

Current Legislative Framework for Wastewater Biosolids

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Outline

- Current context for biosolids management in Alberta
- Guidelines for land application – benefits and risks
- CCME Canada-wide approach for biosolids management
- Future directions for biosolids management in Alberta

Context for Biosolids Management

- Beneficial use
 - *Industrial Release Limits Policy*
 - *Too Good to Waste*
- Biosolids are a potential source of nutrients, organic matter and energy
- Biosolids have risks related to:
 - pathogens
 - heavy metals and other contaminants
 - excessive nutrient loading and nutrient imbalances
- With proper management biosolids risks can be minimized and biosolids can be used as a beneficial soil amendment and for energy recovery

Biosolids Management in Alberta

- Biosolids are regulated to allow beneficial reuse through proper management
- Current beneficial use option is agricultural land application as regulated by:

Guidelines for the Application of Municipal Wastewater Sludges to Agricultural Lands

- Through provincial and CCME initiatives, additional options may be allowed in future

Potential Benefits

- Biosolids are a source of plant nutrients
 - reduce the need for fertilizer
 - typically a low cost option compared to fertilizer
- Biosolids typically contain about 40% organic matter – dry weight basis
 - organic matter improves soil structure and increases its water and nutrient holding capacity
 - organic matter contains energy that can be captured through anaerobic digestion and methane recovery, incineration (?), etc.

Potential Risks

- Biosolids carry potential risks:
 - heavy metals
 - odour
 - excessive nutrient loading
 - nutrient imbalance (high phosphorus to nitrogen ratio)
 - pathogens
 - other contaminants such as pharmaceuticals, personal care products

Managing Benefits and Risks

- Heavy metals
 - land application rates are based on nitrogen requirements with limits for heavy metals
 - limits ensure that when biosolids are used at agronomic rates, heavy metals won't build up to toxic concentrations
 - sewer use bylaws are another tool that has improved biosolids quality

