  - EtoxNet
  - Ontario Ministry of the Environment

Municipal bans

- Bylaws banning cosmetic pesticide use are considered by municipal staff to be moderately successful, although enforcement is a problem
- Municipal bans are allowed in Quebec but they may be beyond the jurisdiction of local governments in other provinces

Shifting legislative context for pesticide management in urban areas

- BC Integrated Pest Management Act will require IPM on public and forested land and utility corridors.
- The BC Local Government Act allows local government to regulate for the protection of public health but bylaws must be approved by Minister of Health
- Under the Community Charter, the province and local governments share responsibility for the protection of health and environment

Municipal approaches to reducing pesticide use on private residential land

- North Vancouver City and District, Port Moody, Vancouver, and Richmond are considering or have considered bans
- Burnaby, Delta, North Vancouver City and District, West Vancouver, Port Moody, Surrey, and Vancouver are developing or have developed educational programs for residents

Status of review

- Legal opinion on impact of the Community Charter has been requested
- The report has been received by the GVRD Solid Waste, Sewerage and Drainage, and Planning and Environment Committees
- GVRD technical advisory committees are considering the report and will provide direction

Public education efforts

- On going research in audience attitude towards the use of pesticides
- Integrated messaging to yard care activities promotion
- Exclusive education program development and partnership delivery with municipalities and special interest groups

Presented by Patricia Bell and Nancy Grenier from the Demand Side Management Division at the GVRD

Presented by Yota Hatziantoniou, Environmental Services Division, City of Burnaby

Abstract
The City of Burnaby is engaged in a process to reduce the use of cosmetic herbicides on private lands. As part of this process, the City has reviewed the findings of its first series of public consultations, and is now currently engaged in developing an multi-target pesticide education program for the Spring of 2004. Focussed education and additional public consultations will help to determine whether more restrictive pesticide reduction measures are required in the future. The City's Proposed Cosmetic Herbicide Restriction Program complements the City's existing IMP Policy for public lands that has been in place since 1992.

City of Burnaby

Engineering Department

Environmental Services Division

November 27, 2003

Proposed Cosmetic Herbicide Restriction Program

1. Background to Cosmetic Herbicide Restriction Program.
2. Summary of Public Consultation Process Findings.
3. Proposed Policy Options.
4. Council Approval of Two-Phase Strategy.

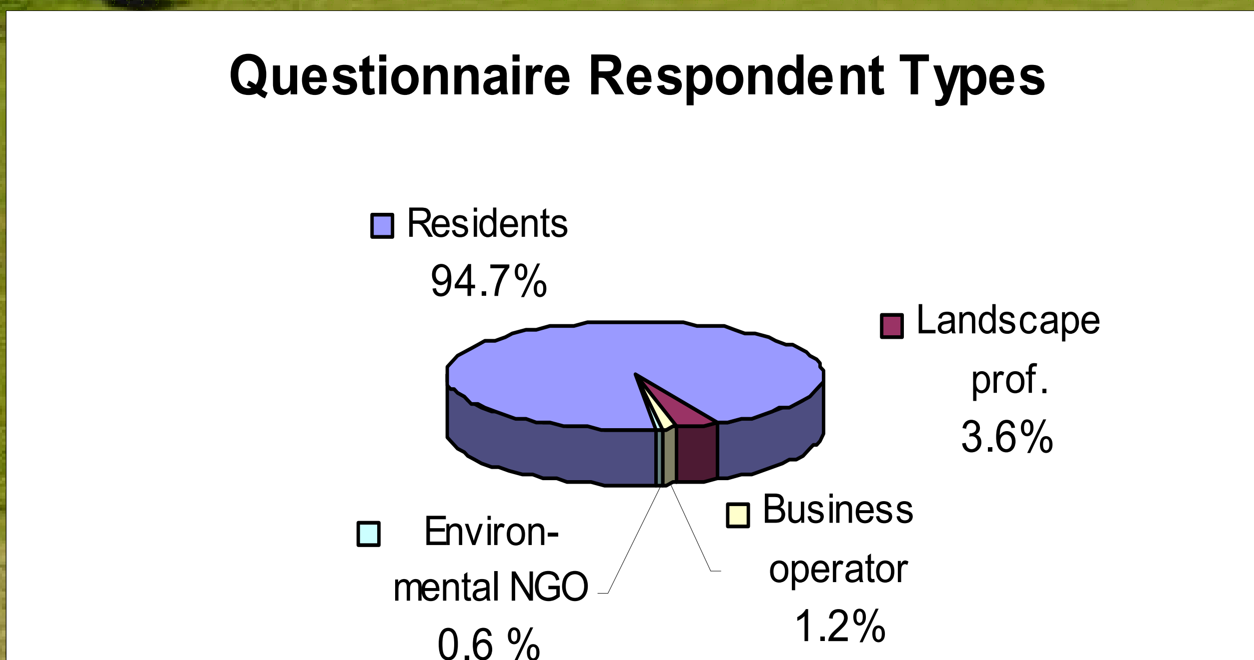
Background to Cosmetic Herbicide Program

- In 1992, Burnaby adopted an IPM Policy for public lands.
- On October 21, 2002, Burnaby City Council adopted the recommendations of its Environment and Waste Management Committee to restrict the use of cosmetic herbicides on private properties.
- Staff were authorized to initiate a multi-stage work plan, including a public consultation process.

Summary of Public Consultation Process Findin

1. Questionnaire (March 26 – July 21, 2003)

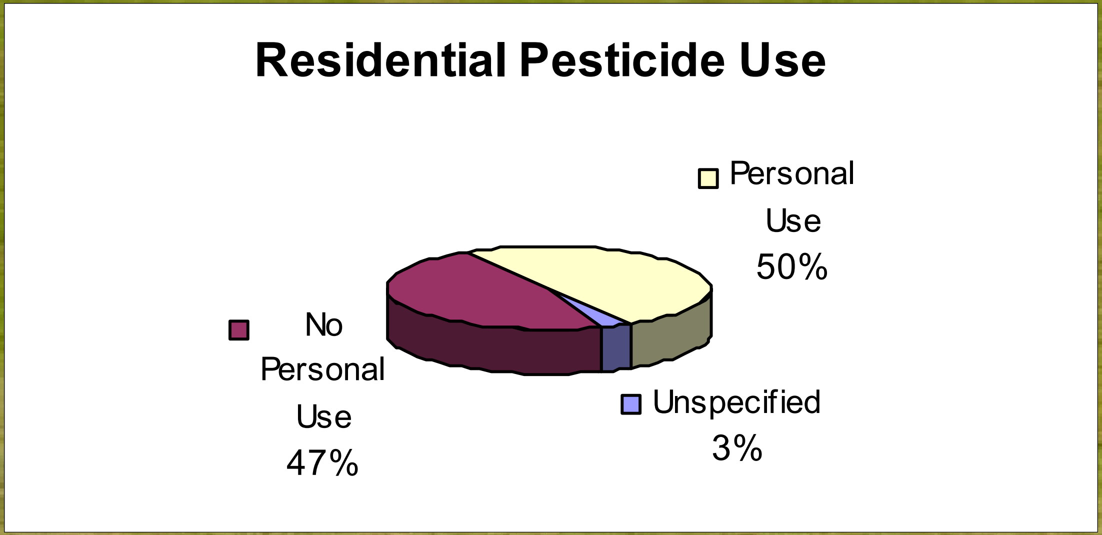
One hundred sixty nine responses received.



Summary of Public Consultation Process Findin

1. Questionnaire (cont'd)

Half of all residents indicated that they use pesticides, particularly herbicides such as RoundUp (34%), Killex (24%) and Weed n' Feed (19%).

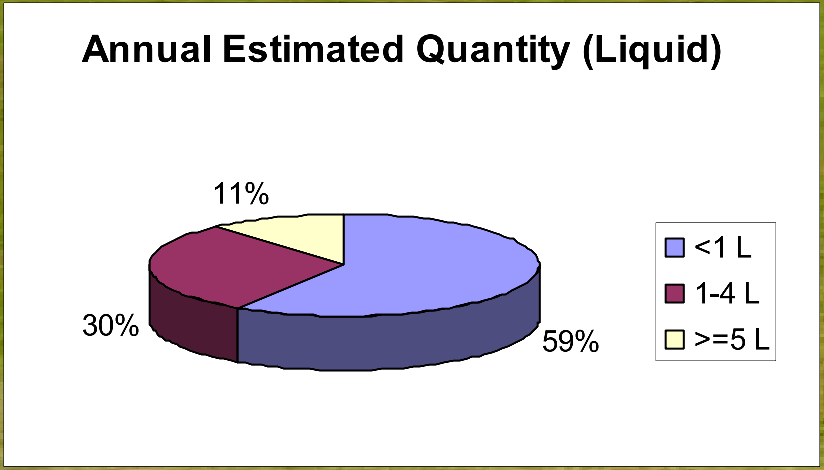


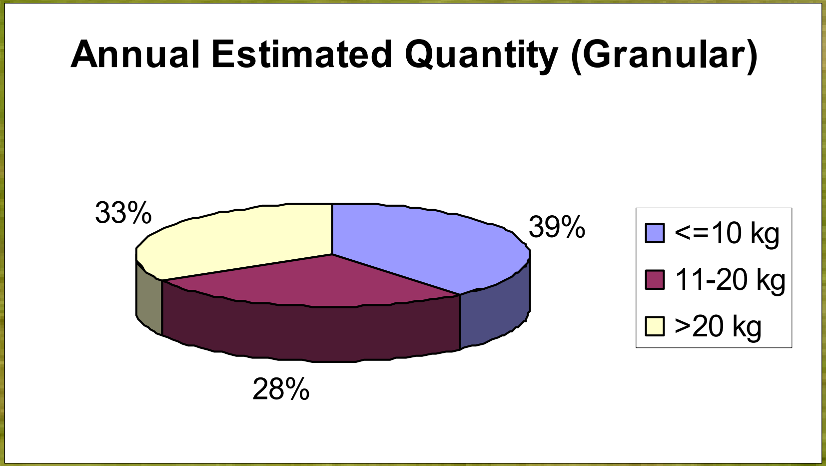
City of Burnaby

Summary of Public Consultation Process Findin

1. Questionnaire (cont'd)

Annual frequency of cosmetic herbicide use 1-4 times/yr with quantities ranging from less than 1 L (liquid) to more than 20 kg (granular).





City of Burnaby

Summary of Public Consultation Process Findin

1. Questionnaire (cont’d)

- Motivations for use: maintaining appearance (35%) and physical challenges in removal of weeds (18%).
- Overall concern for the effects of pesticides (74%).
- Nearly 3/4 of concerned respondents indicated willingness to support some type of an initiative.
- Residents support education (25%), a total ban (25%), combined restriction and education program (20%).

Summary of Public Consultation Process Findin

1. Questionnaire (cont'd)

- Landscape professionals concerned about loss of revenues and suggested other program options.
- Business operators provided mixed responses in terms of their concerns, and the initiatives they would support.
- Challenges for program implementation include enforcement, and the need for pesticide alternatives.

Summary of Public Consultation Process Findin

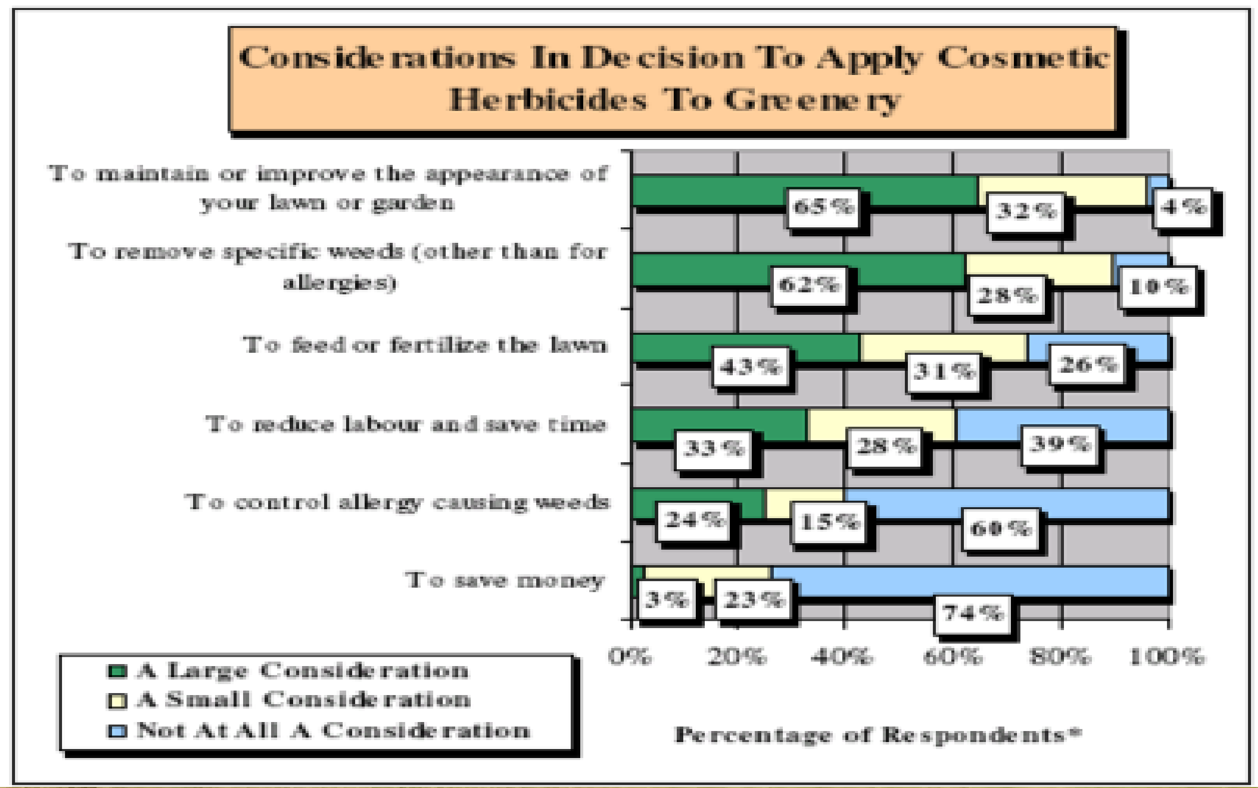
2. Telephone Survey (May 27 – June 13, 2003)

- 300 randomly-selected residents surveyed.
- Fewer than half admitted to applying cosmetic herbicide to their greenery. Of these, the majority apply to lawns (41%).
- Half of users apply products through broadcasting while the remaining do spot applications.
- Commonly used herbicides were Weed n' Feed (41%) and Weed Out, Spray & Green, Weed Stop or Killex (34%).

Summary of Public Consultation Process Findin

2. Telephone Survey (cont'd)

Motivation for use: maintaining appearance (65%), removing specific weeds (62%), and fertilizing the lawn (43%).

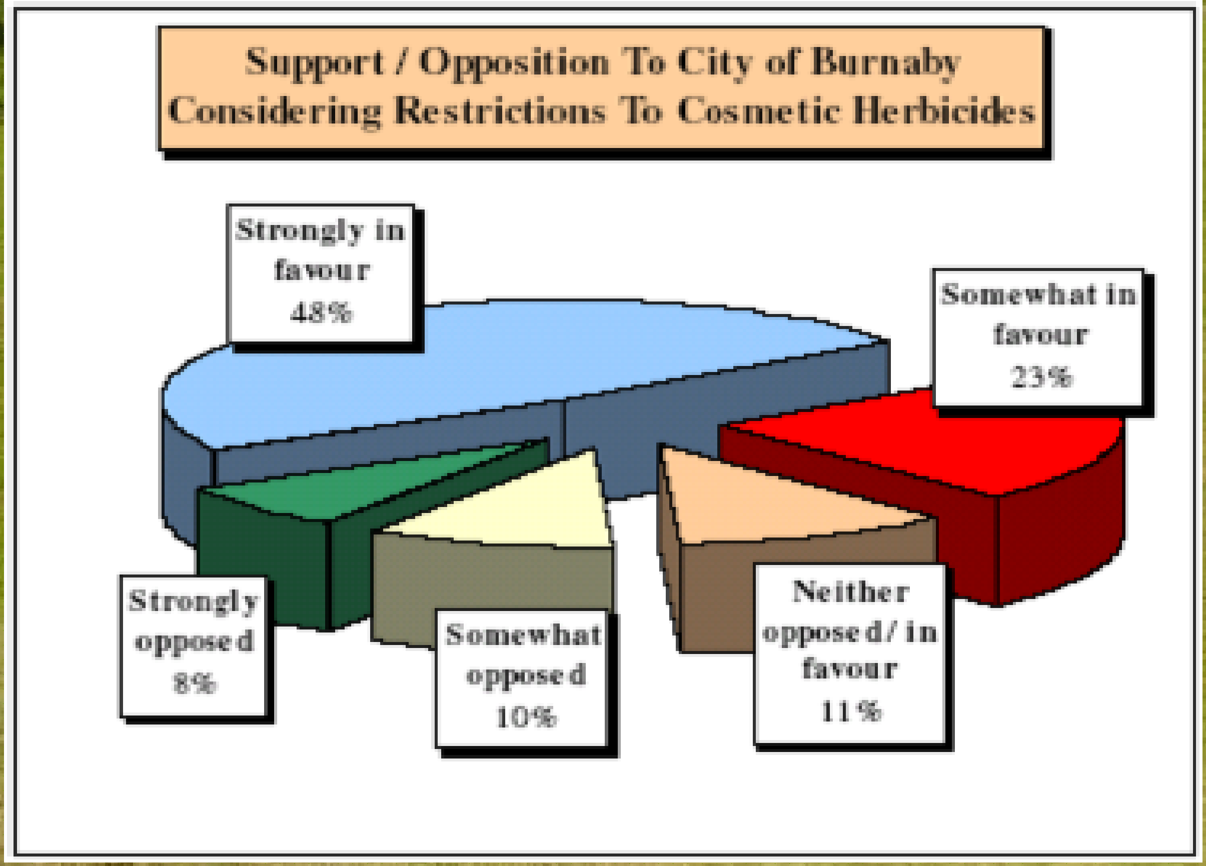


City of Burnaby

Summary of Public Consultation Process Findin

2. Telephone Survey (cont'd)

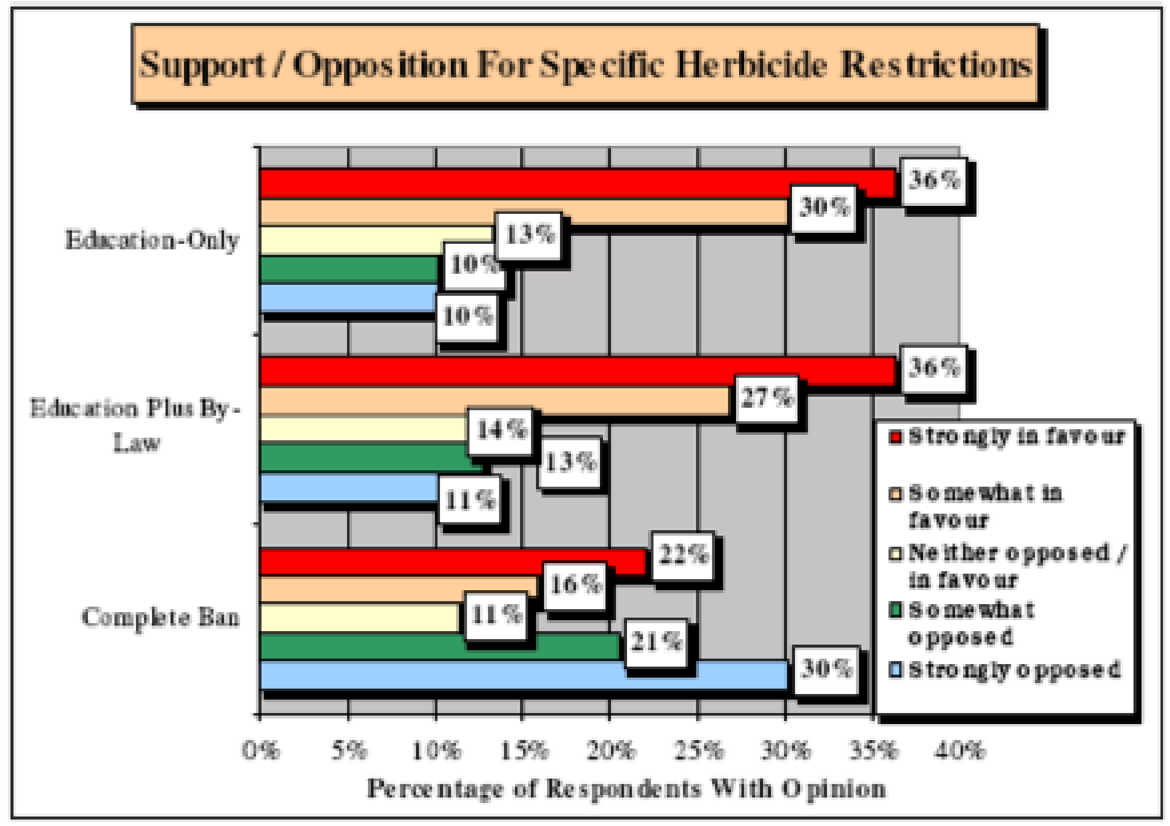
More than 70% of respondents support possible restrictions.



Summary of Public Consultation Process Findin

2. Telephone Survey (cont'd)

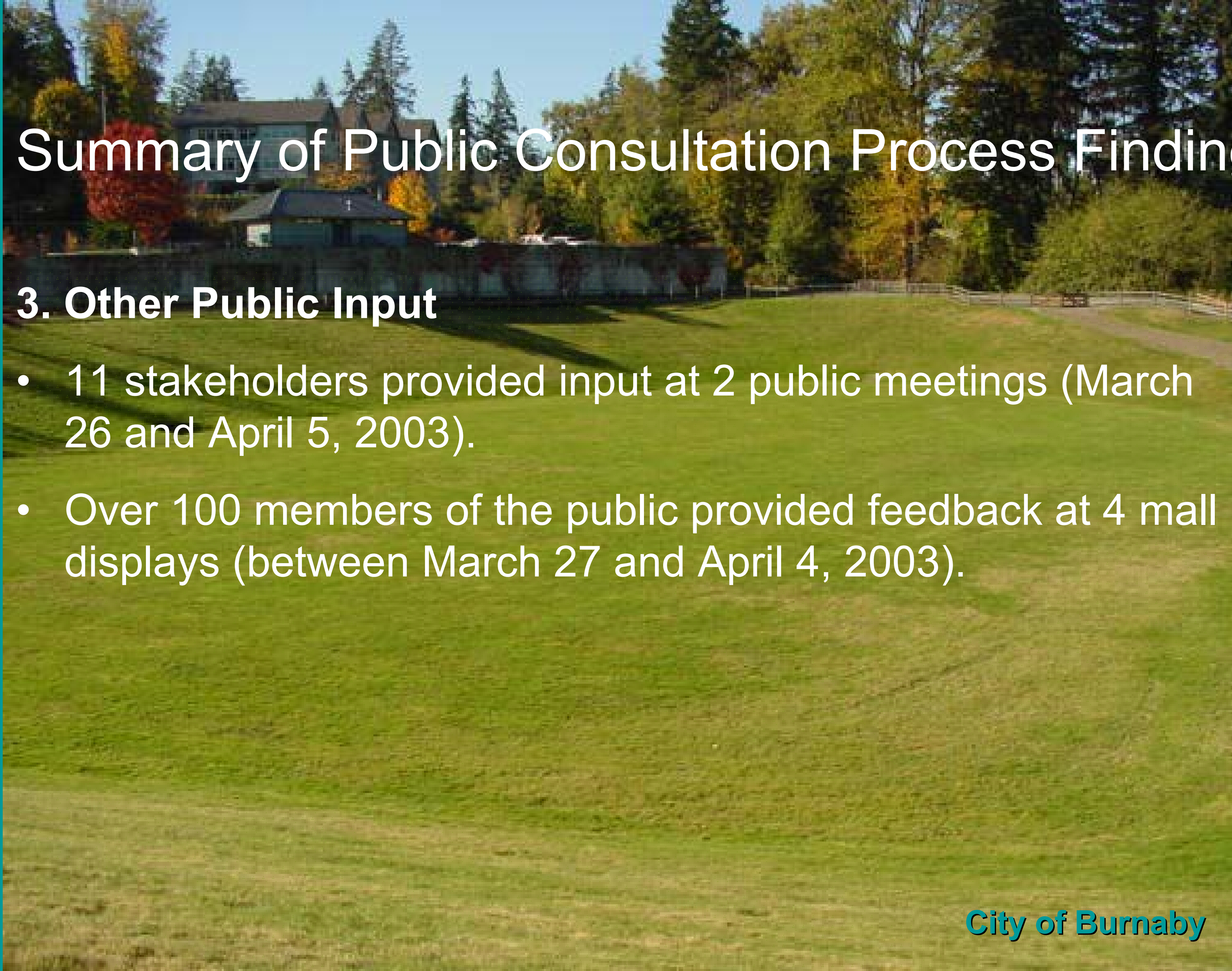
A majority indicated preference for education-only.



1) Combined: 66%

2) Combined: 63%

3) Combined: 38%



Summary of Public Consultation Process Findin

3. Other Public Input

- 11 stakeholders provided input at 2 public meetings (March 26 and April 5, 2003).
- Over 100 members of the public provided feedback at 4 mall displays (between March 27 and April 4, 2003).

Summary of Public Consultation Process Findin

4. Overall Findings

- Most members of the public supported the City's investigation of ways to reduce cosmetic herbicide use.
- City was encouraged to focus on education, rather than on banning.
- City was asked to investigate more natural alternatives to traditional chemical use.