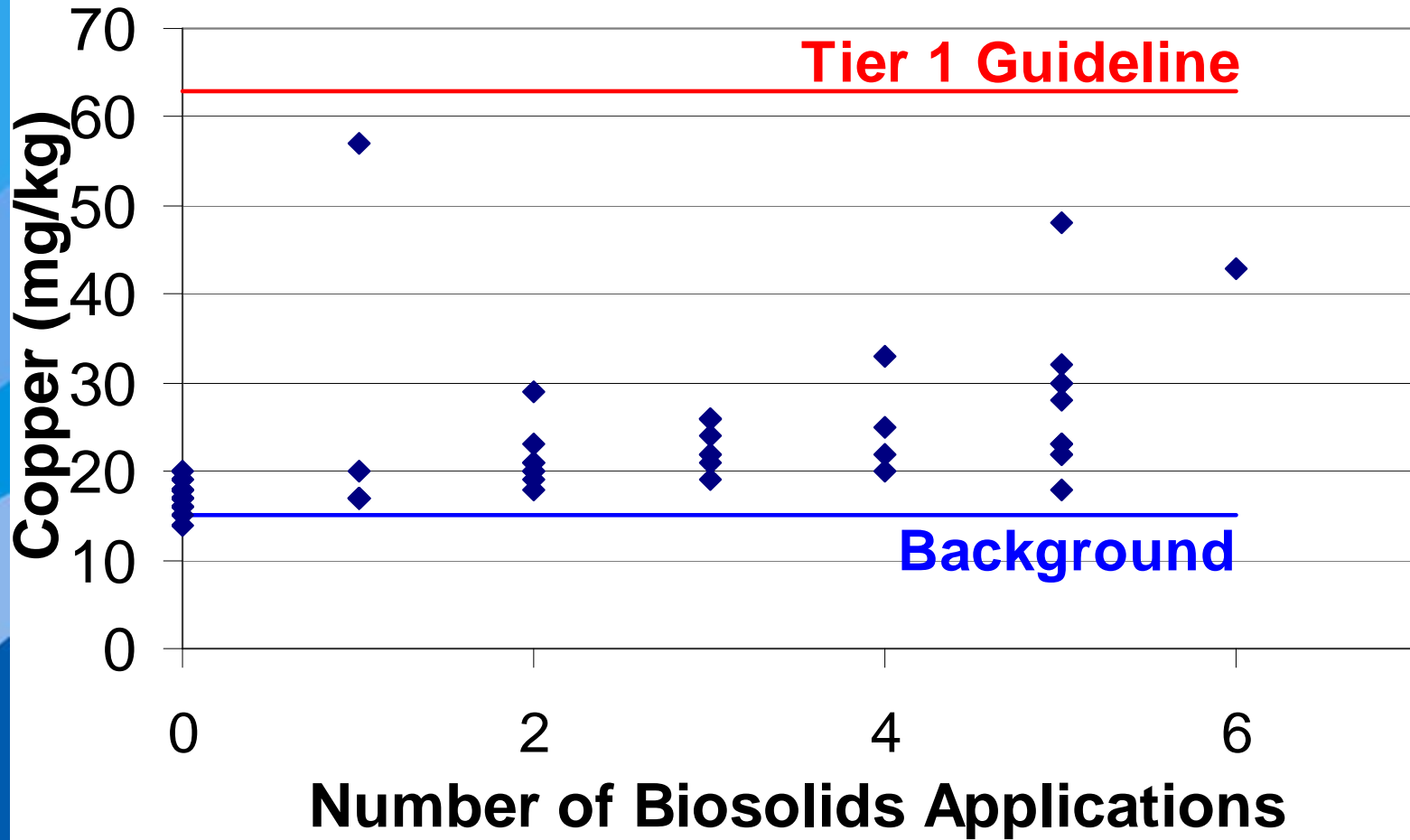
Managing Benefits and Risks - Metals

Metal	Concentration (mg/kg total solids dw)			% Reduction (Current vs. 1981)
	1981 ^a	1995 ^a	Current (2009) Median (of detects)	
Cadmium	35	6.3	1.1	96.9%
Chromium	1040	319	20.3	98.0%
Copper	870	638	271	68.9%
Lead	545	124	24.7	95.5%
Mercury	NA	3.5	0.68	80.9% ^b
Molybdenum	NA	22	3.5	84.1% ^b
Nickel	160	38	10.5	93.4%
Zinc	1390	823	331	76.2%

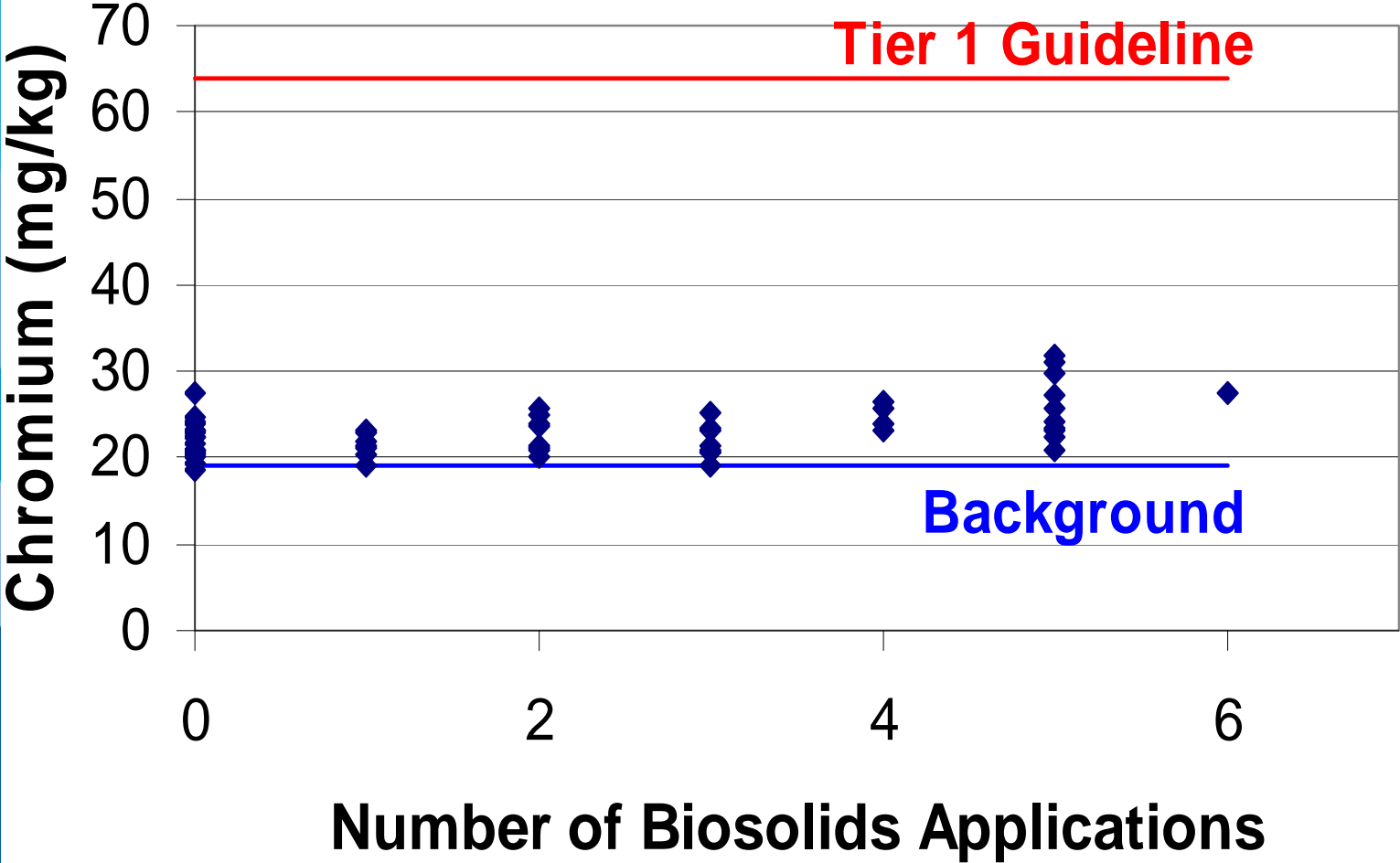
^a from WEAO 2001 report;