Update on Recent Initiatives

1. Federal Provincial Harmonization.
2. Provincial Integrated Pest Management Act.
3. Regional Initiatives.
4. North Shore Public Education.

Update on Recent Initiatives

1. Federal Provincial Harmonization:

- New Pest Control Products Act: reassess pesticides based on cumulative/combined exposures.
- Health Canada's PMRA: reevaluate lawn-care chemicals.
- Fed/Prov/Terr. Cmte on Pest Management and Pesticides: create a harmonized risk-based classification system.

2. Provincial Integrated Pest Management Act:

- Integrated Pest Management Act: if enacted will make IPM a legal requirement in Canada.

Update on Recent Initiatives

3. Regional Initiatives:

- GVRD staff submitted report outlining concerns with non-essential pesticide use in urban environments, and local government approaches to restricting its use.

4. North Shore Public Education:

- Five-year public education program being undertaken on the North Shore.
- Telephone survey of 480 adults in three municipalities will elicit information on residents' pesticide use habits, and factors necessary for them to consider alternatives.

Proposed Policy Options

Option	Description	Comments
Status Quo	Rely on current federal and provincial initiatives.	Does not address potential impacts to env. Minimum action locally.
Education	Information pamphlets, ads, education programs.	Increased awareness. Resource needs would vary from low to medium.
By-Law (Restrict Timing/ Product/ Application Method)	Broad or specific. Could include multi-media, partnering w/ schools and NGOs.	Need to address legal issues. Resource needs would vary depending on bylaw language.
Ban	Non-use of all cosmetic herbicides.	Need to address legal issues and 'infestations'. Resource needs vary.

Council-Approval of Two-Phase Strategy

- Burnaby City Council considered:
  - The findings of the public consultation process.
  - The policy options proposed by staff.
  - The initiatives underway at the federal & provincial level.
- On October 20, 2003, council approved a two-phased approach to address the issue of restricting cosmetic herbicides usage on private properties.

Council-Approval of Two-Phase Strategy

Phase 1: Public Education and Communication

- Information pamphlets & advertisements.
- School programs.

Phase 2: Program Evaluation and Expansion

- Public education review.
- Government initiatives & legal jurisdiction review.
- Public consideration of policy options.
- Program expansion (restriction), as warranted.

Future Directions

Education Program (2004)

Targeting:

- School children
- Residents
- Strata Councils
- Building Maintenance Co's
- Special Interest Groups
- Vendors
- Applicators

Formats:

- Workshops/Presentations
- Brochures/Letters
- Web site
- Mall and Event Displays
- Store Info
- Curriculum Materials
- Lawn Signage


Questions?
City of Burnaby

Overview of Pesticide Use in British Columbia: Risks to Aquactic Ecosystems

Presented by Stacey Verrin, Sarah Begg, and Peter Ross, Institute of Ocean Sciences, Fisheries and Oceans of Canada in Sidney, B.C.

Abstract

A multitude of pesticides is used in British Columbia and the Yukon ("Pacific Region") to control or eliminate unwanted pests, fungi and weeds. Since these chemicals are designed to either kill or affect the organisms in question, risk of adverse health effects in non-target organisms represents a considerable concern. Waterways are particularly vulnerable, since both hydrophobic and hydrophilic pesticides are influenced by hydrologic forces. The Pacific Region of Canada is characterized by a wide variety of biogeoclimatic zones, an important forestry sector, a diverse agricultural industry including concentrated crop and orchard areas in the south, and high human population densities around the Fraser River estuary (Vancouver) and the adjacent Georgia Basin. Characterizing the impact or risk of impact of different pesticides must be initially based upon a consideration of such features, since these differ greatly from other regions of Canada. *No up-to-date list of pesticide quantities used in British Columbia exists, rendering it exceedingly difficult to conduct even a cursory risk assessment on pesticides in the aquatic/marine environments.*

In this report, we draw on the results of six past and current pesticide prioritization efforts in order to construct a foundation for future studies. These prioritizations include i) a select list of eighteen priority pesticides as identified by the Pesticide Management Regulatory Agency (PMRA, Health Canada); ii) pesticides from an Environment Canada (EC) nominating list of toxic substances of concern in the lower Fraser River/Georgia Basin ecosystems; iii) a World Wildlife Fund list of endocrine disrupting pesticides with additions from the Pesticide Action Network (PAN) Europe list; iv) the top 20 pesticides sold or used in British Columbia during the period 1991 to 1999 (Enkon Environmental Ltd.); v) a list of 16 pesticides identified as of concern in the context of risks to the health of coastal killer whales; and vi) a prioritized list of pesticides of concern in the context of the altered migratory behaviour of late-run sockeye salmon in the Fraser River watershed during the period 1996-2002. Total sales for the PMRA list ("i" above) decreased in BC by 4.41% to 223,295 kg from 1991 to 1999, at which point these pesticides accounted for 20.43% of total reportable pesticide sales. Sales of seven of the eighteen PMRA listed ("i" above) pesticides increased during this period, while eight decreased, and three had no record of use in BC in 1999. Total sales for the EC nominating list ("ii" above) increased by 7.54% to 187,866 kg during the period 1991 to 1999, at which point these accounted for 17.8 % of total reportable pesticide sales. Sales of five of the 18 EC pesticides (ii)

increased during this period, while the remaining thirteen decreased. The significant use of wood preservatives and anti-sapstain compounds is evident for BC pesticides, since these compounds account for the overwhelming majority of total pesticides sold or used in BC (6,621,794 kg, or 81.7%, in 1999).

Although some studies have characterized certain persistent organic pollutants (POPs) in fish, marine mammals, and abiotic compartments of the aquatic/marine environment in BC, little is known about the fate of many pesticides and their impacts on the health of aquatic organisms and ecosystems. In addition, little knowledge exists on the fate and effects of carrier compounds in pesticide formulations and the transformation/degradation products or metabolites of the pesticide active ingredients. Our report highlights the need for accessible up-to-date information on pesticide quantities used in the Pacific Region particularly on newer pesticides, in addition to further research in the source-transport-fate characterization, and adverse health effects in sensitive lifestages of invertebrates, salmon and other fish species, and marine mammals.

Overview of pesticide use in British Columbia: risks to aquatic ecosystems

Stacey Verrin, Sarah Begg, and Peter Ross

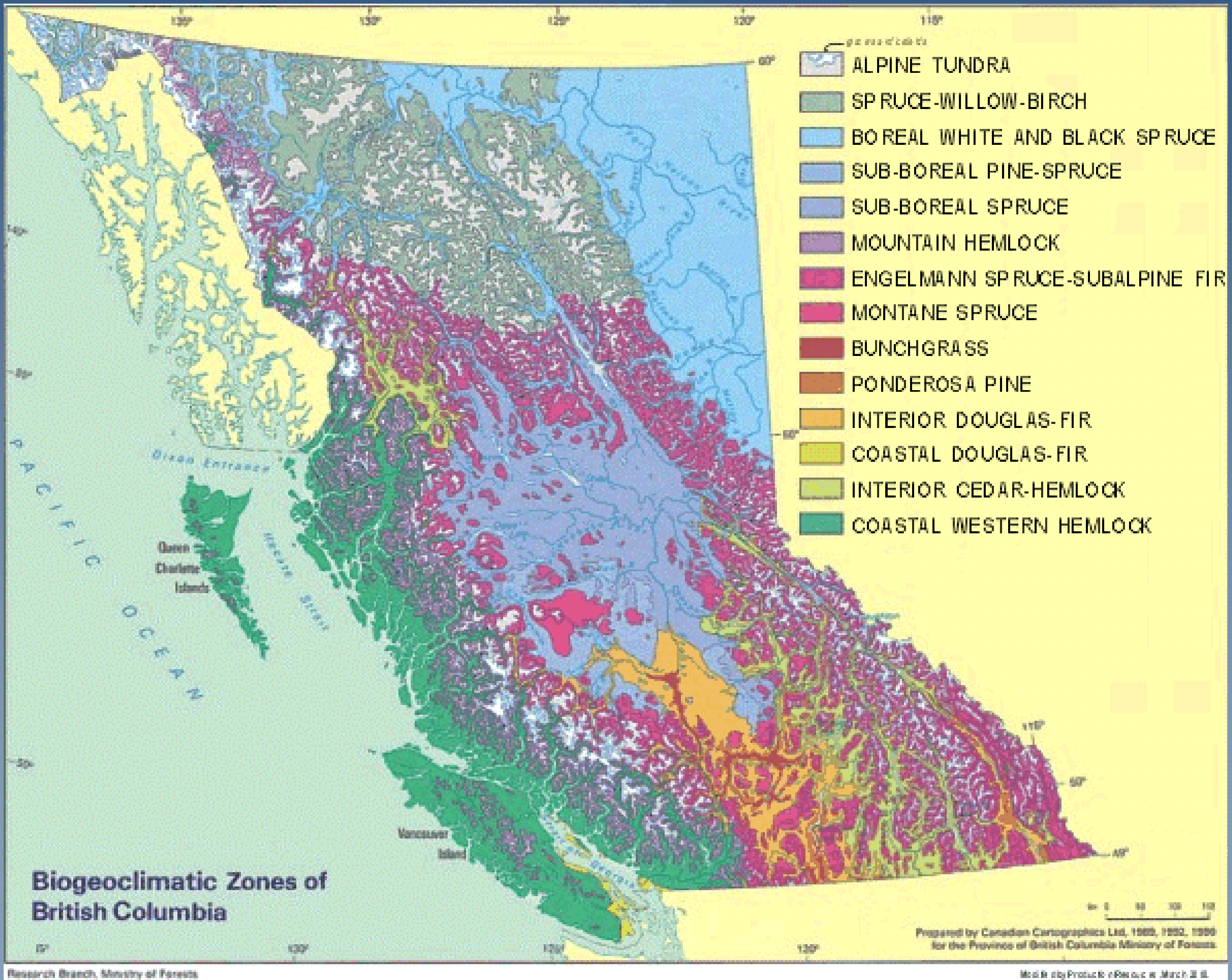
Task

- Examine the use of current and new pesticides in British Columbia in urban, agriculture and forestry related applications.
- Assess the risks of newer pesticides to aquatic ecosystems and to determine geographical hot spots.
- Establish a short list of CUP of concern from a DFO Pacific (PAC) Region perspective.
- Generate Canadian Technical Report of Fisheries and Aquatic Sciences – Dec 31, 2003.

Criteria Used to Identify Geographical Hot Spots

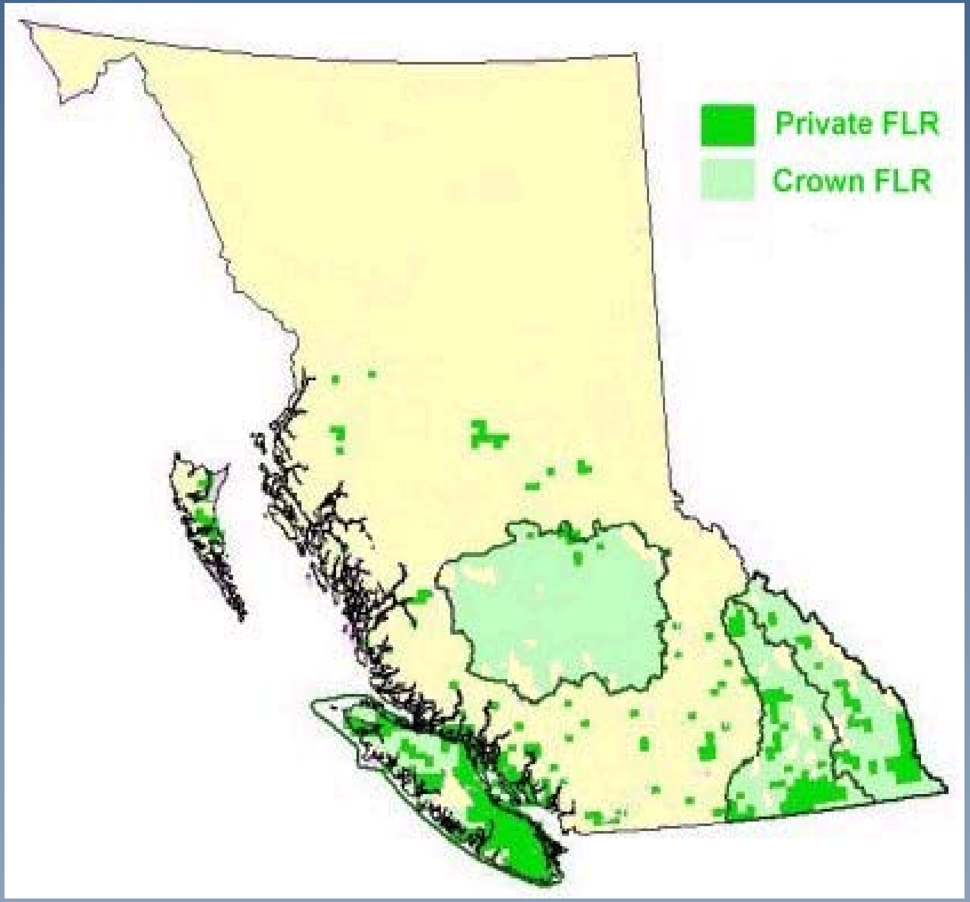
- Land use
  - Forestry
  - Agriculture
  - Urban/Cosmetic
- Proximity to critical salmon habitat and hydrology
  - Particularly late-run sockeye and coho
- Total quantity of priority pesticides of concern by provincial region

Pacific Region consists of 27,000 km of coastline, and covers an area of 143.2 million hectares and has 14 different biogeoclimatic zones

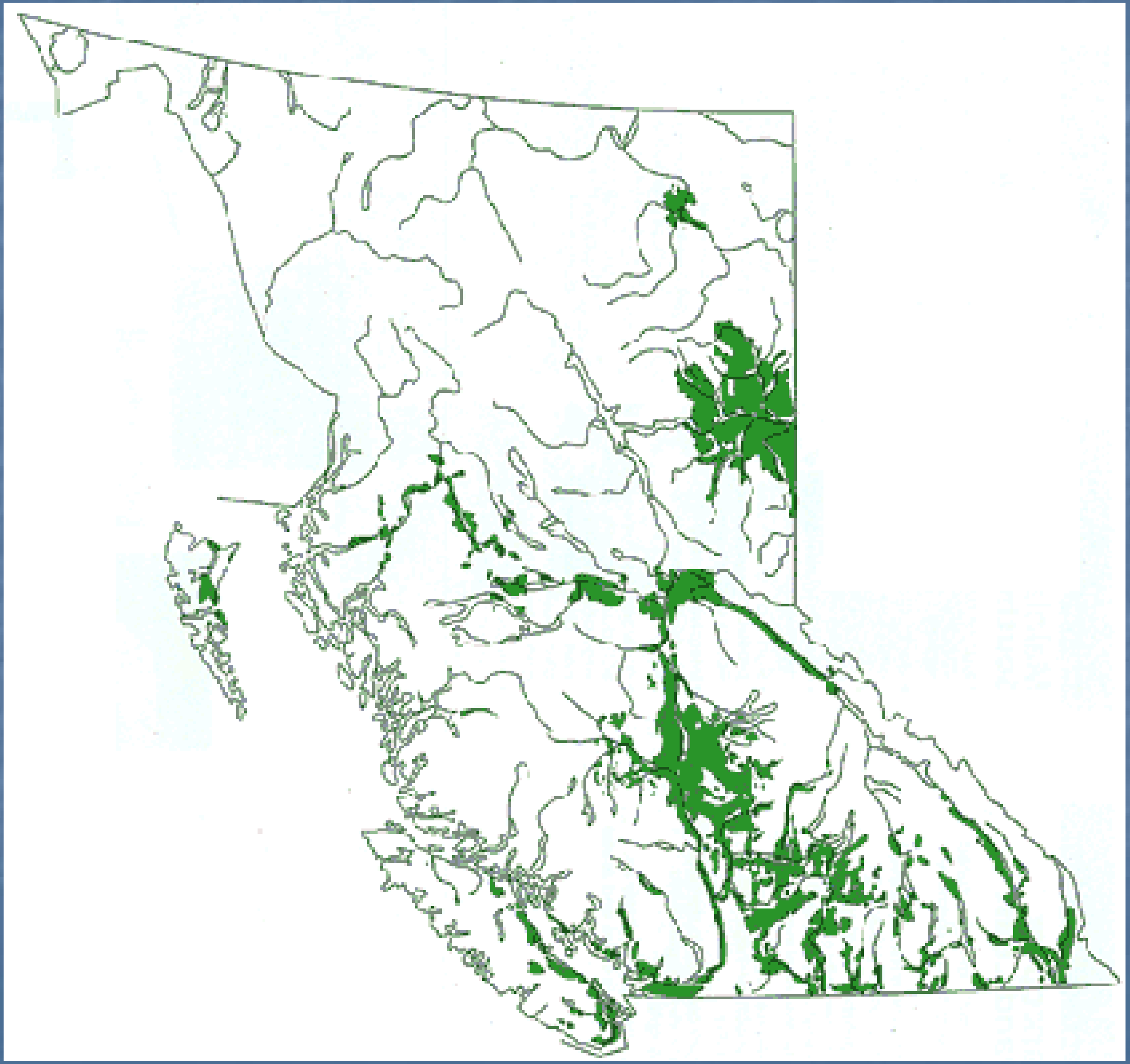


Forestry: Pesticide use in forestry sector may be a concern from a DFO perspective

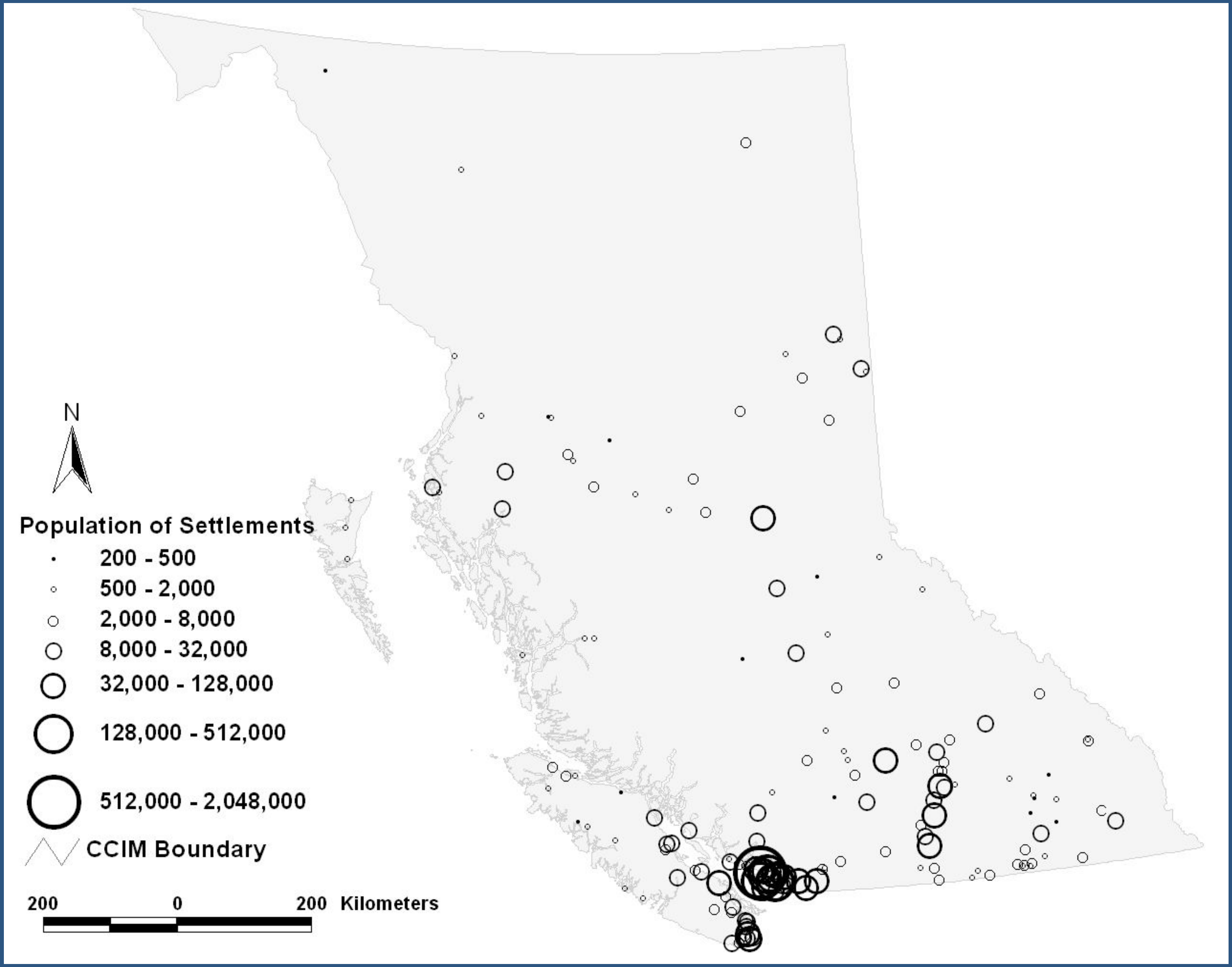
- Forested land 60M ha (62%).
  - 58% not harvestable (parks, sensitive ecosystem, un-merchantable).
  - 25M ha available for logging (Forestry Land Reserve, FLR)
  - Of the 25M ha, 1% is privately managed forest, 24% reserved for Crown timber harvesting practices



Agriculture: Agricultural Land Reserve (ALR) covers 4.7 ha. Intensive activities occur primarily on floodplains and areas adjacent to salmon habitat.



Urban: Majority of BC is inhabited in the lower Fraser Valley.

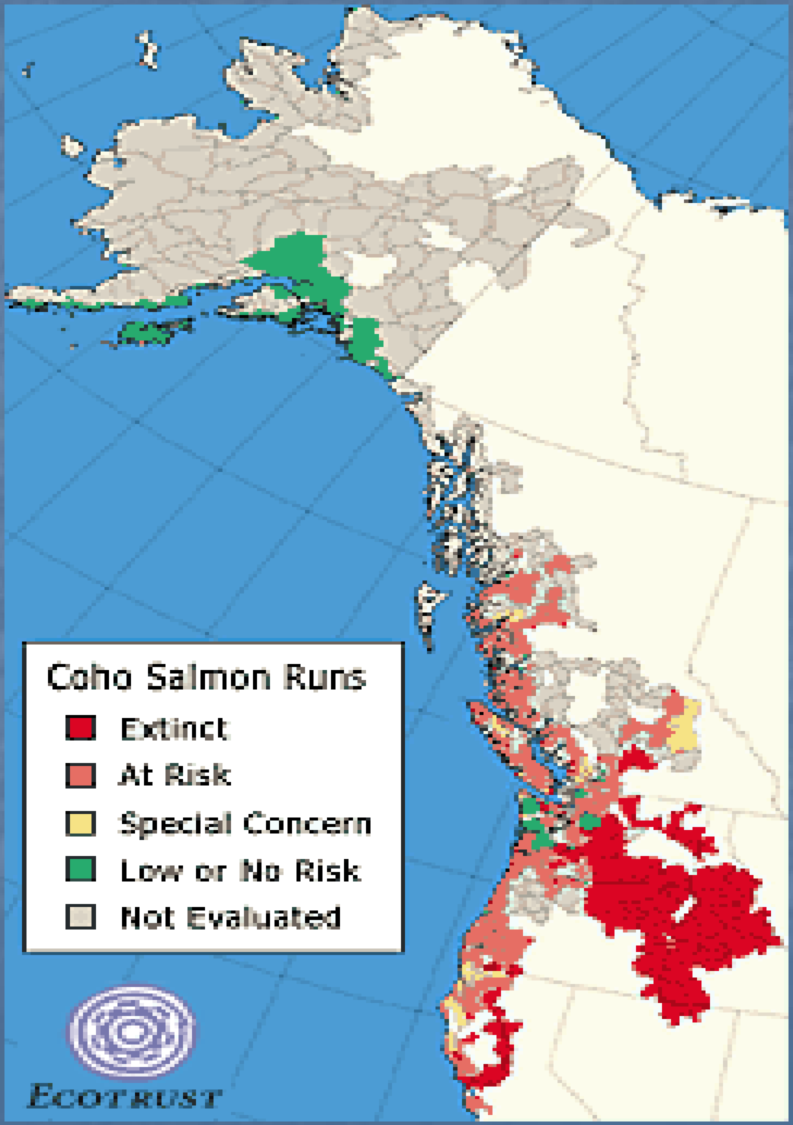


Critical Habitat and Species of Concern

Sockeye at risk?

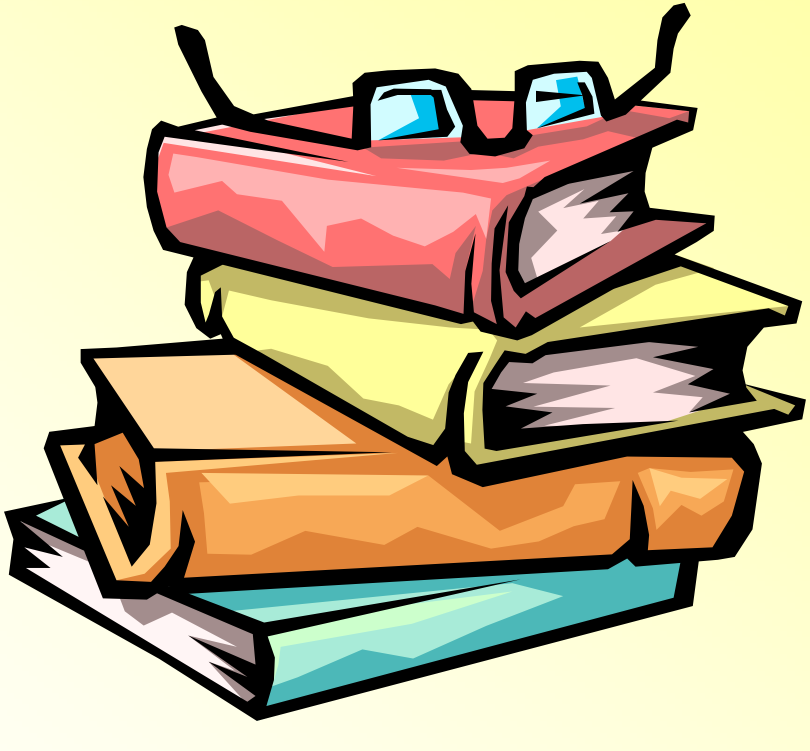
- Late 1990's Late-run sockeye became a concern due to low returns.
- Spawn late summer or fall.
- Primary rearing/spawning locations: Harrison and Pitt Lakes; Chilliwack System and Cultus Lake.
- Rearing duration varies 1 year (young); 2-3 years (other).
- Age and timing of migration to freshwater; 4-5 years, usually between May-October.

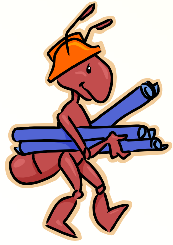
Coho at risk?



- Spawning time – October to late February.
- Primary rearing/spawning location - Very small tributaries in Lower Fraser. Scattered distribution. Natal tributaries include sloughs and tidal channels of Fraser River estuary
- Rearing duration/location - 1-2 years; migrate to sea April-July.
- Age of migration to freshwater - 2-3 years.

Information Sources …





Forestry

Standing Crops:

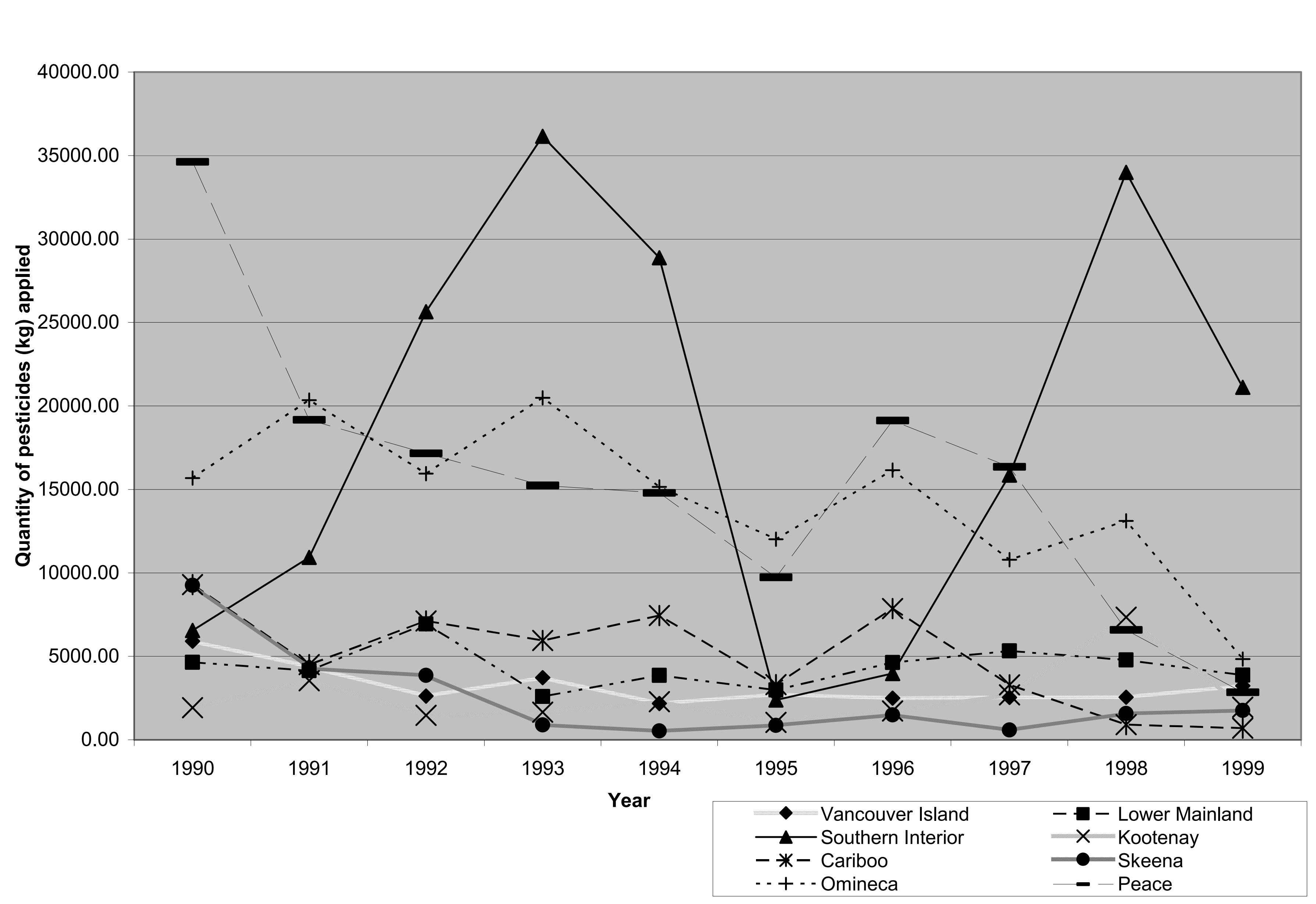
- National Forestry Database Program (Canadian Council of Forest Minister 2002).

- BC MWLAP's CRISP database of permits issued for Forestry related pesticide uses.

Treated Timber:

- Wood preservative and anti-sapstain use from 1991, 1995 and 1999 pesticide use surveys.

Forestry: In 1999 approximately 40.3K kg pesticides were applied by the forestry sector (Ministry of Water 2003b)



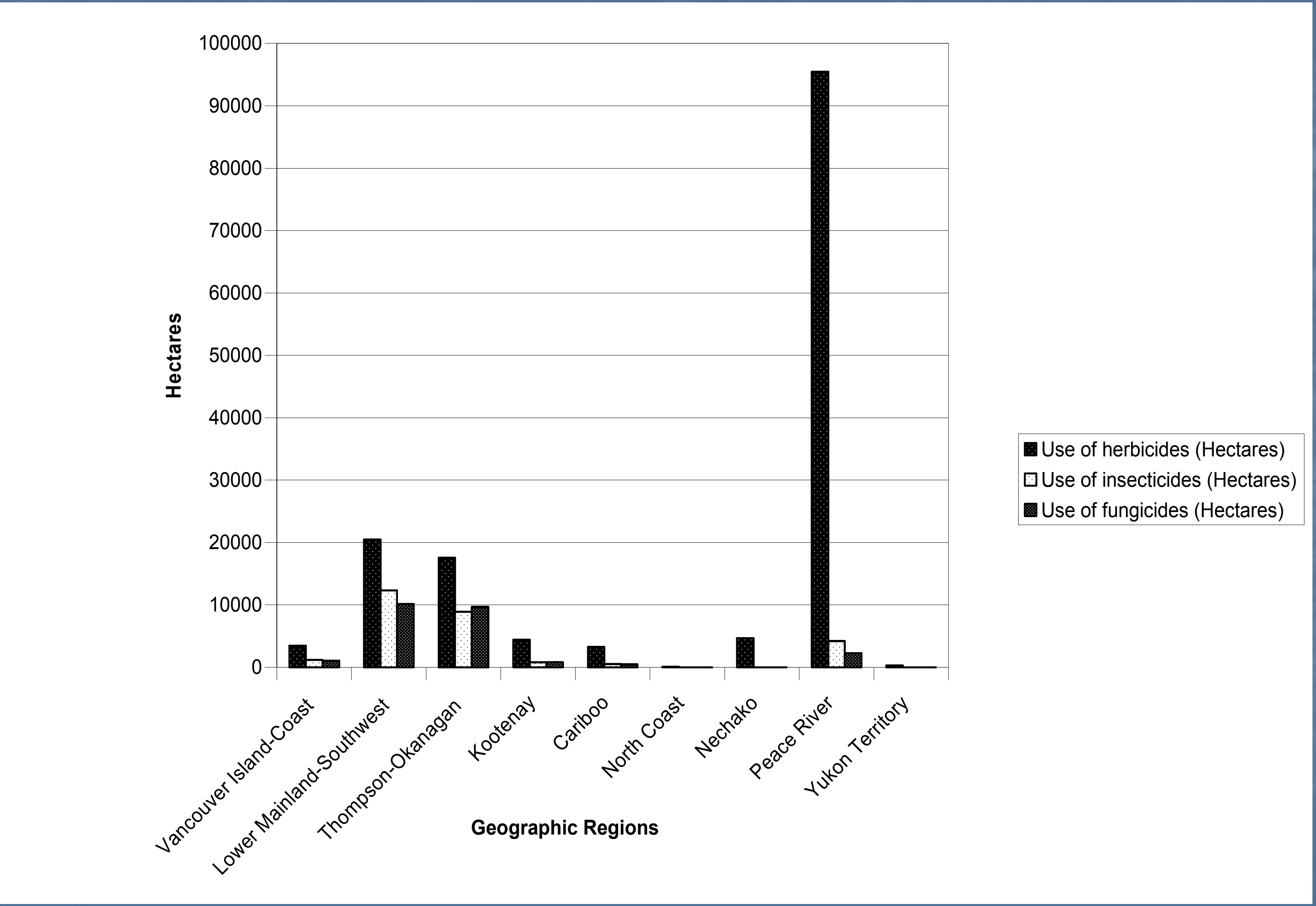
Agriculture

- 1991 and 1999 Pesticide use surveys.
- Crop profiles compiled by BC MAFF.
- Crop production guides.
- Personal communications with pesticide applicators.

Urban

- 1999 Pesticide use survey – telephone survey of Victoria residents by GSA.
- Golf course survey 1995 (UMA Environmental 1996).
- Landscape Services through 1991, 1995 and 1999 surveys.
- Industrial rights of way by electrical, railroad, and natural gas distribution companies. Information successfully obtained from BC Rail and Terasen.

Pesticide use (ha) varies by region in BC.



Data source: (ENKON Environmental Limited 2001)

Summary...

Our strategy for establishing priority CUP for DFO Pacific Region...

- 6 lists used to determine pesticides of concern:
  1. *PMRA-Fisheries and Oceans Canada priority pesticide list (18).*
  2. *Georgia Basin Ecosystem Initiative-Environment Canada priority pesticide list (24).*
  3. *World Wildlife Fund-Pesticide Action Network Europe endocrine disrupting list (105).*
  4. *Environment Canada and BC MWLAP top 20 pesticides list.*
  5. *Fisheries and Oceans Canada priority pesticide list (killer whales; 16).*
  6. *Fisheries and Oceans Canada priority pesticide list (late-run sockeye; 32).*

- Pesticides were then ranked based a tallied score:
  - Quantity sold/used in 1999.
  - Sales trends.
  - Pesticides as high use by sector (such as crop profile information) were identified.

DFO Pacific Region priority CUP list for BC by sector

Urban	2,4-D; Carbaryl; Chlorothalonil; Diazinon; Diuron; Glyphosate; Malathion; MCPA; Quintozene; Triclopyr
Forestry	Carbaryl; CCA; Creosote; Fenitrothion; Glyphosate; PCP; Surfactants in *Bacillus thuringiensis*; Triclopyr
Agriculture	2,4-D; Atrazine; Captan; Chlorothalonil; Chlorpyrifos; Diazinon; Endosulfan; Ethalfluralin; Glyphosate; Pendimethalin; Simazine; Trifluralin

Geographical Hotspots….

- Fraser River Valley
  - High urban influence.
  - Intense and diverse agricultural activities.
  - High forestry application particularly in the Thompson region.
  - High pesticide sale figures (1999 survey).
  - Critical salmon habitat with signs of decreasing population trends in the late-run sockeye salmon stocks.
- Runner up - Southern Interior

Impacts of priority pesticides on salmon habitat in British Columbia: Towards a 'real world' understanding of exposure and effects

Peter S. Ross (DFO-IOS, Sidney, BC), Keith Tierney (PhD candidate, SFU), Tom G. Brown (DFO-PBS, Nanaimo BC), Stacey Verrin (DFO-IOS, Sidney, BC), Chris Kennedy (Simon Fraser University)

Abstract

This project aims to contribute to a risk-based identification of pesticides of current concern in the DFO Pacific Region, thereby facilitating more focused evaluations of possible effects on biota. The project will involve a parallel approach to i) documenting the priority pesticides to which wild coho and sockeye salmon are exposed under different land use regimes (agriculture, urban and forestry sectors) in British Columbia (Phase One); and ii) documenting the effects of sublethal concentrations of a select list of ten priority pesticides on the olfactory and neurological systems of coho salmon under laboratory conditions (Phase Two). Phase One will involve a screen for priority ("current use") pesticides identified as a regional concern to Fisheries and Oceans Canada (Pacific Region priority CUP list: Stacey Verrin and Peter S. Ross) in water, sediment and coho samples from several spawning streams in the Lower Mainland. This approach will help to characterize the relative risks associated with pesticides to salmon spawning areas and freshwater/coastal habitat of concern to DFO. Phase Two will involve a laboratory-based approach to assessing the effects of 12 different current use pesticides (comprising those identified as "high priority" in 2003 Pacific Region assessment) on the olfactory and neurological health of coho salmon**.** Our list of 'top ten' currently consists of chlorothanil, diazinon, endosulfan, trifluralin, chromated copper arsenate (CCA), creosote, glyphosate acid, glyphosate (isopropylamine), 2,4-D amine, and a surfactant blend. This list will be compared to that produced by EC colleagues, and we will explore collaborations on the analysis of a common final suite of current use pesticides.

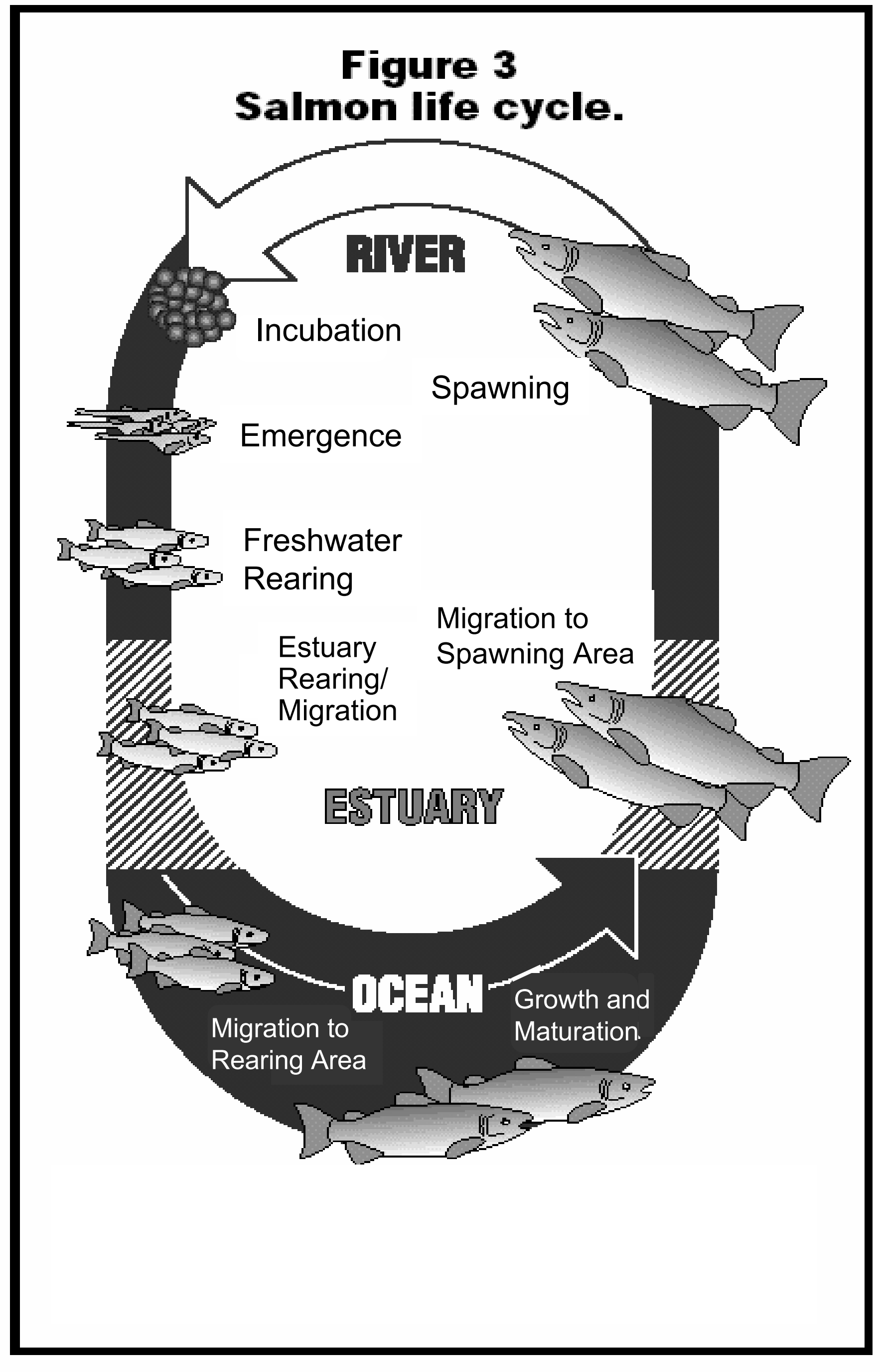
Impacts of priority pesticides on salmon habitat in British Columbia: towards a ‘real world’ understanding of exposure and effects

Peter S. Ross, Keith Tierney, Tom G. Brown, Stacey Verrin and Chris Kennedy
Institute of Ocean Sciences and Simon Fraser University

Current use pesticides and salmonids:

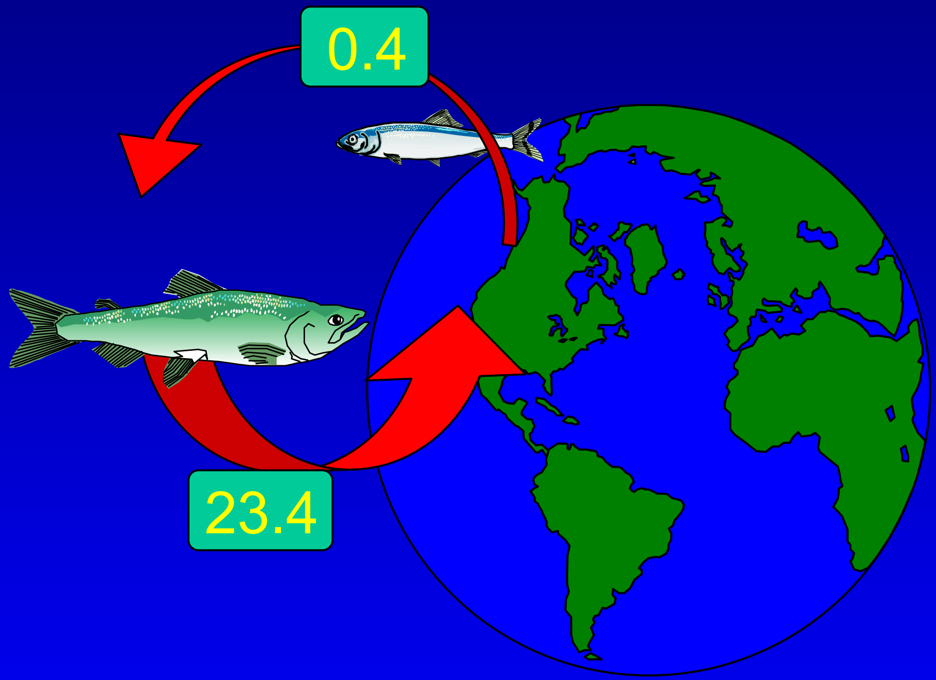
Assessing the impact of Current Use Pesticides (CUP) on salmonids is fraught with challenges associated with complex life histories and widely varying habitat use across freshwater, estuarine, nearshore and open ocean Areas

Pesticide exposure can be chronic (persistent ~ OC) or acute (pulse ~ CUP), via prey or via gill, at one or all life history stages



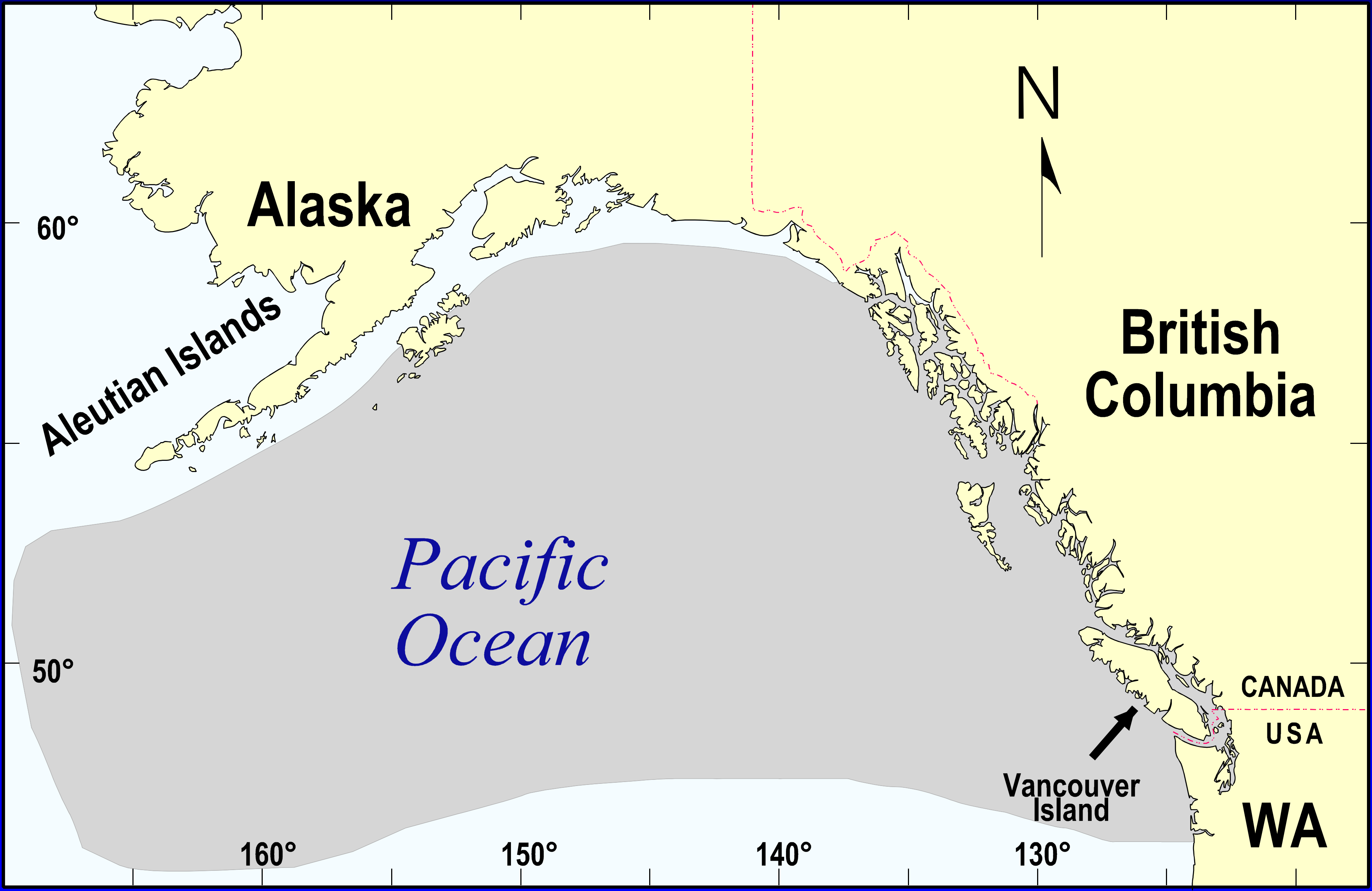
Open Pacific: Adult salmon import legacy pesticides to coastal British Columbia

- We compared DDT levels in outmigrating smolts (young salmon) with returning adults in BC;
- DDT burden in adult salmon returning to coastal BC was overwhelmingly of offshore origin (98.3%);



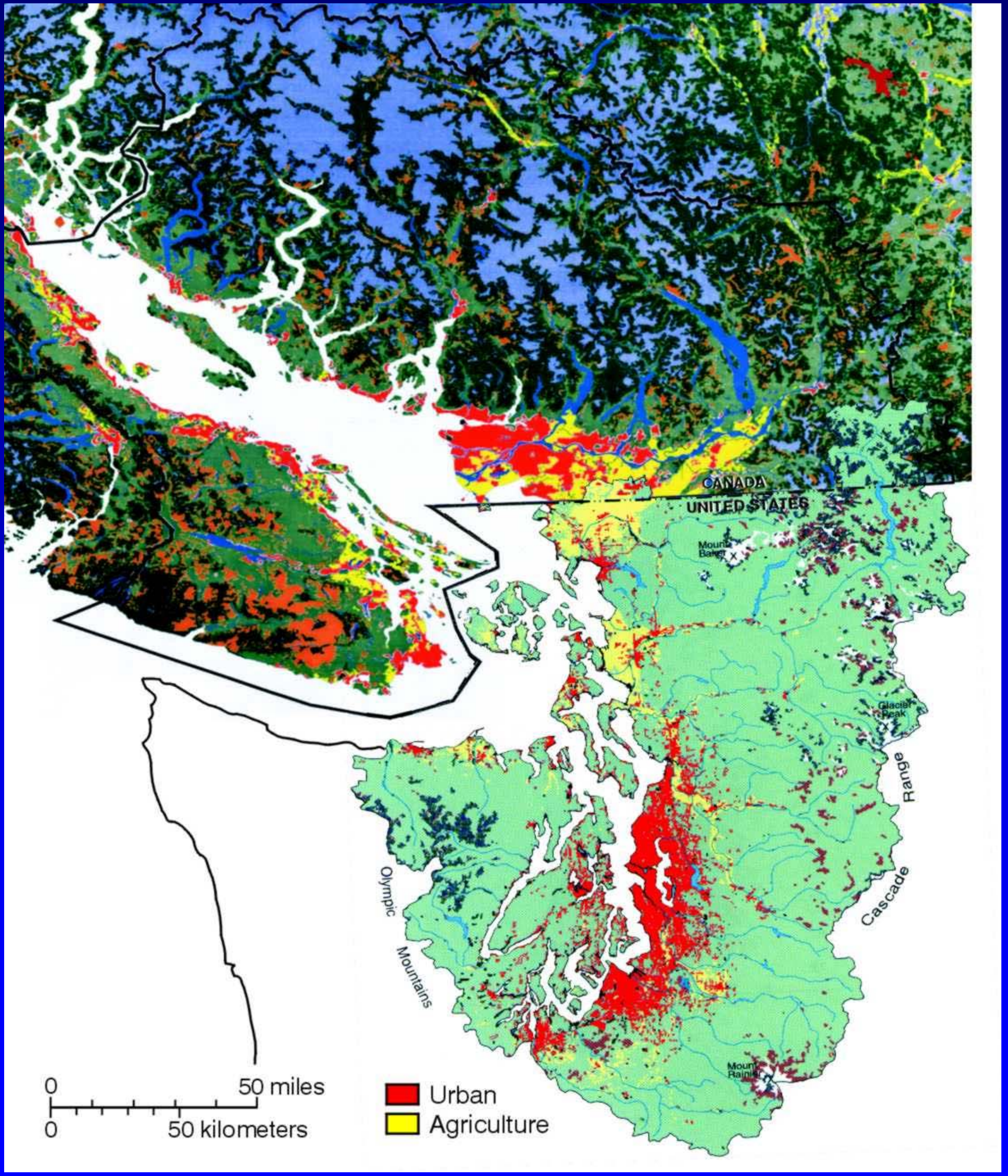
- *Data expressed as ug sDDT (ww).*
- *Concentration of sDDT was 4.3 ug/kg compared to 3.0 ug/kg in adults.*

Open Ocean Rearing Area



Pesticides in spawning habitat: the 'weak link' for salmon?

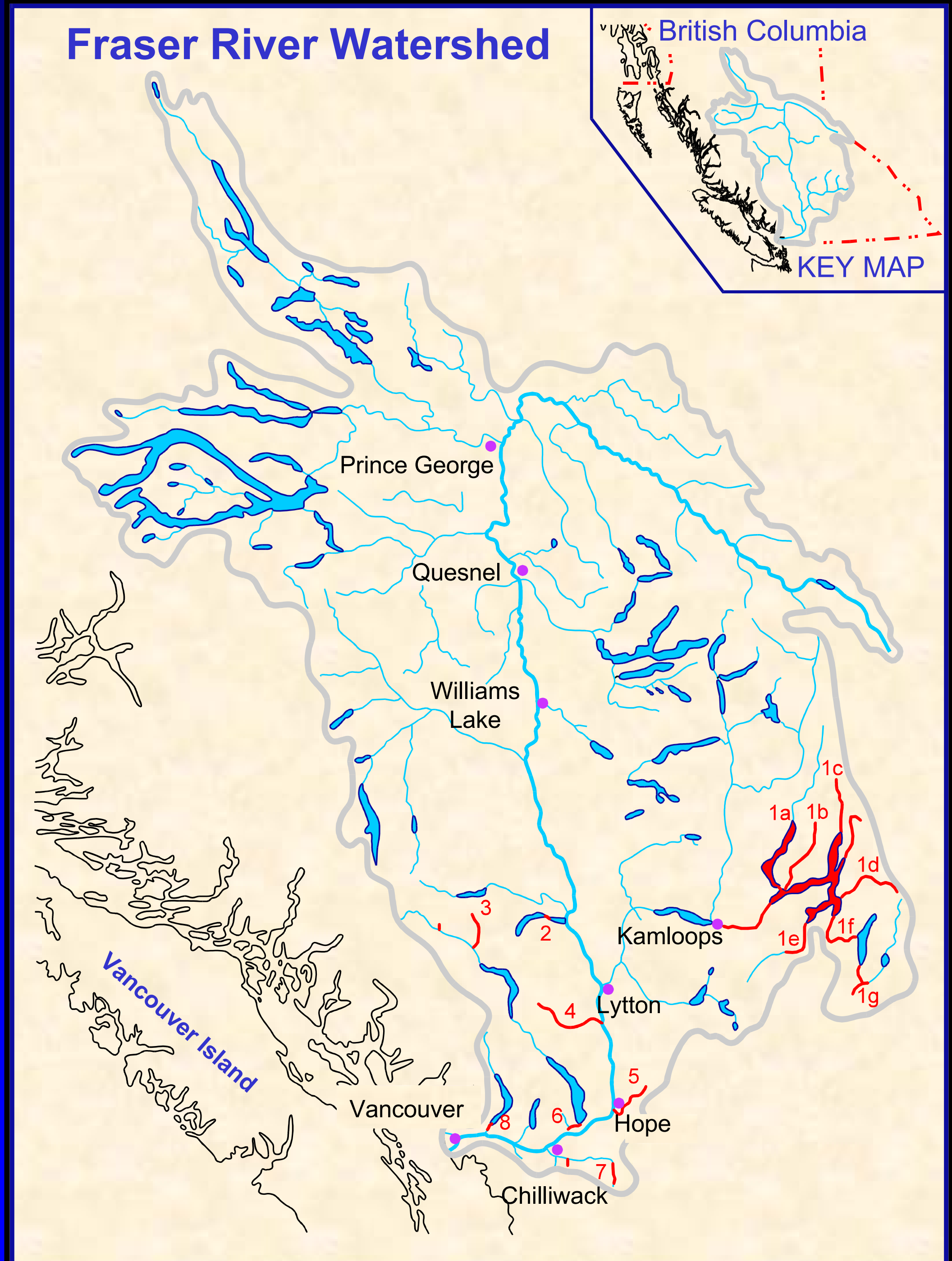
The Lower Fraser watershed and the Georgia Strait are heavily utilized



Salmon may need to migrate hundreds of km through agricultural, urban and forestry areas

Spawning Areas of the Late-run Fraser River Sockeye

- **1 Adams River Run including:**
  - **1a Lower Adams River/Adams Lake**
  - **1b Scotch Creek**
  - **1c Seymour River**
  - **1d Eagle River**
  - **1e Salmon River**
  - **1f Lower Shuswap River**
  - **1g Middle Shuswap River**
- **2 Portage Creek**
- **3 Birkenhead River**
- **4 Nahatlatch River**
- **5 Coquhalla River**
- **6 Harrison River**
- **7 Cultus Lake**
- **8 Pitt River**



Our 3-year CUP project has two elements

- **Phase One: *habitat***
  - Establish PAC DFO priority CUP list (<25)
  - Work with EC on priority list
  - Develop analytical methods (AXYS Analytical Services)
  - Assess CUP in coho salmon habitat: air, water, sediments
  - Assess CUP in juvenile coho
  - Assess in adults? eggs? Sockeye? Invertebrate prey? Stickelback?

- **Phase Two: *effects***
  - Establish PAC DFO CUP shortlist to assess effects (<12)
  - Set up methods to measure effects of CUP on olfaction and neurological responses in lab (SFU)
  - Conduct experiments in laboratory exposure setting
  - Compare effects thresholds to ‘real world’ levels measured in Phase One
  - Conduct study of effects of CUP on salmon *in situ*?

Pesticide Wise

Presented by Madeline Waring, Pesticide Specialist, BC Ministry of Agriculture, Food and Fisheries

Abstract

The BC Ministry of Agriculture, Food and Fisheries is developing a pesticide section, “Pesticide Wise”, on their web site. Pesticide Wise will help producers, crop consultants, pest managers, and farm planners to make responsible pest management decisions. The site will not provide pest control recommendations, but will provide information on topics such as toxicology, environmental protection, safety, pesticide applicator certification, and application technology. Pesticide Wise is currently under development and is expected to be launched in 2004.

Pesticide Wise

A web site to help ranchers, growers, crop consultants, pest managers, farm planners and horticulturists make responsible pest management choices

Programs & Services

- Food Safety and Quality
- Environmental Sustainability and Resource Development
- Fisheries and Aquaculture Management
- Risk Management
- Industry Competitiveness

Other Links

- Key Initiatives
- Site Map
- About the Ministry
- About the Agriculture Industry
- FAQ's
  - Agriculture

Food Safety and Quality

- Apiculture Information

- Animal Health Centre
  - Horse Industry Information

- Pest Management
  - Pest Management Information (Insects, Diseases, Weeds and Other Pests)
  - Alerts
  - Non-Native and Invasive Pests
  - Plant Diagnostic Laboratory

- Pesticide Wise NEW
  - Information for ranchers, farmers, growers, crop consultants, pest managers and horticulturalists about the safe use of pesticides in BC agriculture.
  - Information for home gardeners on the safe use of pesticides.
  - Search for specific information in the Pesticide Wise website.

Pesticide Wise

Ministry of Agriculture, Food & Fisheries

Information for ranchers, farmers, growers, crop consultants, pest managers, and horticulturalists about the safe use of pesticides in BC. Choose from the headings and subheadings below.

- About Pesticides
- Toxicity & Hazard
- Environmental Protection
- Safety Precautions
- Food, Crop & Livestock Safety
- Application Equipment

- Emergencies
  Poison Control Center
  1-800-567-8911
- Certification & News
- Laws & Regulations
- Pesticide Registration
- Pesticide Labels
- Other Resources

Search the Pesticide Wise site: Search

Pesticide Wise

Ministry of Agriculture, Food & Fisheries

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- Application Equipment

- Pesticide Names
- Chemical Families
- General Information
- Resistance Management
- Pesticide Info Sheets
- Pesticides & IPM
- Enhancing Effectiveness
- Neighbour Relations

- Emergencies
  Poison Control Center
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- Certification & News
- Laws & Regulations
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- Pesticide Labels
- Other Resources

Search the Pesticide Wise site: Search

Pesticide Info Sheets

PESTICIDE INFO

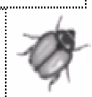
abamectin

ALWAYS READ AND FOLLOW THE LABEL

Information on this page is not to be substituted for label directions

Active Ingredient (a.i.):
abamectin

Target Pest Category:
miticide, insecticide



Examples of Trade Names:
Agri-mek, Avid

Chemical Family:
abamectin is in the avermectin family.

How it works (Mode of Action):
Stimulates the release of the neurotransmitter GABA, causing blockage of nerve impulses in insects and mites, and the pest is paralysed irreversibly within hours.

What it is:
The avermectins are insecticidal/miticidal compounds derived from the soil bacterium *Streptomyces avermitilis*. Abamectin is a natural fermentation product of this bacterium. It acts as an insecticide by affecting the nervous system of and paralyzing insects. Abamectin is active once ingested (stomach poison) although there is some contact activity. It has limited plant systemic activity, but exhibits translaminar movement.

Types of Formulation:
emulsifiable concentrate

Toxicity based on pure active ingredient:

Species	LD_{50}/LC_{50}	Relative Toxicity
Mammal (rat)	LD_{50} Oral : 10 mg/kg	Very toxic
Mammal (rabbit)	LD_{50} Dermal: > 2000 mg/kg	Slightly toxic
Bird (quail)	LD_{50} > 2000 mg a.i./kg	Practically non toxic
Bees (honey)	LD_{50} > 0.009 μg a.i./bee	Highly toxic
Fish (trout) (96 hour)	LC_{50} > 0.003 mg a.i./L	Very highly toxic
Other (earthworm) (28 day)	LC_{50} > 28 mg a.i./kg soil	

*For numerical value of relative toxicity category please go here (web site).

What it controls:
Controls motile stages of mites, leaf miners, suckers, Colorado beetles

How long it takes/Expected Results:
Maximum mortality occurs in 3-4 days but mites and insects are immobilized shortly after ingestion. Life-stage activity – larvae, adult suppression

When; Timing:
For optimum results, it should be applied when mites first appear, be aware of the plant stage, leaves must be young and supple at the time of application in order for the a.i. to penetrate. As leaves age and harden off they lose the ability to take up abamectin and residual control will be greatly reduced.

Province of British Columbia
Ministry of Agriculture, Fisheries & Food

Mixing Instructions:
- Not compatible with captan
- Please refer to label for specific mixing instructions

Label Links:
- Link to the PMRA label search
- Possible link to specific mixing instructions from the actual label

Storage:
- Store in a cool, dry place
- Keep in original container
- Do not store near heat or open flame

Application Tips:
- Add horticultural oil or nonionic surfactant to tank to improve foliage wetting and enhance penetration of a.i. in leaves
- Spray both sides of row
- Do not apply when bees are visiting the treatment area

Applicator Cautions/Re-entry:
- Do not re-enter treated areas until residues have dried.

Environmental Considerations:
- Rapidly degraded in soil
- At soil surface, abamectin is subject to rapid photodegradation, in anaerobic conditions; significantly decreased degradation
- Abamectin is nearly insoluble in water and has a strong tendency to bind to soil particles
- Immobile in soil and unlikely to leach or contaminate groundwater
- Half life approximately 1 week at non-shaded soil surface, in dark, aerobic conditions the half life is approximately 2 weeks to 2 months.
- Rabidly degraded in water
- Surface and ground water at pH's of 5,7 and 9 abamectin did not hydrolyze
- Plants do not absorb abamectin from the soil
- Toxic to fish and wildlife

Resistance Management:
- Abamectin is a Group 6 miticide/insecticide.
- Do not apply more than twice, in sequence or more than 6 times per crop per year.

Integrated Pest Management:
- Use with caution in a pest management program using beneficial arthropods.
- Abamectin is toxic to bees and predator mites on contact, but foliar residue dissipates quickly, making it essentially non-toxic to these species after a few hours.

Restrictions:
- Pre-harvest interval of 3 days

Special Instructions:
- Do not apply through irrigation systems.

Pesticide Wise

Ministry of Agriculture, Food & Fisheries

Information for ranchers, farmers, growers, crop consultants, pest managers, and horticulturalists about the safe use of pesticides in BC. Choose from the headings and subheadings below.

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- Food, Crop & Livestock Safety
- Application Equipment

- General Information
- Environmental Fate
- Protecting
  - Bees & Beneficials
  - Fish & Wildlife
  - Non-Target Vegetation
  - Water/Groundwater
- Drift Management
- Buffer Zones

- Emergencies
  Poison Control Center
  1-800-567-8911
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- Other Resources

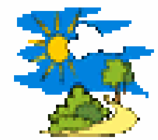
Search the Pesticide Wise site: [ ] Search

Contents

Environmental Protection

General Information

Responsible use of pesticides to protect the environment.



Environmental Fate

What happens to pesticides in the environment and how to minimise their impact.

Protection

Precautions to protect non-target wildlife and vegetation from exposure from pesticide applications.

Drift Management

Guidelines to minimise effects of pesticide drift.

Buffer Zones

Pesticide-free zones and buffer zones around water bodies and other sensitive habitats.

Plans for Pesticide Wise

- Continue preparing content winter 2003/04
- Review and edit content
- Launch the site in 2004

Pesticide Wise

Coming in 2004

The Fish and The Chip Genomic Applications for Environmental Toxicology Molecular vs. Conventional Endpoint Measurements

Presented by Graham van Aggelen, Environment Canada, Pacific Environmental Science Centre, Environmental Toxicology Section, North Vancouver, B.C.

Abstract

Toxicological testing, whether it be laboratory or field based, has been and continues to be a tool set that is used to evaluate the potential for a pesticide or other related materials to cause some measurable effect. Canada, through the efforts of Environment Canada's toxicology programs, has been a leader in establishing standardized toxicological methods and implementing them into action. While there have been great strides in standardizing how we conduct the various toxicological tests, there really haven't been any changes in the end-point measurements since John Sprague wrote the ABC's for fish bioassays for ASTM in 1973. We continue to rely on traditional endpoint measurements such as death, growth or reproduction, as the chief means to gauge the deleteriousness of a pesticide or herbicide. Further to this is the emergence of a new generation of suspect toxicants collectively labeled endocrine disrupting chemicals. There is a need to develop and add a new set of predictive tools. The last ten years have seen a dramatic leap forward in toxicological sciences with respect to the measure of molecular level toxicological effects. This can be summed up in one word "genomics". The word 'toxicogenomics" has been coined to describe this new area of toxicology that uses genomic related technologies. Work presented will highlight the results that the Pacific Environmental Science Centre (PESC) has achieved over the last four years toward developing and implementing a genomic toxicology program, and how these genomic tools will be used to evaluate potential toxicogenomics effects of endosulfonate, atrazine and simazine within the Lower Mainland. The work supports research being conducted by the Commercial Chemical Division of the Pacific and Yukon Region of Environment Canada.


Pacific Environmental Science Centre

2003 Pesticide Workshop
The Fish & The Chip
+
A TAD bit More for your Toxicological Menu

Graham van Aggelen
Environment Canada
Pacific Environmental Science Centre
Environmental Toxicological Section
North Vancouver

Acknowledgements

- Dr. Caren Helbing-UofVic
- Dr. Nik Veldhoen-UofVic
- Doug Crump-UofVic.
- Joy Bruno-PESC
- Heather Osachoff-PESC
- Dr. Mike Wan-EC
- Jen-ni Kuo-Ec
- John Pasternak-EC
- NSERC
- STAGE-EC
- Pest. Science Fund-EC

Toxicology "a la Carte"
NEW MENU ITEMS
Fresh from the Genomic Cafe

FOR PESTICIDE TOXICOLOGICAL EVAULATION

- FISH
  - Au Routine (just not enough anymore)
  - Fish & The Chip
  - Application to pesticide evaluation
    - Endosulfan case study

- Frog
  - Just a TAD more..
  - the Hole-y-tail
  - both on an assorted array…..
  - Acetochlor case study

New Toxicological Approaches for Effects

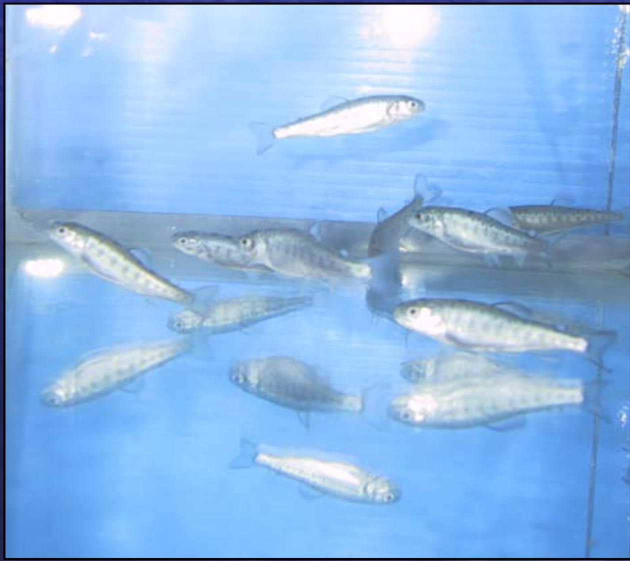
- Toxicological evaluations of pesticides broken down to essentially:
  - Acute and chromic exposures
  - Endpoint measurements
    - Quantitative or qualitative (death, reproduction, growth,behavior).
    - Excellent means to gauge effects
    - Not so good for molecular level effects
    - Endocrine disrupting Chemicals

EARLY LIFE STAGES

- Critical stages of development are susceptible to contaminants
- Key link to EDC related effects due to their vulnerability
- Existing Standardize EC methods for conducting the bioassay.

EGGS

ALEVIN



FRY

SUB-LETHAL EFFECTS FROM EDCs

low fertilization

low hatch rate

mortality

delayed hatch

cellular level impacts

intersex gonads

sex-reversal

deformities

poor survival

impaired reproduction

hormonal and biochemical changes

behaviour and courtship changes

poor survival

Kime, 1998

(α+β)- endosulfan and endosulfan sulfate Toxicological Study

- Combine traditional approaches with new toxicogenomic approach.
- Use of PESC RBT gene array to be applied
- Unique approach to gain critical toxicological information.

Current Studies

- Std 96HRLC50 RBT studies conducted at PESC established acute toxicity (Wan etal in press)
- Studies by Wan etal (1989&1995) indicate varying concentrations of (α+β)-endosulfan and endosulfan present in receiving waters.
- Tissue from underyearling Rainbow trout survivors in LC50 taken for genomic profiling.

Microarrays = Gene Expression Profile Tool

- isolated and characterized specific genes for amphibians and fish microarrays
    - a microarray is a membrane or glass chip that has been spotted with known genes, which are immobilized in specific locations
- 450 genes on the bullfrog array
- 150 genes on rainbow trout array
- Linkage to deleterious effects or molecular/biochemical expression

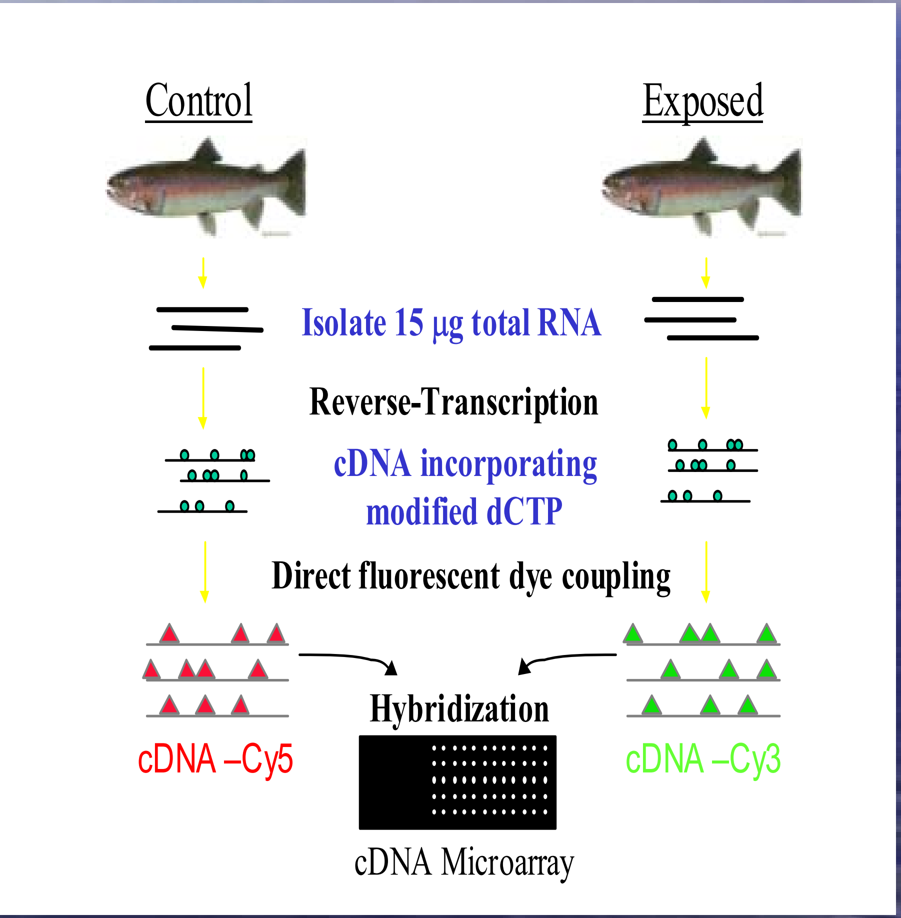
Rainbow Trout Microarray

From GenBank sequences, designed *150 cDNA pieces* (~ 500 bp in size)

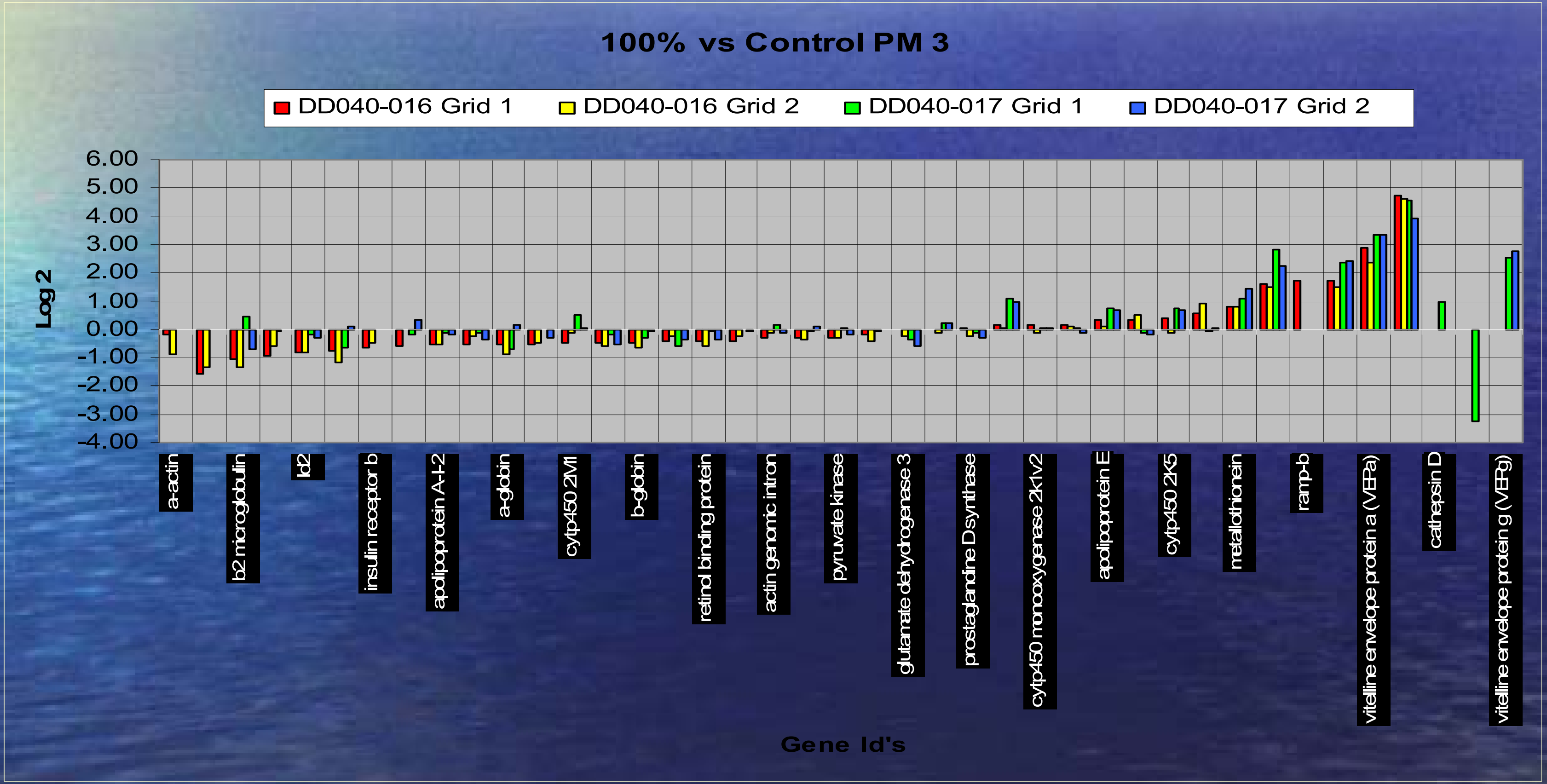
Oncogenes	Signaling molecules
Tumor Suppressors	Apoptotic
Transcription factors	Metabolic/enzymatic
Housekeeping	Binding/transporter
Structural	Endocrine
Regulatory	Signal transducers/receptors

PESC Rainbow Gene Array

- Exposures conducted in lab or in-situ with fry, eggs, or live capture
- Tissue brain, liver and muscle.

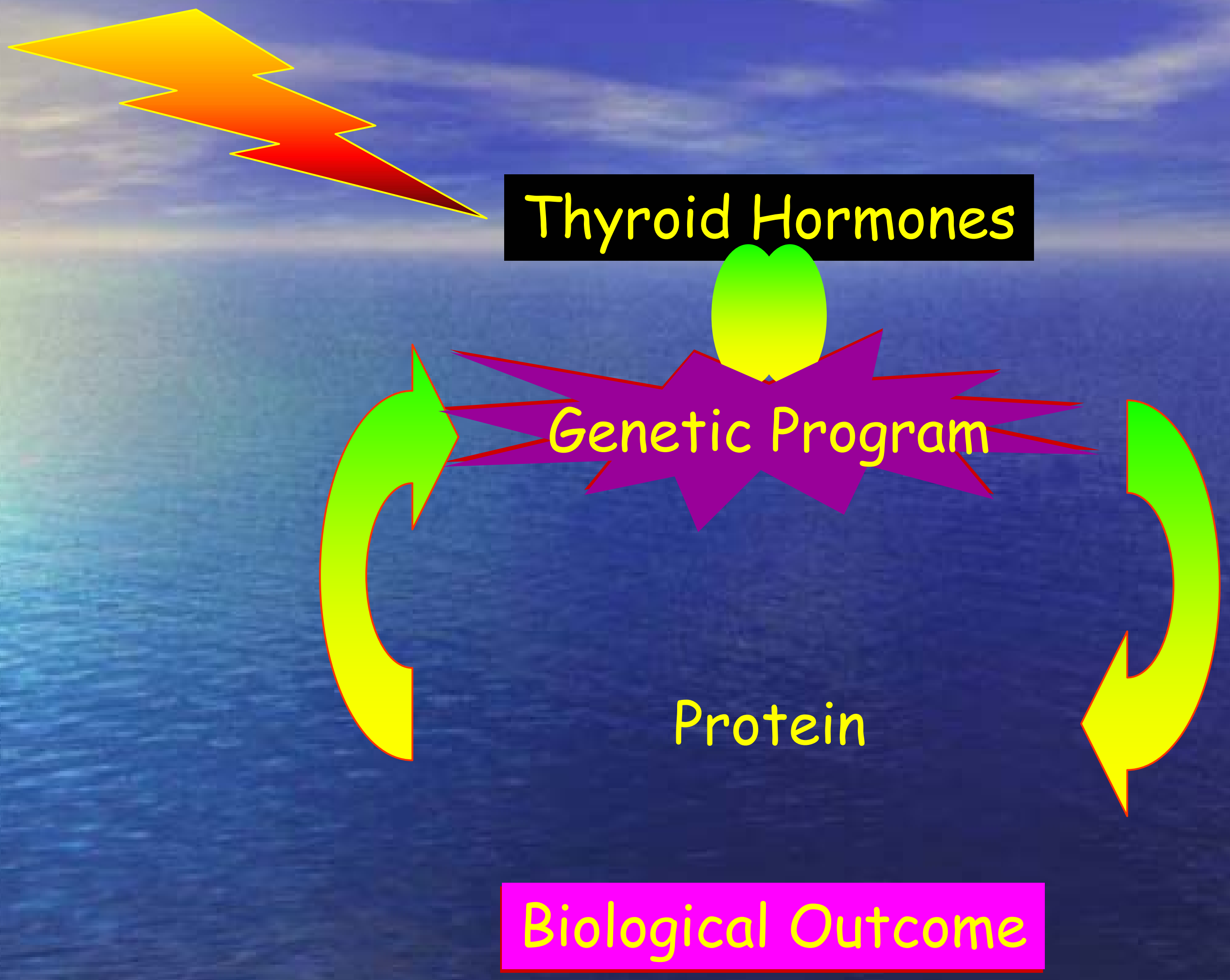


Microarray Expression Data



Tadpole Bioassay

- Working towards standardizing bioassay method (Bruce Pauli-CWS)
- PESC method involves static renewal
- Time course exposure model
- Tadpoles tested at critical metamorphic stage.
- *Rana catesbeiana* (bull frogs) current animal of choice.



Thyroid Hormones
Genetic Program
Protein
Biological Outcome

Frog MAGEX DNA Array
(multi-species analysis of gene expression)

Xenopus laevis and *Rana* sequences

Nylon membrane support

Built-in controls

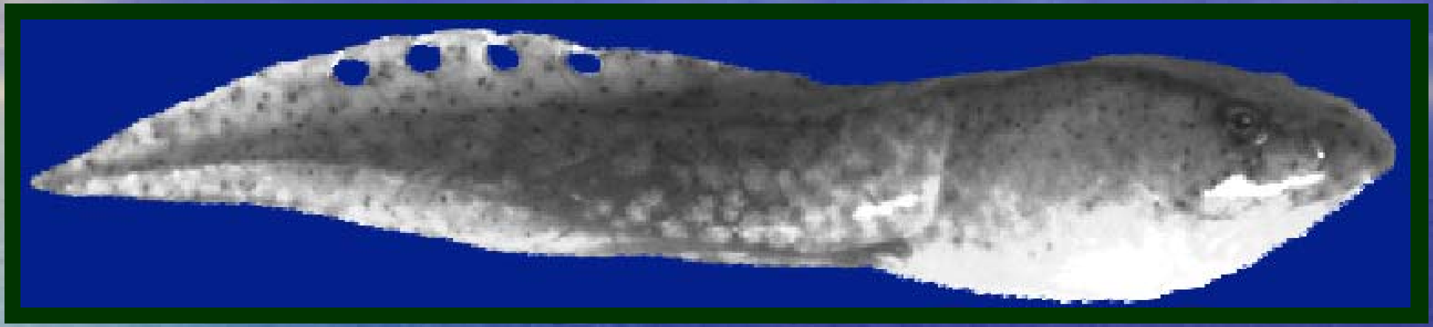
420 cDNA targets

- oncogene
- tumour suppressor
- apoptotic
- transcription factor
- structural
- transporters
- signaling molecules & receptors
- metabolic/enzymatic

New Approach

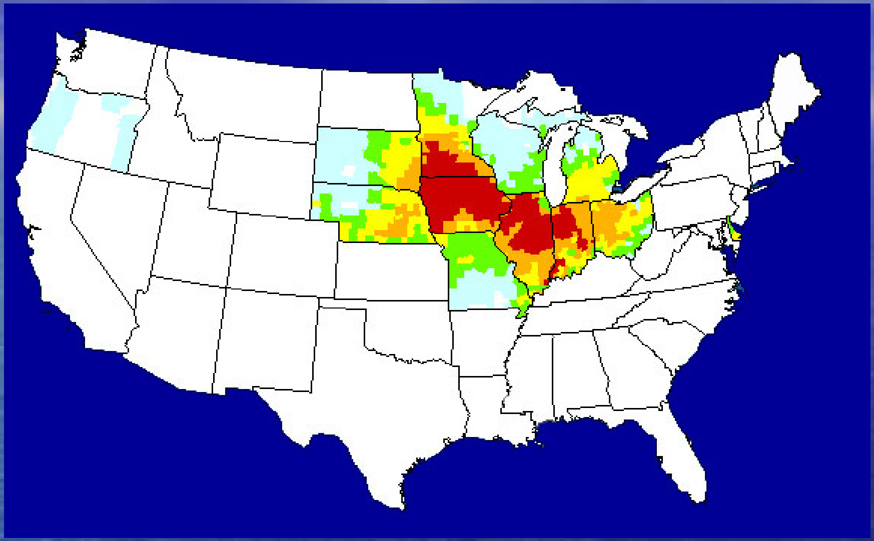
- In-situ field studies have been the "canary in the mine" measure. If you see effects something has happened.
- Toxicogenomics provides ability for a means to predict long term effects prior to manifestation in the wild.
- If you can see or measure field effects—you're too late!

Live Animal Biopsy



- Collect tail fin tissue from live *Rana catesbeiana*
- Tissue stable in RNA preservative
- Prepare total cDNA for PCR analysis
- Single biopsy provides for 200 PCR reactions
- Spring 2004 field campaign

Acetochlor

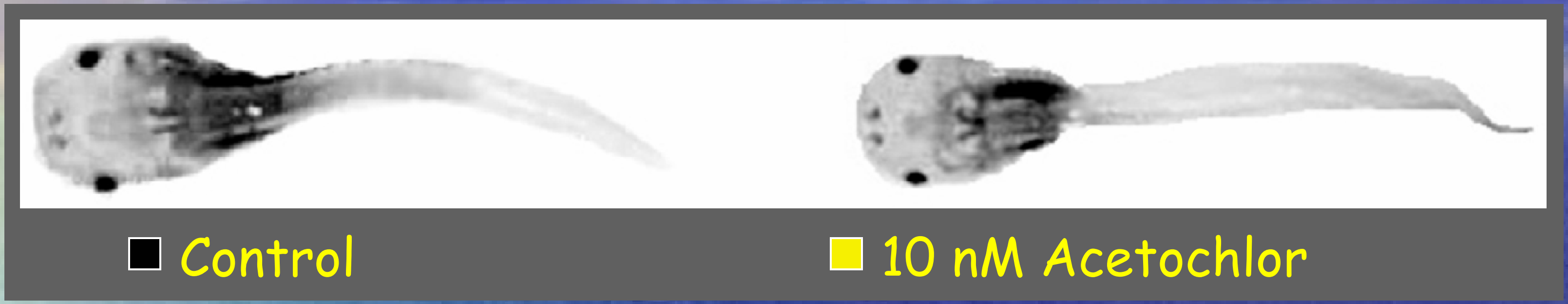


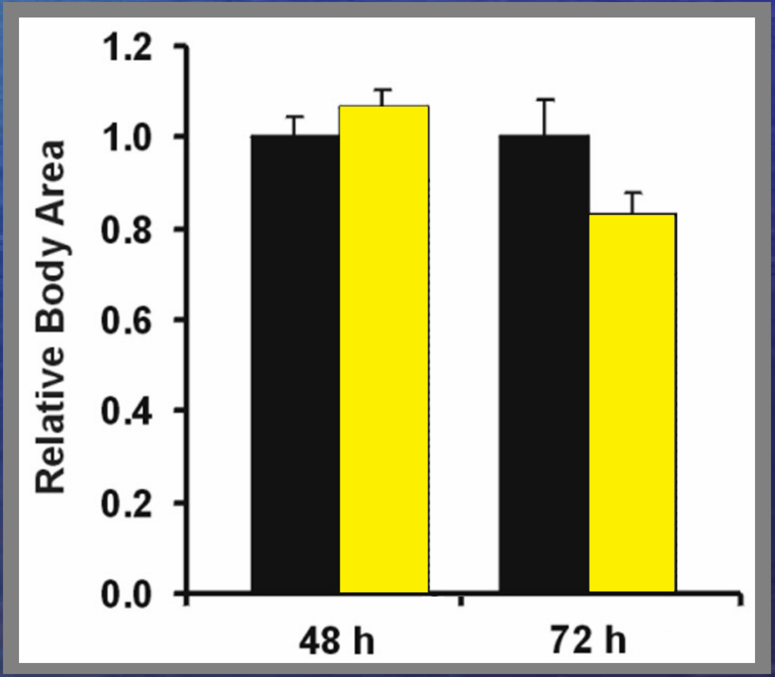
Persistence in the Environment

- 2.7 nM (730 ng/L) median in surface water
- 10 nM (2.7 ug/L) within the 80th percentile

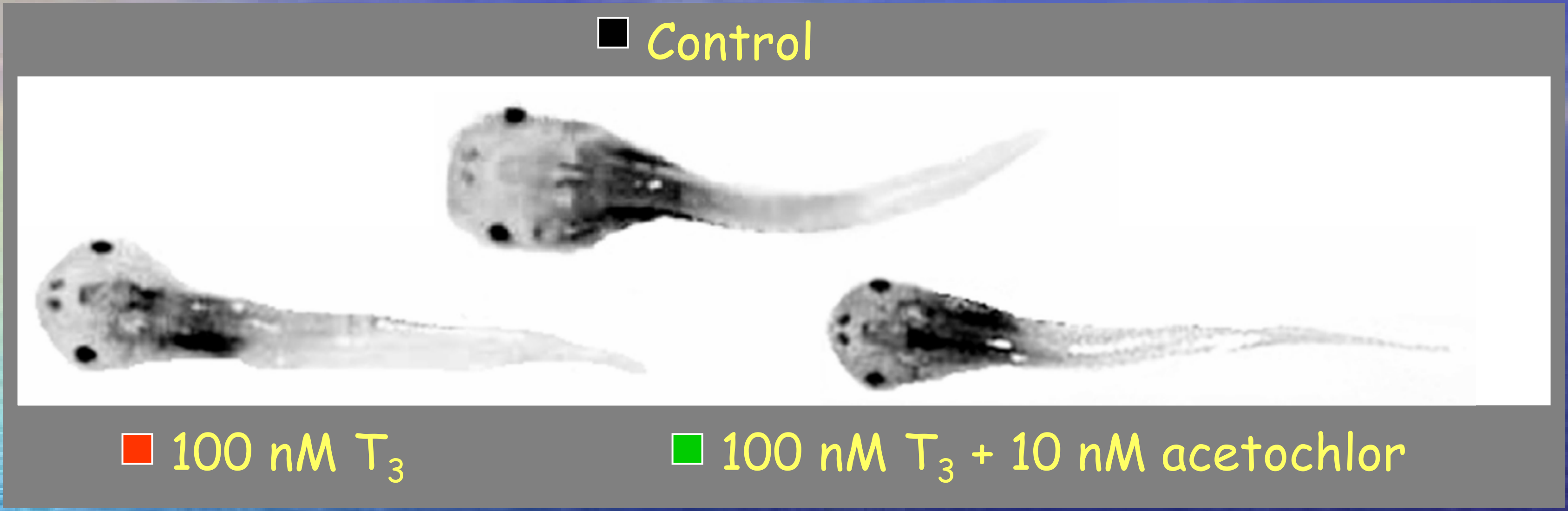
- preemergent herbicide
- introduced in 1994
- applied to ~25% of corn crops
- second only to atrazine in usage

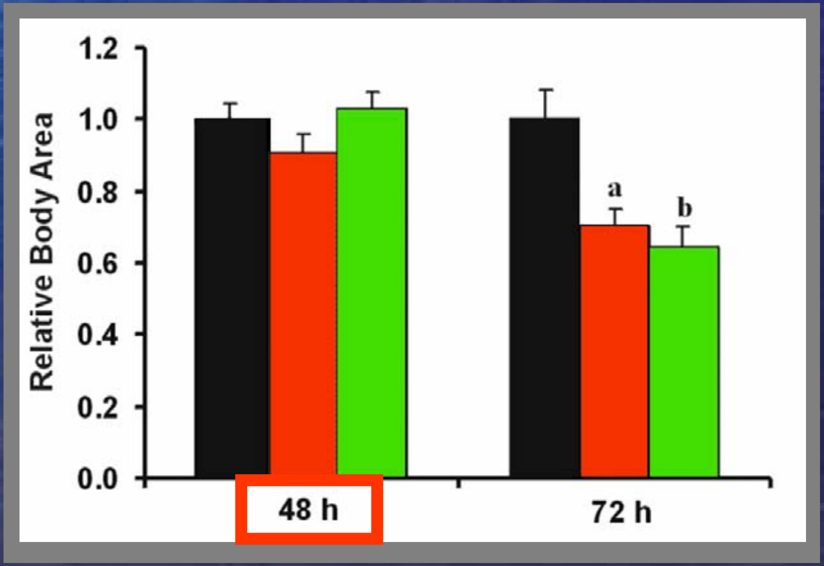
Acetochlor affects premetamorphic *Xenopus* tadpoles





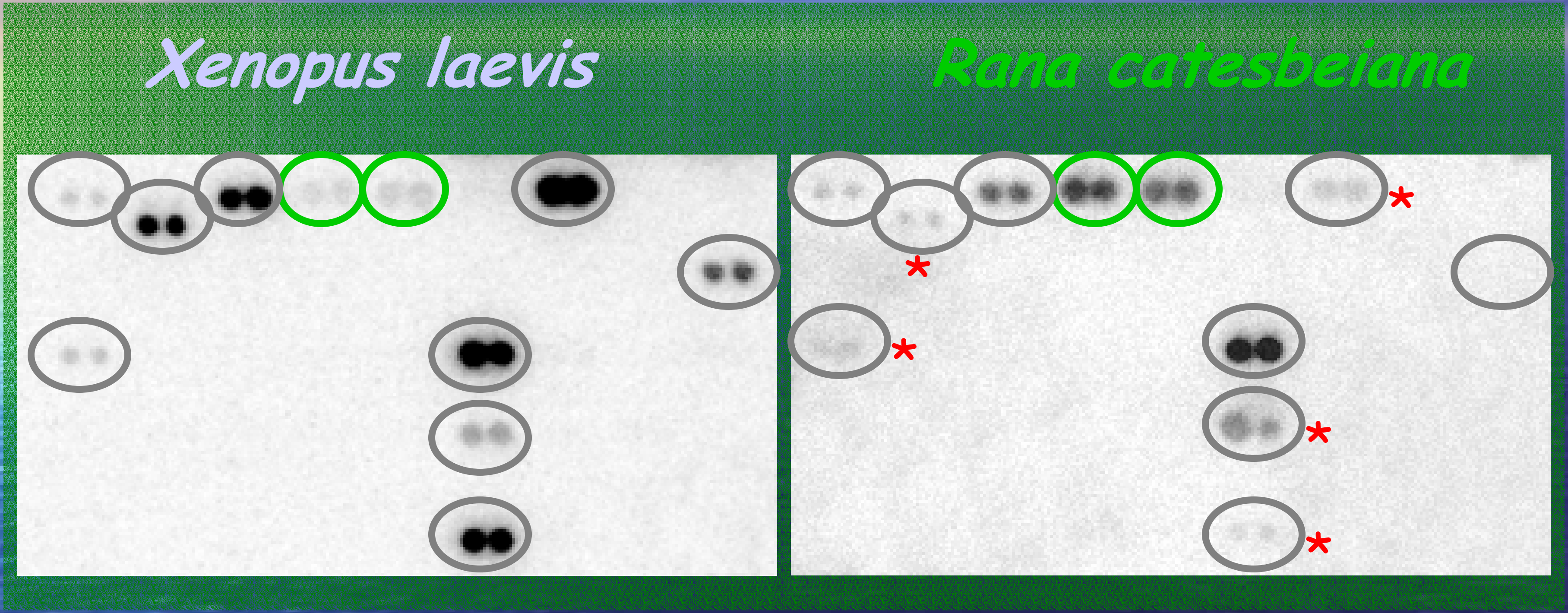
Acetochlor accelerates precocious metamorphosis in *Xenopus* tadpoles





Crump et al, Env Health Persp 2002

The MAGEX DNA Array is Useful for Different Frog Species



The MAGEX DNA array can be applied to amphibian species with limited genetic information

Tail cDNA from premetamorphic tadpoles

Canadian Pacific Railway Herbicide Application – Railway Applications and Use of Shrouds

Presented by Angelo Dalcin, Canadian Pacific Railway

Abstract

Vegetation management on the railway focuses on the right-of-way which is made up of the centre ballast section and area outside track centre to the property boundary. Unfortunately the physical nature of the ballast is conducive to the growth of vegetation which can lead to negative effects such as the prevention of track safety inspections, tripping hazards, poor drainage, increased risk of fire and interference with the operation of on-track equipment and other structures such as switches. As a result, to ensure the safe and efficient operation of the railway total vegetation control is required for the ballast section. However, continuous seedbed loading, the spread of weeds from the ROW and budget constraints all limit the possibility of achieving this level of control. Ballast control levels are therefore based on more practical and achievable levels using a pre-determined action threshold of five percent ground cover for main track and sidings.

Technology is used to increase the efficiency of ballast applications. This presentation focuses on two such technologies: the use of shrouded booms to counteract the effects of drift and the reduction of herbicide use using WeedSeeker® technology.

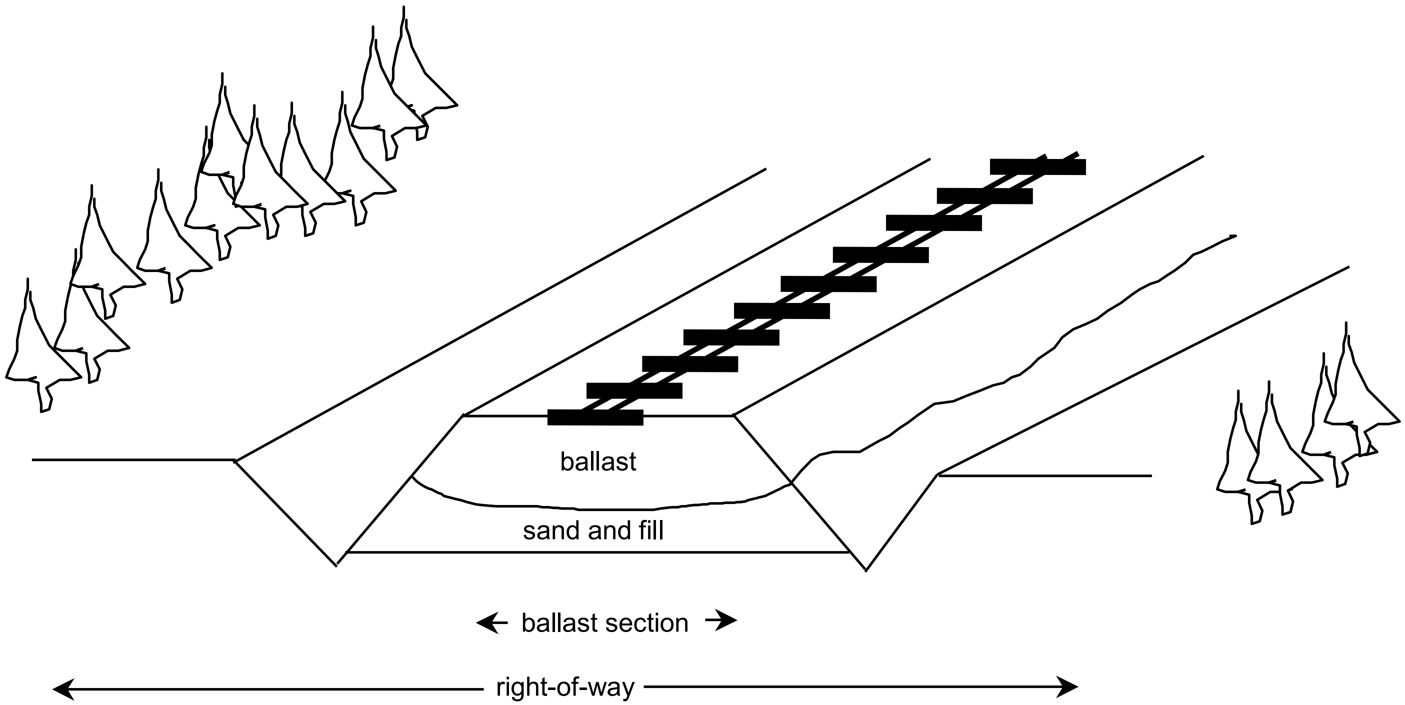
The effect of drift on an herbicide application is influenced by the droplet size, the distance the droplet has to move from the nozzle to the target and the spray pattern. In railway applications, a perforated shrouded boom is used to protect the droplet during its path to the target. They work by preventing wind shear that creates smaller droplet sizes and by protecting the droplets from the full effect of the wind. Rail applications also use nozzles with lower pressure, larger droplet size and narrow fan widths at an overall reduced distance to ground (approximately 50 cm). All of these factors prevent wind dispersion of the product in the field.

Canadian Pacific Railway Herbicide Applications

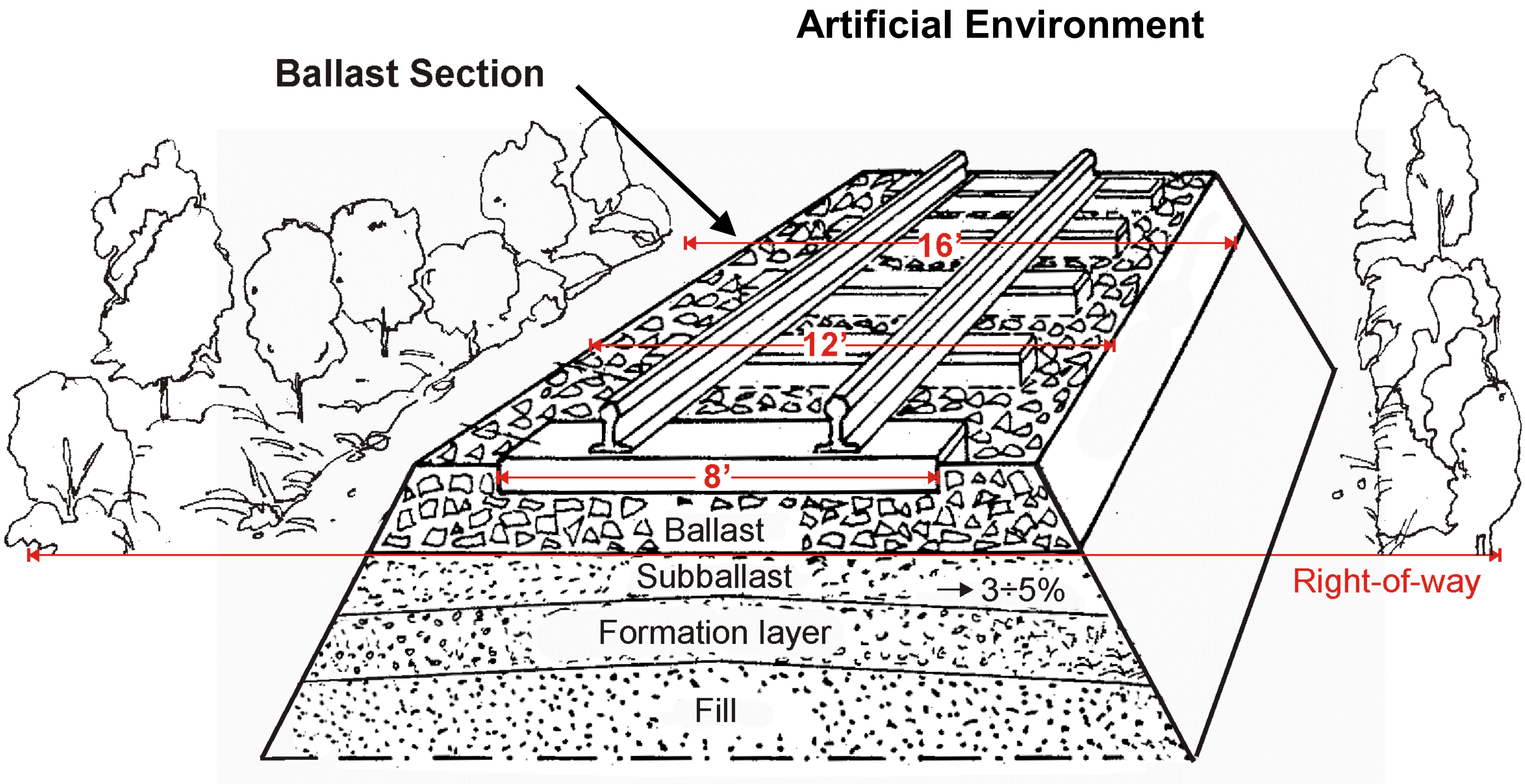
Railway Applications and Use of Shrouds

Angelo Dalcin
Vegetation Management Specialist
November 27, 2003.

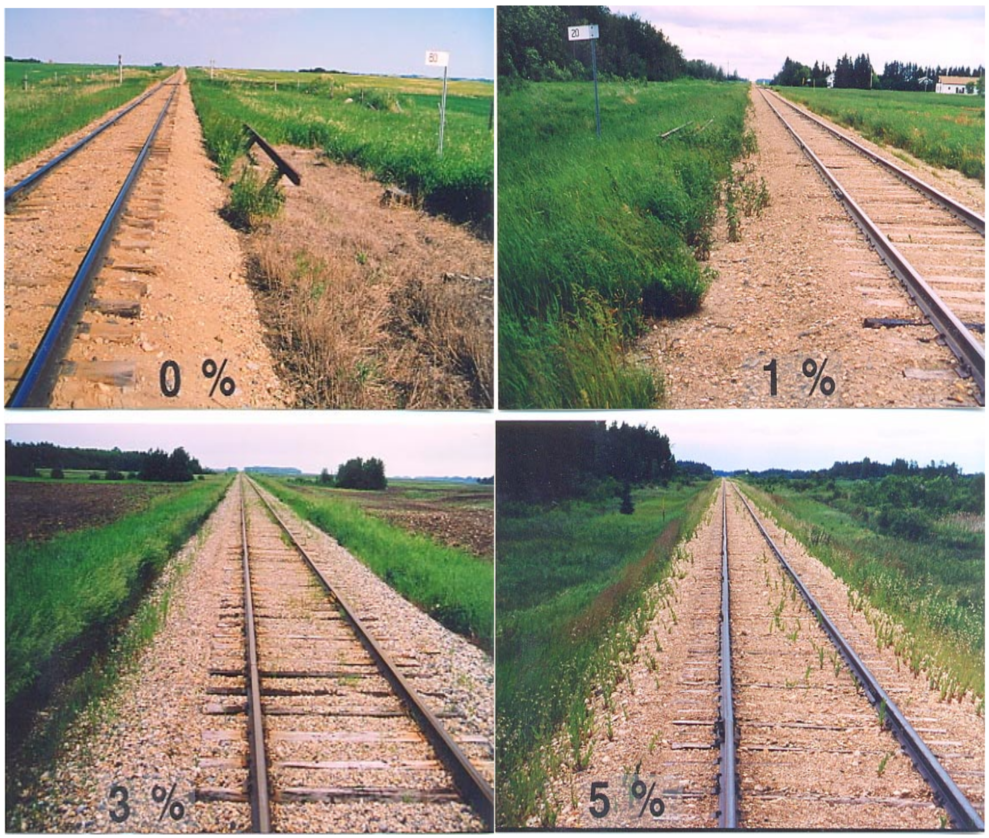
Vegetation Management on Railways



Need for Vegetation Management



Need for Vegetation Management



Need for Vegetation Management

- Safety
  - Roadbed integrity (soft track can result).
  - Inspection of rail component by crews
  - Reduce risk of fire from rail operations
  - Tripping hazard to crews. (The the most frequent injury to railway employees is slips and trips).

- Operations
  - Wheel slippage caused by vegetation
  - Difficult for mechanical equipment to Function

Application Technologies

- Drift Control
  - Use of Shrouded applications
- Reduction in Herbicide use
  - Weedseeker technologies

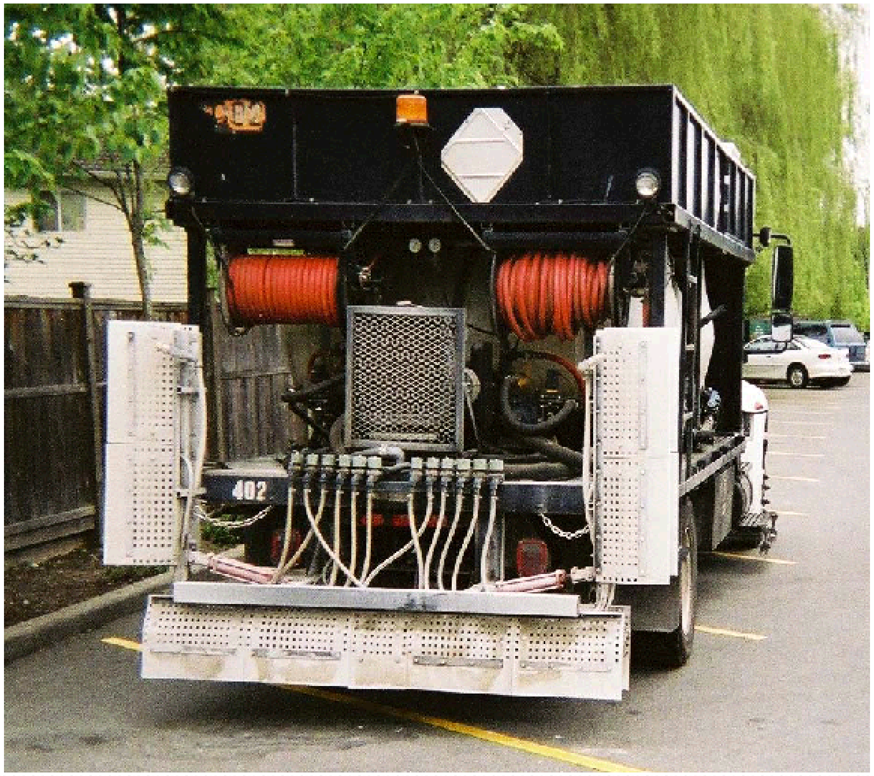
Drift is associated with Droplet Size

Diameter (Microns)	Time to Fall 10 ft in Still Air	
1	(fog)	28 hours
10	(fog)	17 minutes
100	(mist)	11 seconds
200	**(fine droplet)**	**4 seconds**
400	**(coarse droplet)**	**2 seconds**
1000	(very coarse droplet)	1 second

The longer the droplet is airborne, and the greater the unsheltered distance, the greater the potential for drift.

Shrouded Boom – Rear View

DeAngelo Herbicide Application Equipment



Rear View

The truck has 2 electric reels (one from each tank) Side booms turn upward to avoid obstacles.
2 sets of nozzles are within the shrouds.
One set of nozzles are tied to weedseeker mechanisms.

Shroudded Boom – Side View

Side View

To note are hi-rail equipment, separate tanks.
The short Wheel Base and allows sharp turning radius which is useful in moving on and off track on smaller “crossings”.

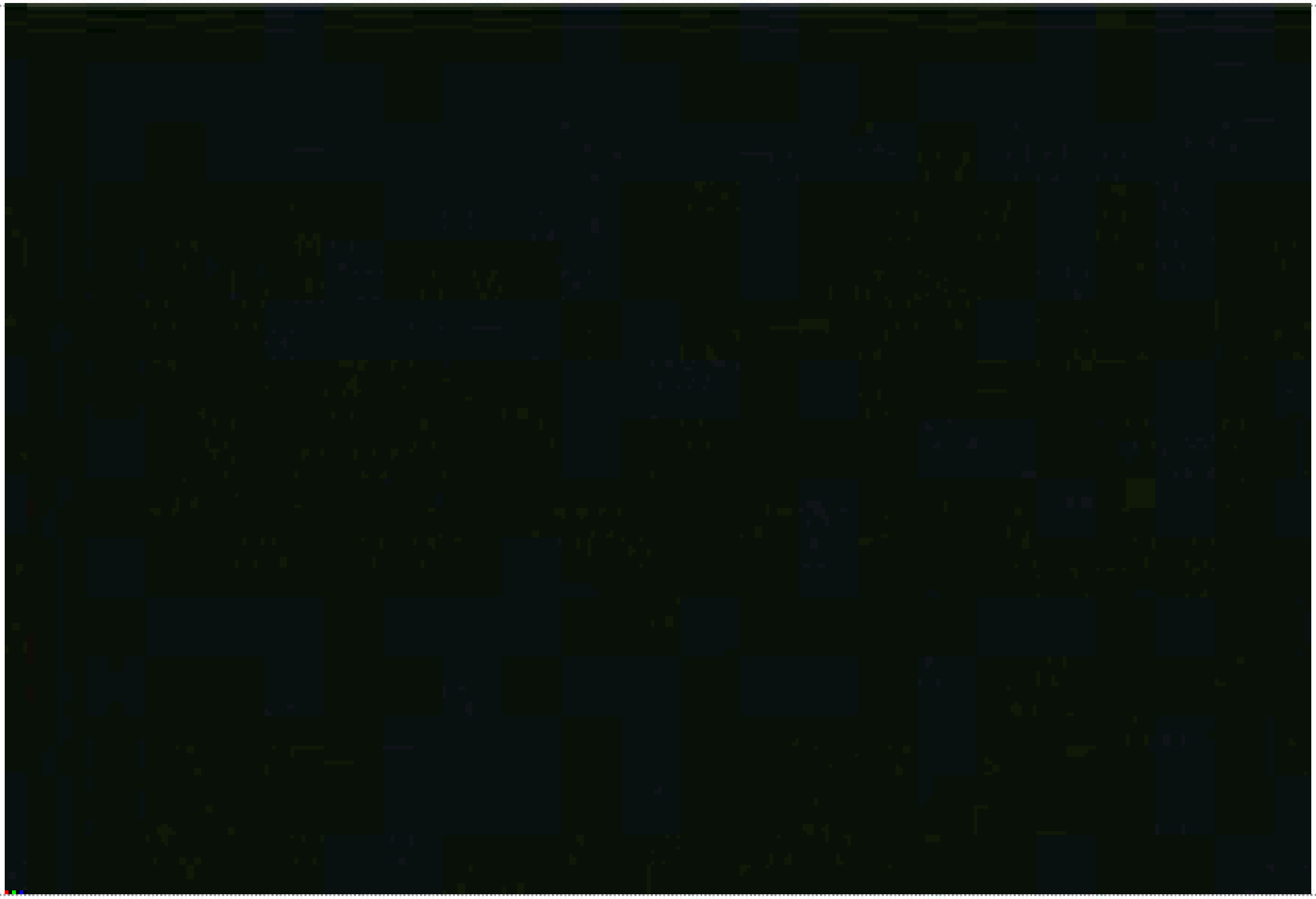
Drift Control Strategies with Rail Applications

- Short Distance to ground approximately 25 cm—droplet sheltered until then.
- Wind speed very low at ground level (we don't apply in windy conditions.
- Nozzles design -- droplet size between 200 and 600 microns.
- Narrow nozzle fan angle (80 deg) to reduce fine droplet potential
- Use of Shrouded Booms to Reduce Shear effect from wind cutting droplet when it emerges from the nozzle.
- Smooth, precise, guided application on rail

Sample Application

Additional Information

- Dr Tom M. Wolf
  - Agriculture Canada
  - Regina, Sask
  - "The effects of cones, screens, and shrouds on the drift and deposition characteristics of field sprayers."



Questions?

A Brief Summary of a Preliminary Study on the Potential of the Hi-rail Mounted *'Deangelo Shrouded Boom Sprayer System*' to Minimize Drift and Impact on Non-target Organisms along Railway Right-of-ways

by

M.T. Wan and J. Kuo

CHEMICALS EVALUATION SECTION
COMMERCIAL CHEMICALS DIVISION
ENVIRONMENTAL PROTECTION
DEPARTMENT OF THE ENVIRONMENT
PACIFIC & YUKON REGION

October 2003

ABSTRACT:

- **The effectiveness of the hi-rail mounted *'Deangelo shrouded boom sprayer system'* to reduce herbicide spray drift and impact on non-target organisms was investigated on the Lower Mainland of British Columbia during a 2003 CP Railway right-of-way (ROW) glyphosate spray operation.**
- **Drift cards were laid out at various locations and distances away from the edge of the railway ballast gravel base to capture and monitor the deposition of drift droplets of the rhodomine-dye/glyphosate mixture released by this boom system.**
- **Water and sediment samples of adjacent ditches, streams or water bodies were collected to determine for residues of glyphosate and its degradation product, aminomethylphosphonic acid (AMPA).**
- **Photographs were taken 2 months after the spray application to illustrate the visible demarcation of glyphosate impacted vegetation along the railway ROW.**

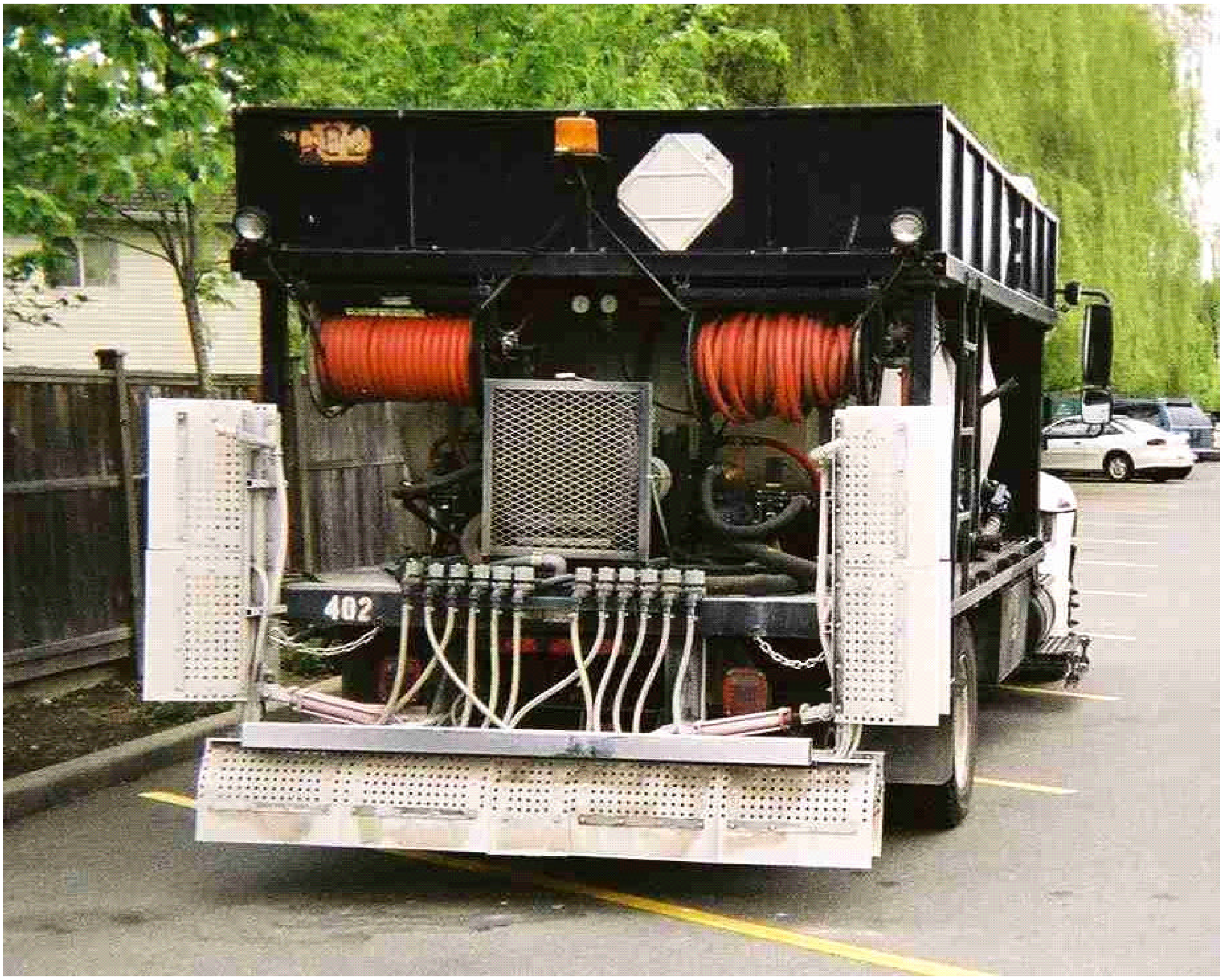


Figure 1. Hi-rail mounted with the "*Deangelo shrouded boom sprayer system"*

Figure 2. CP Rail Burnaby M11.57 (49^{o} 12.188' – 123^{o} 00.974')

Figure 3. CP Rail Burnaby M11.95 (49^{o} 12.157' – 123 ^{o} 00.758'); 10 m PFZ , at a creek crossing below railway; red marker shows adjacent ROW ditch

Figure 4. CP Rail Mission Cascade M86.6 (49^{o} 07.919' – 122^{o} 192.16')

Figure 5. CP Rail Abbotsford M4 (49^{o} 04.498' – 122^{o} 17.184'), marker is the location of the ditch along the ROW

Table 1. Recovery[a] of Glyphosate and AMPA residues of quality control, field water and sediment samples

Sampling time	Water (mg/L)		Sediments (mg/kg)	
	Glyphosate	AMPA	Glyphosate	AMPA
May 26/28, 2003				
"Blind" QC[b] samples (%)	30	30	10	10
Identified QC[b] samples (%)	83	63	100	66
Control samples (n = 1)	ND	ND	ND	ND
May 8, 2003				
Pre-spray	ND	ND	ND	ND
May 26, 2003 0.1 h post-spray (Burnaby)	ND	ND	ND	ND
June 17, 2003 504 h post-spray (1st rain storm)	ND	ND	ND	ND
May 28, 2003 0.1h post-spray (Mission)	ND	ND	ND	ND
June 17, 2003 480 h post-spray (1st rainstorm)	ND	ND	ND	ND
May 28, 2003 0.1 h post-spray (Abbotsford)	ND	ND	ND	ND
June 18, 2003 480 h post-spray (1st rainstorm)	ND	ND	ND	ND

[a]Detection limits (>90% CL): Water: glyphosate and AMPA = 0.005 mg/L
Sediments: glyphosate and AMPA = 0.3 mg/kg

[b]Average recovery in % (n = 2) of spiked QA/QC samples

Table 2. Deposition of rhodamine dye-glyphosate drift droplets/card (15 cm x 15 cm)

Location (n = 2/treatment)	**Distance (m) away from ballast**		
	0	**1.0**	**2.0**
Burnaby M11.56			
Without vegetation	5	0	0
With vegetation	1	0	0
Burnaby M11.95			
Without vegetation	3	0	0
With vegetation	1	0	0
Mission Cascade M86.66			
Without vegetation	4	0	0
With vegetation	1	0	0
Abbotsford M4			
Without vegetation	3	0	0
With vegetation	1	0	0

Table 3. Acute toxicity[1] of AMPA, glyphosate, Roundup®, and surfactant to selected non-target organisms

Indicator Organisms	EC50, LC50 LD50 (mg/L) of test materials			
	AMPA	**Glyphosate**	**Roundup®**	**Surfactant (MON 0818)**
Aquatic organisms				
Algae (*Scenedesmus subspicatus*); 72-h static	79.7	485 *Selenastrum spp*	-	-
Crustacean (*Daphnia magna*); 48-h static	691	720	-	-
Fish (*Oncorhynchus mykiss*) rainbow trout; 96-h static	520	10	33	2.0
Fish (*O. gorbusca*) pink salmon; 96-h static	-	14	33	4.5
Semi-aquatic organisms				
Frog (*Crinia insignifera*); 48-h	-	83.6	51.8	-
Terrestrial organisms				
Bees (*Apis sp*); contact	-	>100 µg/bee	-	-
Birds (bobwhite quail); 8-d feeding	-	>4,640	-	-
Earthworm (*Eisenia fetida*)	28.1 NOEC 56-d	>5,000 14-d test	-	-
Rat (*Rattus spp*)	-	5,600 acute oral	-	-
Soil mycorrhizal fungus (IC50), 14-d	4.2	0.5	-	-

[1]Data from: Folmar et al (1979); Tomlin (2002); Wan (1983, 1986, 1989); Wan et al (1987, 1989, 1998)

A Brief Summary of Preliminary Data on the Acute and Sub-acute Toxicity of a-endosulfan, b-endosulfan, (a+b)-endosulfan, their metabolite Endosulfan Sulfate, and formulated products Thiodan 4 EC and Endosulfan 50 W to salmonid *Onchorhynchus mykiss*, Cladoceran *Daphnia magna* and Amphipod *Hyelella azteca*

by

M.T. Wan[1], J. Kuo[1], C. Buday[2], G. Schroeder[2], G. Van Aggelen[2], and J. Pasternak[1]

[1]Environment Canada, Environmental Protection Branch, Commercial Chemicals Division, Pacific and Yukon Region, 401 Burrard Street, Vancouver, B.C., Canada V6C 3S5
[2]Pacific Environmental Science Center, 2645 Dollarton Highway, North Vancouver, B.C., Canada, V7H 1B1

November 27, 2003

ABSTRACT:

- **Study objective = to determine the acute/sub-acute toxicity of endosulfan & its transformation/formulated products on a salmonid, daphnia, & an amphipod**
- **Completed about 70 % lab work of this 2002/2003 project**
- **Acute toxicity of a-, b-, (a+b)-endosulfan & endosulfan sulfate to salmonid, daphnia, hyalella were determined, using active ingredient of each isomer or combination of all isomeric compounds**
- **Using toxicogenomic & other techniques, subtle effects of sub-acute simulated field concentrations were tested on these indicator organisms**
- **Report completion awaits the results of sub-acute toxicity tests**
- **Tables 1, 2 & 3 are data highlights**

Table 1. Test materials

Compounds	Concentration of active ingredients (a.i.)
a-Endosulfan	99.5%
b-Endosulfan	99.3%
(a+b)-Endosulfan*	99 % (60 % a-Endosulfan + 40% b-Endosulfan)*
Endosulfan sulfate	98%
Endosulfan 50 WP	50% (of 67 % a-Endosulfan + 32.5% b-Endosulfan) + 50 % blank
Endosulfan 50 blank	100% blank (*unavailable for testing*)
Thiodan 4EC	40% (of 67% a-Endosulfan + 32.5% b-Endosulfan) + 60% emulsifier
Thiodan emulsifier	100% emulsifier

*** - laboratory chemical analysis**

Table 2. Toxicity of test materials to Rainbow trout, Daphnia and Hyalella

Test chemicals & bioassay time (h)	Acute toxicity (mean µg/L, 95% C.L., n = 3)		
	Rainbow trout	Daphnia	Hyalella
a-endosulfan			
24-h	-	-	-
48-h	-	1179 (790 – 2048)	-
72-h	-	-	-
96-h	0.5 (< 1.0)	-	2.7 (0.5 – 10.0)
ß-endosulfan			
24-h	-	-	-
48-h	-	1519 (962 – 3178)	-
72-h	-	-	-
96-h	3.3 (2.8- – 4.0)	-	153 (10 – 240)
(a + ß)-endosulfan			
24-h	-	-	-
48-h	-	839 (642 – 1113)	-
72-h	-	-	-
96-h	0.7 (0.6 – 0.8)	-	5.7 (4.2 – 7.5)
Endosulfan sulfate			
24-h	-	-	-
48-h	-	2123 (1446 – 3988)	-
72-h	-	-	-
96-h	1.4 (1.3 – 1.6)	-	5.7 (4.2 – 7.5)
Endosulfan 40EC			
24-h	-	-	-
48-h	-	1823 (1485 – 2239)	-
72-h	-	-	-
96-h	4.6 (4.0 – 5.2)	-	11.5 (8.5 – 33.9)
Endosulfan 50WP			
24-h	-	-	-
48-h	-	1919 (1539 – 2395)	-
72-h	-	-	-
96-h	3.5 (3.1 – 3.9)	-	5.9 (1.3 – 25.2)

Table 3. Acute lethality of simulated field concentrations of (a + ß)-endosulfan on coho salmon, rainbow trout, daphnia, and hyalella

Test Concentrations	Mortality (%)			
	Coho	Rainbow	Daphnia	Hyalella
Control	0	0	0	0
Acetone control	0	0	0	0
Low (0.01 µg/L)	0	0	0	0
Mid (0.10 µg/L)	0	0	0	0
High (0.50 µg/L)	0	17	0	0

A Brief Summary of Preliminary Data On Residues of Endosulfan and Selected Historical Organochlorine Pesticides in the Lower Fraser Valley of British Columbia

by

M.T. Wan, J. Kuo, and J. Pasternak

Environment Canada
Environmental Protection Branch
Commercial Chemicals Division, Pacific and Yukon Region
401 Burrard Street, Vancouver, B.C.
Canada V6C 3S5

November 27, 2003

ABSTRACT:

- **Study objective = to determine endosulfan & historical Organochlorine (OC) pesticide levels in the Lower Fraser Valley of British Columbia**
- **Completed field work of this 2-year project in July 2003**
- **Crop soils, ditch/river sediments, and water samples were taken for Endosulfan & OC residue analyses from various sites (Fig. 1)**
- **Data are now being processed**
- **High lights of data presented in Tables 1, 2, 3 & 4**
- **Report to be published in a peer reviewed journal.**

TABLE 1 (March 2003)

Recovery of Organochlorine Insecticides from Fortified Pristine Samples of Sediment, Soil, Vegetation and Water

Insecticides	Recovery rate (%)[a] Mean ± S.E. (n = 5)[b]			
	Sediment[c] (n = 5)	Soil[c] (n = 5)	Vegetation[c] (n = 3)	Water[c] (n = 10)
Aldrin		90 ± 4		98 ± 7
a-BHC		86 ± 6		108 ± 6
b-BHC		89 ± 4		112 ± 7
d-BHC		88 ± 6		117± 7
g-BHC (Lindane)		87 ± 5		110 ± 7
Dieldrin		90 ± 3		123 ± 8
a-Endosulfan		86 ± 6		112 ± 7
b-Endosulfan		89 ± 4		111 ± 7
Endosulfan sulfate		90 ± 4		117 ± 7
Endrin		95 ± 2		159 ± 9
Endrin aldehyde		80 ± 5		116 ± 7
Heptachlor		83 ± 6		118 ± 7
Heptachlor epoxide		91 ± 4		110 ±7
Methoxychlor		93 ± 3		153 ± 10
p,p-DDD		88 ± 3		130 ± 7
p,p-DDE		89 ± 4		102 ± 7
p,p-DDT		90 ± 5		112 ± 7

[a] fortification levels: water, 0.10 – 0.45 mg/L; sediments, soil, vegetation, 50 - 300 mg/kg.
[b] samples of each substrate submitted as ‘blind’ (look alike field samples) to the analysts.
[c] detection limits: water, 0.01 mg/L; sediments, vegetation, soil, 0.02 mg/kg.

TABLE 2 (July 2002 – July 2003)

Organochlorine Pesticide Residues of Top Soils of Watershed Streams (1, 2, 3, 4) and Farms of Sumas Prairie (6), Cloverdale (8), Delta (10), Westham Island (11) and Burnaby (13) on the Lower Mainland of British Columbia

Pesticides	Sampling sites [mean[a] mg/kg wet[b] wt., (f/n; range)[c]]					
	(1, 2, 3, 4)	(6)	(8)	(10)	(11)	(13)
Aldrin	ND[d] (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.04 (4/16; 0.03 - 0.05)
a-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
b-BHC	ND (0/4)	ND (0/12)	0.04 (2/16; 0.03 - 0.05)	ND (0/12)	ND (0/12)	0.04 (3/16; 0.03 - 0.06)
d-BHC	ND (0/4)	ND (0/12)	0.03 (2/16; 0.02 - 0.04)	ND (0/12)	ND (0/12)	0.07(3/16; 0.03 - 0.08)
g-BHC (Lindane)	ND (0/4)	ND (0/12)	0.04 (5/16; 0.03 - 0.07)	ND (0/12)	ND (0/12)	0.04 (5/16; 0.02 - 0.11)
Dieldrin	ND (0/4)	ND (0/12)	0.23 (8/16; 0.02 - 0.40)	ND (0/12)	0.14 (4/12; 0.06 - 0.36)	0.95 (16/16; 0.18 - 2.40)
a-Endosulfan	ND (0/4)	ND (0/12)	0.03 (7/16; 0.02 - 0.05)	ND (0/12)	0.23 (7/12; 0.04 - 1.00)	0.03 (9/16; 0.03 - 0.04)
b-Endosulfan	ND (0/4)	ND (0/12)	0.52 (16/16; 0.02 - 1.30)	ND (0/12)	0.31 (7/12; 0.09 - 1.40)	0.65 (16/16; 0.03 – 1.90)
Endosulfan sulphate	ND (0/4)	ND (0/12)	0.91 (15/16; 0.03 - 4.00)	0.02 (1/12)	0.10 (7/12; 0.03 - 0.19)	1.18 (16/16; 0.04 - 2.33)
Endrin	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.07 (8/16; 0.03 - 0.11)
Endrin aldehyde	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Heptachlor	ND (0/4)	ND (0/12)	0.22 (4/16; 0.05 - 0.40)	ND (0/12)	ND (0/12)	0.04 (4/16; 0.03 - 0.05)
Heptachlor epoxide	ND (0/4)	ND (0/12)	0.29(6/16; 0.03 - 0.70)	ND (0/12)	ND (0/12)	0.23 (16/16; 0.03 - 0.46)
Methoxychlor	ND (0/4)	ND (0/12)	0.05 (4/16; 0.02 - 0.10)	ND (0/12)	ND (0/12)	0.70 (1/16)
p,p-DDD	ND (0/4)	ND (0/12)	1.22 (15/16; 0.30 - 6.00)	ND (0/12)	0.05 (3/12; 0.03 - 0.05)	0.60 (16/16; (0.08 - 1.42)
p,p-DDE	ND (0/4)	ND (0/12)	0.40 (15/16; 0.04 - 0.80)	ND (0/12)	0.05 (7/12; 0.03 - 0.07)	0.21 (16/16; 0.07 - 0.41)
p,p-DDT	ND (0/4)	ND (0/12)	1.66 (13/16; 0.03 - 4.00)	ND (0/12)	0.09 (10/12; 0.03 - 0.16)	0.48 (16/16; 0.11 – 1.30)

[a] mean concentration of positive occurrence, not adjusted for recovery efficiency.
[b] moisture content varying from 1% - 10%
[c] f = frequency of positive occurrence, / = out of, n = total number of samples per site over a 2-year period; range of concentrations.
[d] ND = not detected, detection limit = 0.02 mg/kg.

TABLE 3 (July 2002 – July 2003)

Organochlorine Pesticide Residues of <u>Sediments</u> of Watershed Streams (1, 2, 3, 4) and Farm Ditches of Sumas Prairie (6), Cloverdale (8), Delta (10), Westham Island (11) and Burnaby (13) on the Lower Mainland of BC

Pesticides	Sampling sites [mean[a] mg/kg wet[b] wt., (f/n; range)[c]]					
	(1, 2, 3, 4)	(6)	(8)	(10)	(11)	(13)
Aldrin	ND[d](0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.05 (10/16; 0.03 - 0.07)
a-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
b-BHC	ND (0/4)	ND (0/12)	0.03 (1/16)	ND (0/12)	ND (0/12)	0.05 (8/16; 0.03 - 0.06)
d-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.10(1/16)
g-BHC (Lindane)	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Dieldrin	ND (0/4)	ND (0/12)	0.27 (2/16; 0.03 - 0.50)	ND (0/12)	ND (0/12)	0.39 (16/16; 0.03 - 1.18)
a-Endosulfan	ND (0/4)	ND (0/12)	0.07 (1/16)	ND (0/12)	ND (0/12)	0.03 (5/16; 0.03 - 0.04)
b-Endosulfan	ND (0/4)	ND (0/12)	0.39 (7/16; 0.03 - 1.70)	ND (0/12)	ND (0/12)	0.23 (16/16; 0.03 - 0.63)
Endosulfan sulfate	ND (0/4)	ND (0/12)	0.73 (7/16; 0.03 - 2.90)	ND (0/12)	0.08 (7/12; 0.03 - 0.10)	0.59 (16/16; 0.04 - 1.33)
Endrin	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.04 (9/16; 0.03 - 0.05)
Endrin aldehyde	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Heptachlor	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Heptachlor epoxide	ND (0/4)	ND (0/12)	0.07(2/16; 0.03 - 0.11)	ND (0/12)	ND (0/12)	0.13 (14/16; 0.03 - 0.40)
Methoxychlor	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
p,p-DDD	ND (0/4)	ND (0/12)	0.32 (9/16; 0.03 - 1.10)	ND (0/12)	0.03 (6/12; 0.03 – 0.06)	0.36 (16/16; (0.03 - 0.73)
p,p-DDE	ND (0/4)	ND (0/12)	0.28 (8/16; 0.03 - 0.70)	ND (0/12)	0.03 (5/12; 0.03 - 0.08)	0.14 (13/16; 0.04 - 0.29)
p,p-DDT	ND (0/4)	ND (0/12)	0.92 (8/16; 0.03 - 4.00)	ND (0/12)	0.03 (2/12; 0.03 – 0.04)	0.27 (15/16; 0.05 - 0.70)

[a] mean concentration of positive occurrence, not adjusted for recovery efficiency.
[b] moisture content varying from 15% - 35%.
[c] f = frequency of positive occurrence, / = out of, n = total number of samples per site over a 2- year period; range of concentrations.
[d] ND = not detected, detection limit = 0.02 mg/kg.

TABLE 4 (July 2002 – July 2003)

Organochlorine Pesticide Residues of <u>Waters</u> of Watershed Streams (1, 2, 3, 4) and Farm Ditches of Sumas Prairie (6), Cloverdale (8), Delta (10), Westham Island (11) and Burnaby (13) on the Lower Mainland of BC

Pesticides	Sampling sites [mean[a] μg/L[b], (f/n; range)[c]]					
	(1, 2, 3, 4)	(6)	(8)	(10)	(11)	(13)
Aldrin	ND[d] (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
α-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
β-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
δ-BHC	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
γ-BHC (Lindane)	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Dieldrin	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.10 (7/16; 0.03 – 0.08)
α-Endosulfan	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	0.08 (4/12; 0.01 – 0.16)	0.01 (1/16)
β-Endosulfan	ND (0/4)	ND (0/12)	0.01 (5/16; 0.01 - 0.02)	ND (0/12)	0.04 (5/12; 0.02 - 0.08)	0.10 (16/16; 0.03 - 0.44)
Endosulfan sulfate	ND (0/4)	0.01 (1/12)	0.05 (10/16; 0.03 - 0.10)	ND (0/12)	ND (0/12)	0.24 (16/16; 0.03 - 1.26)
Endrin	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.03 (3/16; 0.02 - 0.04)
Endrin aldehyde	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Heptachlor	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
Heptachlor epoxide	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.09 (11/16; 0.03 - 0.28)
Methoxychlor	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	ND (0/16)
p,p-DDD	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	ND (0/12)	0.07 (8/16; (0.01 - 0.22)
p,p-DDE	ND (0/4)	ND (0/12)	ND (0/16)	ND (0/12)	0.02 (1/12)	0.09 (4/16; 0.01 - 0.14)
p,p-DDT	ND (0/4)	ND (0/12)	0.03 (4/16; 0.01 – 0.06)	ND (0/12)	0.02 (1/12)	0.09 (13/16; 0.02 - 0.28)

[a] mean concentration of positive occurrence, not adjusted for recovery efficiency.
[b] suspended particles varying from 0.0001% - 1%
[c] f = frequency of positive occurrence, / = out of, n = total number of samples per site over a 2-year period; range of concentrations.
[d] ND = not detected, detection limit = 0.01 μg/L

Assessment Endpoints for Ecological Risk Assessments of Pesticides: A Scientific Perspective

P. Delorme., C. Kriz, V. Hodge, H. Mulye, R. Sebastien, C. Hart, P. Takacs, D. François, G. Kaminski and T. MacQuarrie

Abstract

Assessment endpoints are expressions of actual environmental values that we wish to protect. As part of their decision making process, risk managers use assessment endpoints as a link between the risk assessment and identified protection goals. The Environmental Assessment Division of the PMRA sponsored a workshop to identify and characterize, from a scientific perspective, the ecological assessment endpoints that should be considered in the environmental assessment and risk management decisions for the registration of pesticides in Canada. Scientists from government, academia, NGO and industry were invited to participate. Discussions were organised along the taxonomic groups (plants, terrestrial invertebrates, aquatic invertebrates, fish, amphibians, birds, and mammals). Initial sessions examined the applicability of generic assessment endpoints to the different levels of biological organization (i.e., individuals, population, community and ecosystem). Subsequent sessions refined the selection of assessment endpoints by considering temporal, spatial and biological factors as well as agricultural factors (i.e. use patterns). The generic and refined assessment endpoints for each taxonomic group and their rationales will be presented. The outcome of the workshop will provide a scientific perspective for risk managers on environmental protection goals and provide risk assessors with clearer guidance on assessment endpoints for ecological risk assessment of pesticides.

Assessment Endpoints for Pesticide Risk Assessments

Results of the Val Morin Workshop
October 4-6, 2002

Background

- Prior to the revision of assessment methods we need to have a better understanding of what we are trying to protect.
- As a first step, a three-day workshop was held from October 4-6, 2002 to address, from a scientific perspective, what assessment endpoints should be considered in our risk assessments.
- Scientists from government, academia, non-governmental organizations and industry, with a range of expertise participated in the workshop. The results of this workshop may also be relevant for other regulatory programs.

Assessment Endpoints
- Defined -

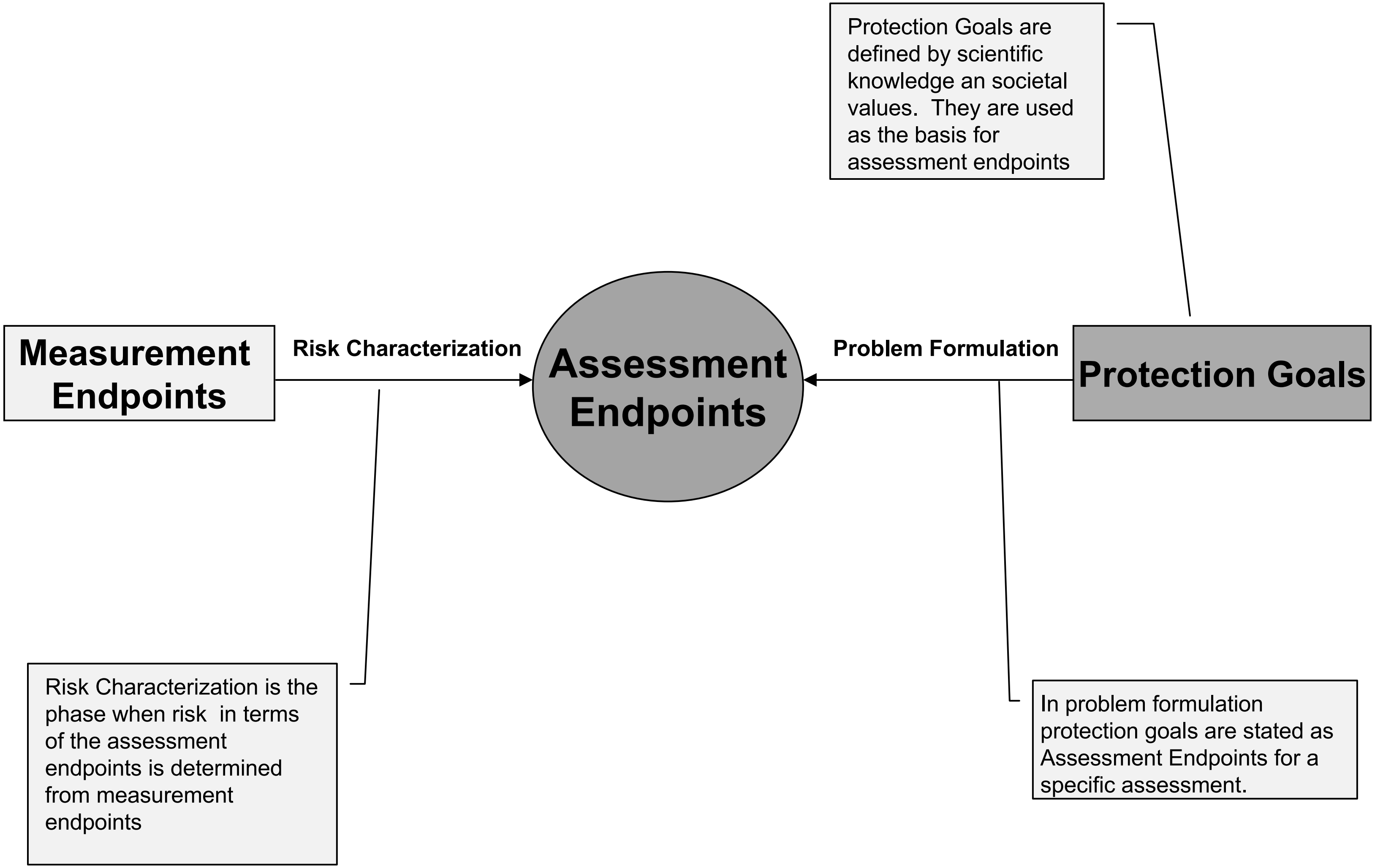
- Assessment endpoints are "explicit expressions of the actual environmental value that is to be protected" (US EPA,1998).
- Assessment endpoints are normally identified during the problem formulation, during which, the problem is defined, the information available is identified, and the appropriate assessment endpoints are stated.
- Assessment endpoints provide the link between the broader protection goals/policies which are often enshrined in law and specific measurement endpoints.

Assessment Endpoints

- Assessment endpoints are comprised of two components:
  - a valued ecological **entity**
  - an **attribute** of that entity that is important to protect or that is representative of an important process.

- Assessment endpoints can be :
  - general (e.g., bird reproduction)
  - more specific (e.g., red-winged blackbird nesting success)

- Assessment endpoints must be:
  - relevant to the ecosystem they represent
  - susceptible to the stressors of concern (Environment Canada, 1997; US EPA, 1998).


Protection Goals are defined by scientific knowledge an societal values. They are used as the basis for assessment endpoints
Measurement Endpoints
Risk Characterization
Assessment Endpoints
Problem Formulation
Protection Goals
Risk Characterization is the phase when risk in terms of the assessment endpoints is determined from measurement endpoints
In problem formulation protection goals are stated as Assessment Endpoints for a specific assessment.

Protection Goals

- For Pesticide Risk Assessments protection goals not explicitly stated – they are inherent in the assessment as represented by the data requirements
- no formal problem formulation is done for each assessment
  - Basic question is the same for all assessments –will use of this product cause harm to the environment in Canada?
  - For both new products and re-evaluation formal data requirements for fate and toxicity have been set based on different types of use.

Challenges

- Currently, assessment endpoints are either not defined or are vague
- Not clear what we are trying to protect – individuals, populations, communities, ecosystems?
- Current assessment methods do not allow for the estimation of “risk” (ie. magnitude of effect and probability of occurrence) – they identify which groups might be at risk
- New methods will allow estimation of risk

Challenges

- Current methods need to be updated to reflect new knowledge
- However – important that we examine what we need to protect before updating assessment methods
- Need to translate protection goals into assessment endpoints to ensure we are estimating the hazard and risk appropriately to allow risk management decisions which will achieve protection goals

Criteria for Assessment Endpoints

Criteria	Explanation
Ecological relevance	System-level consequences would be expected if the assessment endpoint was significantly impacted.
Susceptibility	Entities & attributes that are highly exposed and responsive to this exposure are preferable.
Appropriate scale	The assessment endpoint must have a scale appropriate to the site being assessed, for both temporal and spatial scales.
Operationally definable	Able to clearly state what must be measured and modelled to examine response of the assessment endpoint.

Workshop Setup

Participants were divided into groups organised by taxonomy

- plants
- terrestrial invertebrates
- aquatic invertebrates
- fish
- amphibians
- birds
- mammals

- Participant discussions were from a scientific perspective and based on current knowledge regarding ecosystem function and sustainability.
- Discussions focussed on identifying and characterizing appropriate and meaningful assessment endpoints for environmental protection.

Discussion Session A – Results
Generic Ecological Assessment Endpoints (GEAE's)
Entities

Taxonomic Group	Primary Entity	Secondary Entities
Plants	Community	Populations
Aquatic Invertebrates	Community	Populations, Individuals
Terrestrial Invertebrates	Functional Group	Individuals, Populations, Ecosystem
Fish	Population	Individuals, Community
Amphibians & Reptiles	Population	Individuals
Birds	Population	Individuals, Community
Mammals	Population	Individuals, Community

Discussion Session A Results

- The lowest level of biological organization identified:
  - primary entity - population
  - endangered species - individual
  - keystone species - individual
- The size of the organism affected the choice of primary entity. For smaller organisms the primary entity of concern tends to be at the community level.
- As the size of the organism increases the primary entity of concern shifts to population.
- Groups which identified communities as the primary entity are all very diverse compared to the other four taxonomic groups and all play key roles in providing necessary ecosystem services, (e.g. primary production, nutrient recycling, as sources of food for other organisms, and in the case of plants provide habitat for other organisms).

Discussion Session A Results

- For larger organisms, populations often exist in a spatial context which is larger than a field scale level, thus, the potential for exposing an entire community is decreased.
- For these larger organisms, populations/communities appear to be more of a concern where large scale applications (e.g. on crops such as wheat) are occurring.
- Many of the groups identified habitat as a relevant entity, with attributes of condition, quantity and quality, or its presence/absence. In this case effects on the identified entity and attributes are of concern because of the potential for indirect effects on the group being considered
- For each of the identified entities similar attributes were identified in all the taxonomic groups.
- This reflects that all populations share some basic attributes, (growth, survival and reproduction of individuals) as do communities (diversity, species richness, relative abundance of different species).

Disscussion Session A
Generic Attributes

Entity	Common Attributes Identified
Organism (Individual)	kills/conspicuous mortality behaviour
Population	Survival, reproductive competence/success Abundance, extirpation production
Community	species richness, diversity assemblage/composition structure & function
Habitat	Condition, presence/absence of quantity/quality

Discussion Session B
Biological and Ecological Factors to Consider when Refining Generic Assessment Endpoints

- There was general agreement that regardless of the specific entity chosen, the list of relevant attributes remains the same.
- Factors identified by the various taxonomic groups help define the relevant entity - e.g.
  - for populations they can help identify species or genera
  - for communities they help define the type of community (eg. pelagic fish vs benthic fish)
- A broad range of factors were identified to refine the assessment endpoints. These can be categorized into several major themes:

Discussion Session B
Biological and Ecological Factors to Consider when Refining Generic Assessment Endpoints

- In addition to the bio/eco factors the choice of relevant assessment endpoints (entities and attributes) is dependent on a number of other factors:
  - physical/chemical properties of the pesticide
  - nature of the toxicity (acute vs chronic vs reproductive)
  - the use pattern of the pesticide which includes the number, timing and frequency of application(s), methods of applications, geographic areas of application, types of ecosystems to be treated, and potential scale of application.

General Conclusions & Key Messages

- Each taxonomic group agreed on a set of science based generic assessment endpoints
- The results will ultimately provide guidance for future discussions on approaches to risk assessment, risk assessment methods and the role of societal values in identifying environmental protection goals.
- There was general consensus that there is a need to examine the issue of societal values and how they affect protection goals and relevant assessment endpoints.
- Participants identified the need to examine the current data requirements to ensure that the measurement endpoints are appropriate to address the assessment endpoints identified in this workshop.

General Conclusions & Key Messages

- The choice of assessment endpoints for a specific product will depend on the toxicity and fate properties of the pest control product in question.

- It maybe necessary to have different levels or tiers of assessment endpoints as an assessment moves from a screening level through to higher levels with more sophistication.

Next Steps

- Examine societal values for environmental protection and factor results into choice of assessment endpoints.
- Examine available data and risk assessment methods for their suitability linking measurement endpoints to assessment endpoints.
- Publish Results

Raptor and waterfowl exposure to pesticides in agricultural ecosystems of southwestern BC.

Presented by Laurie Wilson, Sandi Lee, John Elliott, Canadian Wildlife Services, Environment Canada

Abstract

Potatoes and other root crops are among the most important economic crops in the Lower Mainland. The principle potato pest is the wireworm, whose numbers are currently increasing. The BC Wireworm Task Force is a multi-stakeholder group responsible for developing and evaluating alternative pest control strategies for wireworms. The most effective method to control wireworms is the use of the granular organophosphate pesticides, most of which have caused secondary poisoning of raptors in previous years and are therefore no longer available. This year, the Task Force has requested emergency registration of chlorpyrifos (Pyrifos 15G, Pyrinex 480EC). It will be the only effective chemical method available to local growers for controlling wireworm. Reported sales of chlorpyrifos in the Lower Mainland have doubled in the past 3 years (4,189 kg chlorpyrifos, all formulations in 1999; 8,172 kg Lorsban 15G in 2002).

South coastal BC supports high densities of wintering raptors. Each year during late fall and early winter, local wildlife rehabilitation centres receive an influx of sick and dead raptors, primarily bald eagles. We have monitored the causes of injury and mortality of these raptors and have documented that secondary poisoning, through ingestion of pesticide-poisoned prey animals, is an important cause of death (Elliott et al., 1996, 1997; Wilson et al. 2002). Since 1989, at least 96 raptors were poisoned by anticholinesterase pesticides. Seven insecticides (carbofuran, fensulfothion, phorate, fonofos, terbufos, parathion, fenthion) have been implicated in raptor poisonings, resulting in the withdrawal of two compounds (carbofuran, phorate) from the local market and discontinuation of two chemicals (fensulfothion, fonofos). This winter the monitoring program will continue, focusing on the potential impact of the increased use of chlorpyrifos.

We will also investigate the proportion of waterfowl mortalities on agricultural fields treated with granular chlorpyrifos which are attributable to pesticides. Agricultural fields not treated with insecticides and fields where granular and liquid chlorpyrifos was applied the previous spring will be surveyed for wildlife mortalities from November through December 2003.

Results from these studies will be used to develop guidelines to incorporate wildlife toxicity concerns in pesticide use decisions such as site-specific integrated pest management programs.

<u>References:</u>

Elliott, J.E., Langelier, K.M., Mineau, P. and Wilson, L.K. 1996. Poisoning of bald eagles and red-tailed hawks by carbofuran and fensulfothion in the Fraser Delta of British Columbia, Canada. *Journal of Wildlife Diseases* 32(3):486-491.

Elliott, J.E., Wilson, L.K., Langelier, K.M., Mineau, P. and Sinclair, P.H. 1996. Secondary poisoning of birds of prey by the organophosphorus insecticide, phorate. *Ecotoxicology* 6:219-231.

Wilson, L.K., Elliott, J.E., R.S. Vernon, B.D. Smith, S.Y. Szeto. 2002. Persistence and retention of active ingredients in four granular cholinesterase-inhibiting insecticides in agricultural soils of the lower Fraser River Valley, British Columbia, Canada, with implications for wildlife poisoning. *Environ. Toxicol. Chem.* 21(2):260-268.

Raptor & waterfowl exposure to pesticides in agricultural ecosystems of southwestern BC

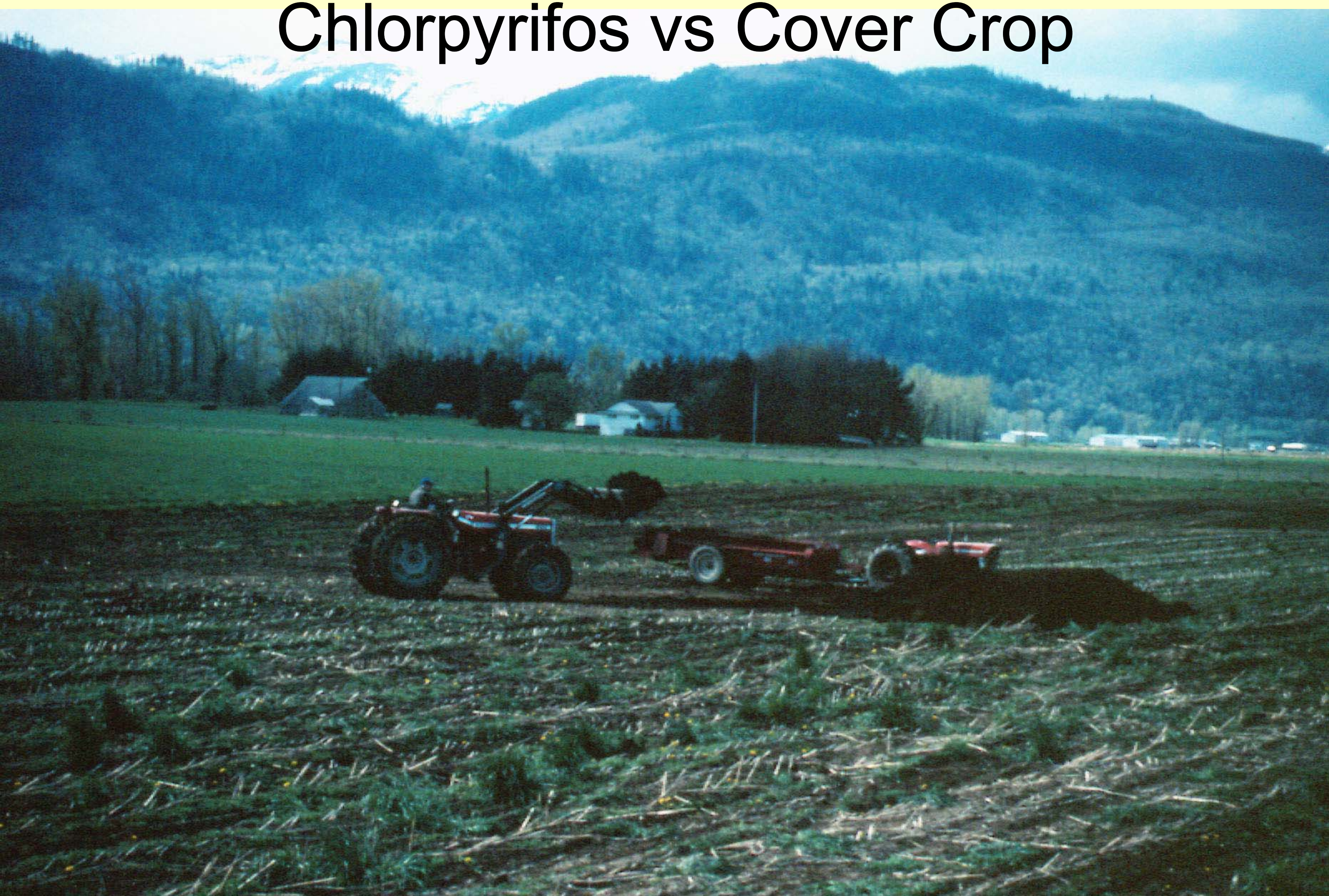
Laurie Wilson, Sandi Lee, John Elliott

Canadian Wildlife Service

Delta, British Columbia

Wireworm

Chlorpyrifos vs Cover Crop



Pesticide Science Fund – Objectives

1. Monitor incidence of secondary poisoning of raptors by currently used agricultural pesticides (OP/Carbamates).
2. Determine the proportion of waterfowl mortalities on agricultural fields treated with chlorpyrifos which are attributable to pesticides.

Raptors collected 2002-03 (N=183)

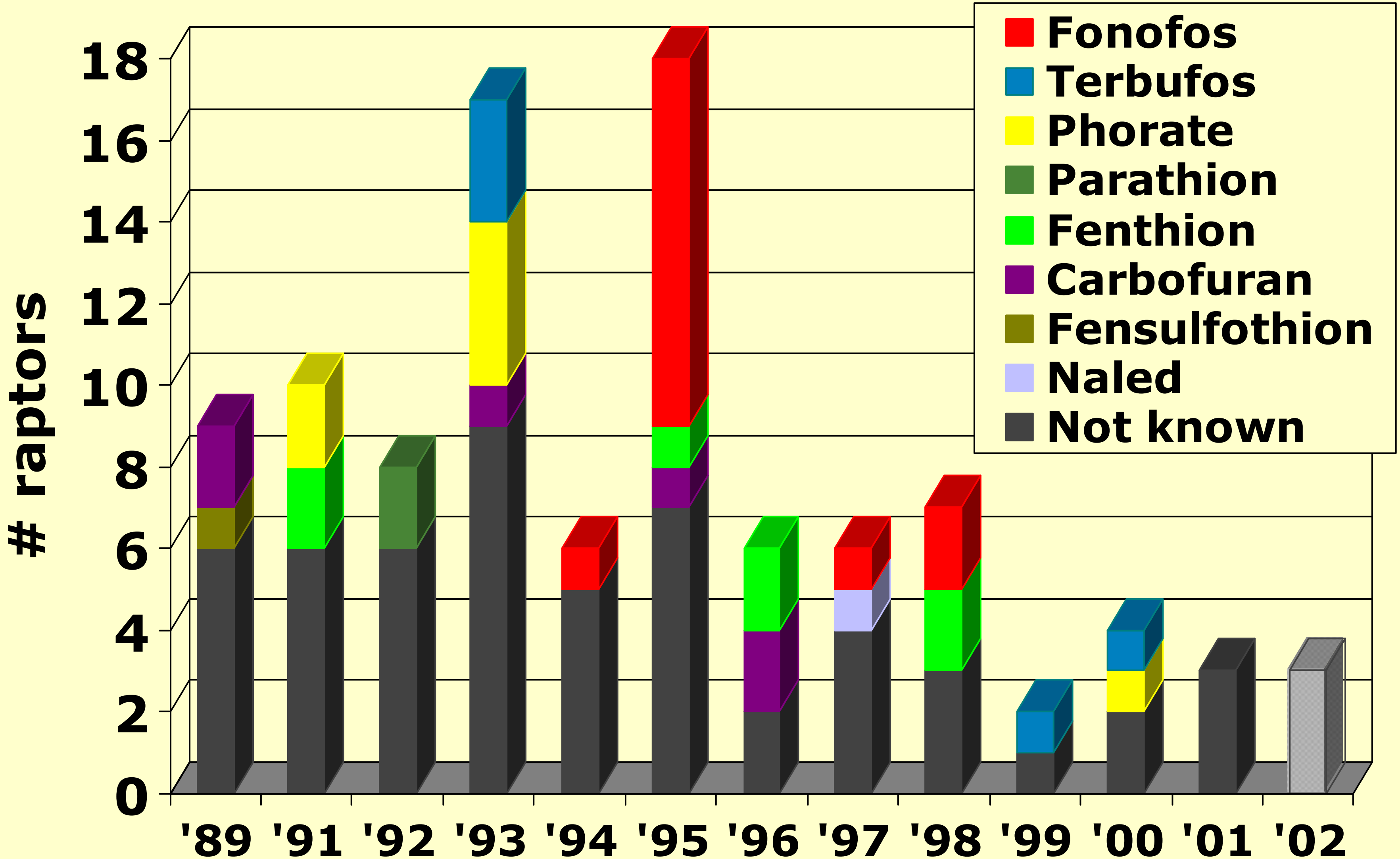
	V.Island	L.M.	Other	Total
BAEA	17	11	10	38
RTHA	4	23	4	31
GHOW	-	8	7	15
BNOW	-	65	-	65
Accipiters	2	19	-	21
TRUS	4	-	-	4
Other	1	2	6	9
	28	128	27	183

Strongly suspected raptor poisonings, BC, 2002-2003 (n=5)

Species	Location	Date	Pesticide Suspected	TBA
BAEA	Delta	12-Feb-00	Anti-ChE	brainChE, crop
BAEA	Delta	3-Apr-03	Anti-ChE	brainChE, stomach
BAEA	Delta	24-Apr-03	Anti-ChE	plasmaChE, pellet
BAOW	W.Vancouver	14-May-03	Rodenticide	liver
BAOW	W.Vancouver	26-May-03	Rodenticide	liver

Additional "Possible" suspects (n=11):
-Pesticides – 5 BAEA, 1 GHOW, 1 COHA
-Rodenticides – 2 BNOW
-Lead – 2 BAEA

Raptor pesticide poisoning British Columbia, 1989-2001 (N=96)



Brodifacoum residues in Raptor livers, 1999-2001

	BNOW Lower Mainland, BC	GHOW Southern Ontario	RTHA Southern Ontario
N	32	35	38
% detected	37.5%	51%	37%
range (ppm)	0.003 - 0.47	0.005 - 0.25	

** No individuals diagnosed as rodenticide-poisoned, nor had excessive bleeding **

Wildlife Kill Network Responses, 2003

Diazinon (1) 6 wigeon, Osoyoos, April-03

(2) 18 wigeon, North Van, Nov-03

Nephrosis (medicated feed?) – 12+ starlings, Aldergrove, Mar-03

By-catch – 67 seabirds, B.Bay, Aug-03

Cardiac defect – 1 swan (cynget), N.Van, May-03

Caustic burns – 2 barn owls, Ladner, Jul-03

Undetermined (1) 24 mallards, Chilliwack, Feb-03

(2) 20 pigeon, Surrey, July-03

Runoff and leaching potential of bromacil and diuron along railroad of ROW in the Lower Fraser Valley, B.C. - project update

Presented by J. Kuo, M. T. Wan and J. Pasternak, Commercial Chemicals Division, Environmental Protection Branch, Environment Canada

Abstract

Bromacil and diuron are active ingredients of the herbicide Krovar I DF™ marketed by Du Pont Canada Inc. Currently, this product is registered for use in Canada under the *Pest Control Products Act* for the control of many annual and perennial weeds. In British Columbia, Krovar I DF™ is used for general weed control along railroad rights of way (ROW).

Bromacil and diuron are absorbed mainly through the roots with slight absorption through the leaves and stems. Their long residual activity in soil (>=6 months) may result in potential impacts for nontarget plants. Bromacil is highly soluble in water and highly persistent in soil (>=2 years). It can leach through soil and enter groundwater. The high leaching potential of bromacil has raised concerns that it may be contaminating ground water in the Lower Fraser Valley area of British Columbia.

British Columbia is located in a temperate climate zone with railroad tracks crossing fish-bearing, rearing, and habitat rivers, streams, and lakes throughout the province. In the Lower Fraser Valley, heavy rainfall during the fall and winter months causes major concerns over the environmental impact of bromacil use in the shallow groundwater and fishery sensitive areas. Presently, under the B.C. provincial permitting system, a 10-metre Pesticide Free Zone must be maintained along all water bodies in order to protect these sensitive areas.

This project was designed to determine the leaching and run-off potential of bromacil in the Lower Fraser Valley and to make recommendations to the BC Ministry of Water, Land and Air Protection and the Pest Management Regulatory Agency of Health Canada on the use of bromacil in these areas. In May, 2002, Krovar I DF™ was sprayed at two Southern Rail of B.C.'s ROWs: 272 St. Crossing in Fort Langley and Fadden Rd. Crossing in Abbotsford, B.C. Sampling was completed in May, 2003. The run-off and leaching data will be compiled and the conclusions of this study will be published in 2004.

Runoff and leaching potential of bromacil and diuron along railroad of ROW in the Lower Fraser Valley, B.C. - project update

J. Kuo, M. T. Wan & J. Pasternak

2003 EC PYR Pesticide Information Exchange

November 27, 2003

Contents -

Acknowledgement -

- Georgia Basin Ecosystem Initiative
- Commercial Chemicals Division, EPB
- B.C. Ministry of Water, Land and Air Protection
- Southern Railway of B.C.
- B.C. Hydro

Introduction -

Krovar I DF

- a herbicide containing active ingredients, bromacil & diuron
- registered for weed control on non-crop land areas in Canada
- used for general weed control along railroad ROW
- B.C. permit condition: maintenance of a 10 m PFZ along all streams

… introduction -

Bromacil

- mainly absorbed via roots with slight absorption via leaves and stems
- high leaching potential
- moderately to highly mobil in soil
- highly persistent in soil: >= 2 years
- slightly toxic to rainbow trout: 75 ppm (48h-LC_{50})
- long residual activity: >= 6 months

… introduction -

Diuron

- mainly absorbed via roots
- moderately toxic to rainbow trout: 5 ppm (96h-LC_{50})
- long residual activity: 4-8 months
- DT_{50} in soil: 3-6 months

Objective -

- To determine leaching potential of bromacil in the Fraser Valley
- To determine run off potential of bromacil in the Fraser Valley
- To make recommendations to the BCMWLAP and PMRA, Health Canada on its use in the Lower Fraser Valley

Description -

- location: along SRBC railway in Abbotsford and Fort Langley of B.C.
- run off: Abbotsford and Fort Langley
  leaching: Fort Langley
- application date: May 15, 2002
- soil property: loamy soil; pH of 5.4; moisture content of 27.5%
- samples taken:
  - 1 day before the spray
  - same day after the spray
  - 1 day, 1, 8, 9, 21, 27, 35 and 43 weeks after the spray

Sampling sites in th

272 St. Crossing in Fort Langley

A Border

Fadden Rd. Crossing in Abbotsford

Sampling sites in the Fraser Valley

Canada/USA Border

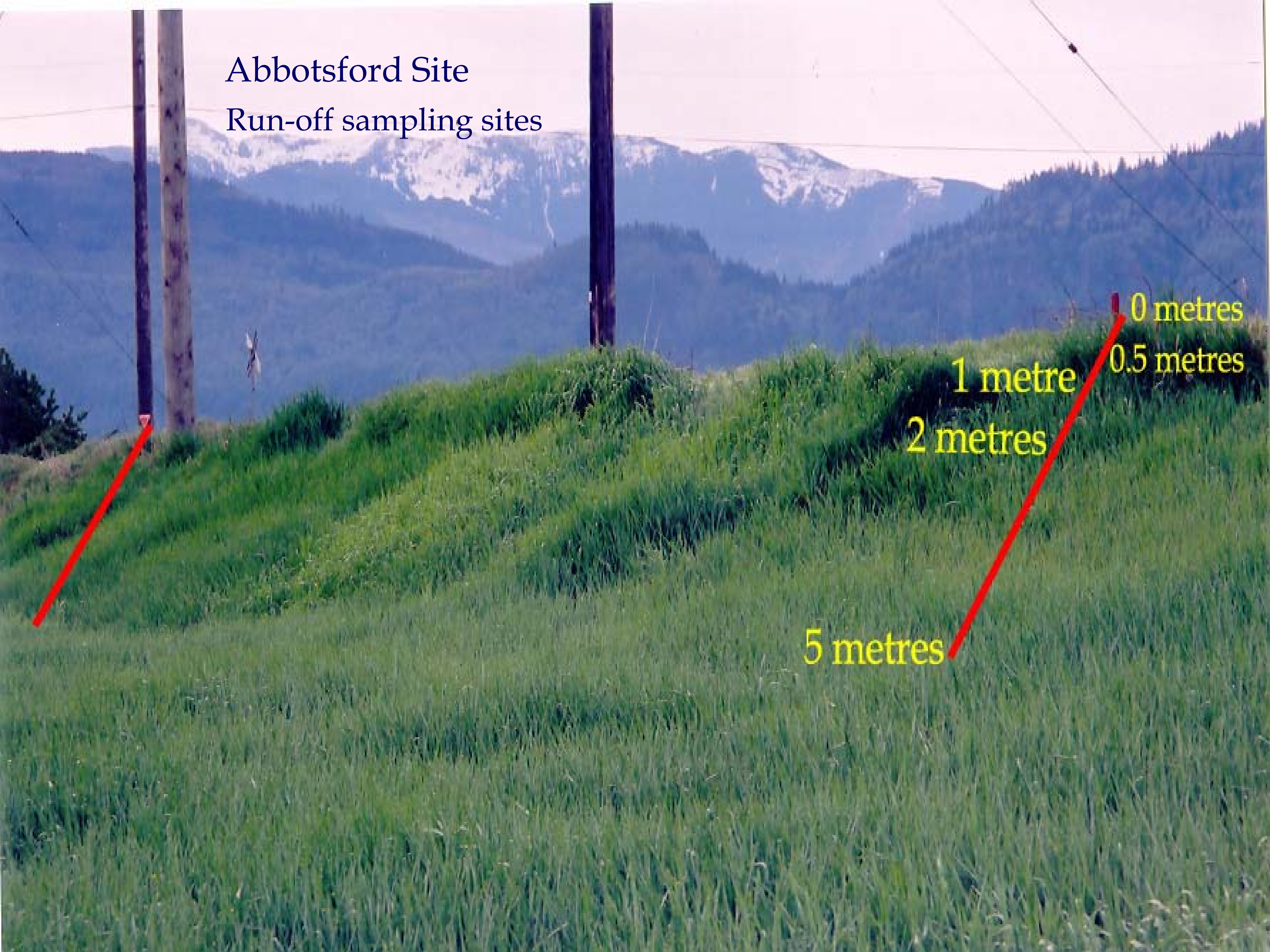
Fadden Rd. Crossing
in Abotsford

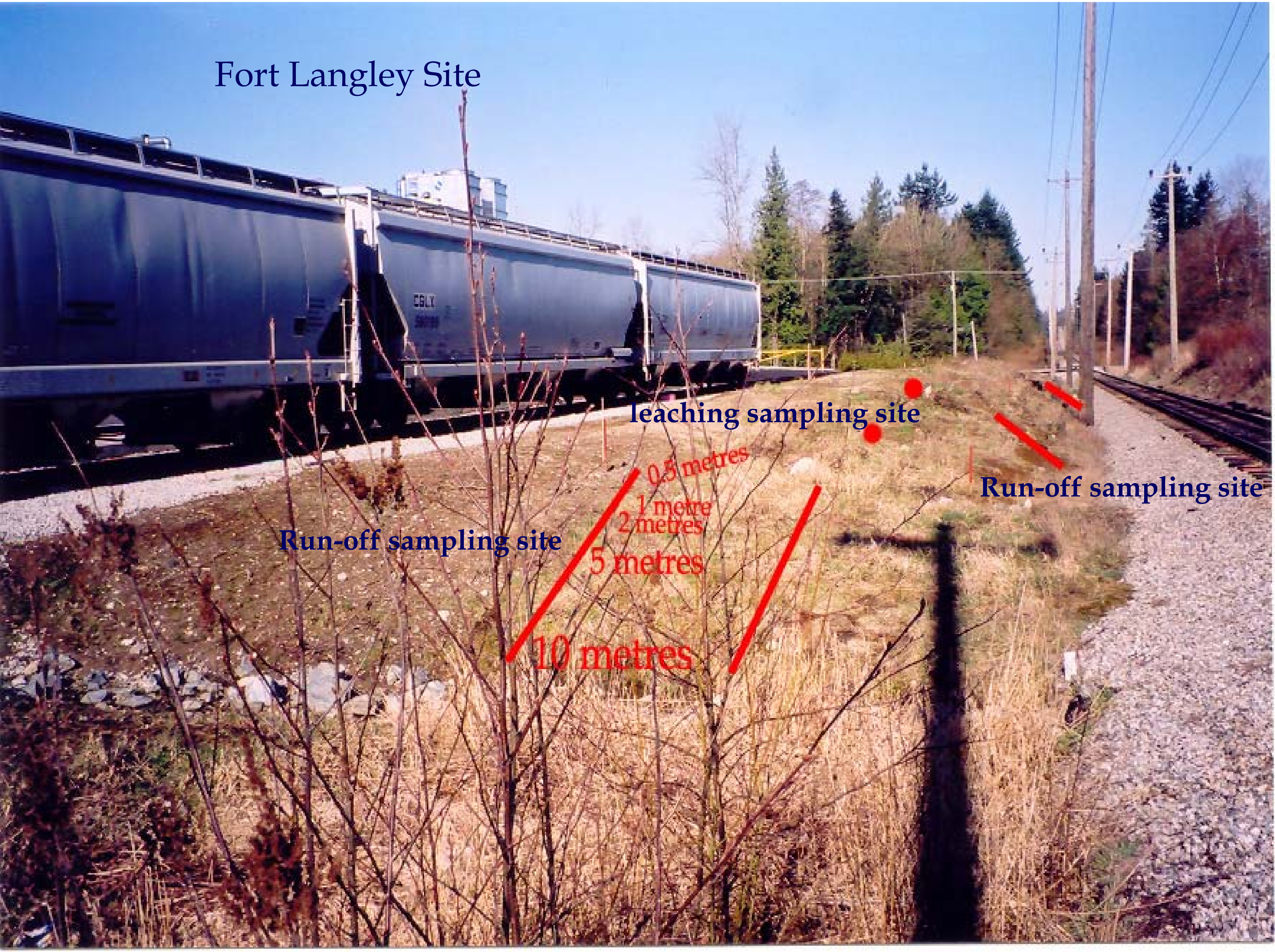
Sampling sites in the Fraser Valley

272 St. Crossing in Fort Langley

Canada/USA Border

NOTICE
PUP # 344-015-01/03
FOR Additional information
call: 604-527-6307 Engineering
SPRAYING OF THE HERBICIDE
FOR WEED CONTROL
WILL TAKE PLACE ON
May 14-17/02
SOUTHERN
RAILWAY


Abbotsford Site
Run-off sampling sites
0 metres
0.5 metres
1 metre
2 metres
5 metres


Fort Langley Site
leaching sampling site
0.5 metres
1 metre
2 metres
5 metres
10 metres
Run-off sampling site
Run-off sampling site