^b reduction based on current vs. 1995 data

Copper Concentration in Soil



Chromium Concentration in Soil



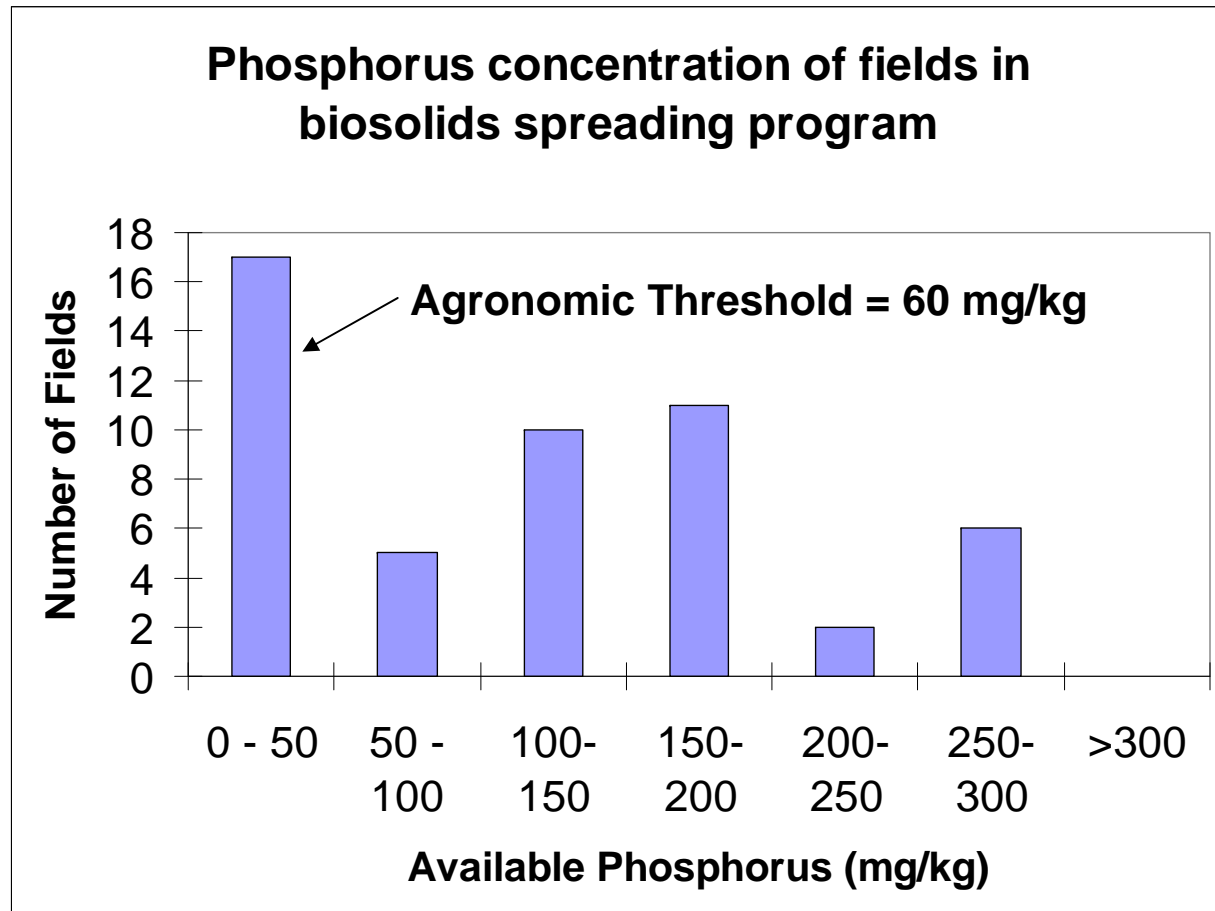
Managing Benefits and Risks - Nutrients

- Nitrogen applied at rates that exceed crop requirements can reduce crop yield and leach below the root zone
 - lodging and delayed crop maturity
 - potential negative impacts to groundwater quality

	kg/tonne dry weight
Total Kjeldahl nitrogen	57
Ammonium - nitrogen	9
Total phosphorus	22

Managing Benefits and Risks - Nutrients

- Repeat applications lead to phosphorus buildup in soil
 - potential negative impacts to surface water quality



Managing Benefits and Risks - Pathogens

- Current pathogen and odour management requirements based on:
 - incorporation of sludges and biosolids into soil and restrictions for food and forage crops
 - Setback requirements for water wells, residences, etc.
 - loading rates based on degree of treatment
- Treatment of sewage sludge to produce biosolids minimizes pathogens and odour
- Future guidelines will incorporate pathogen limits

Emerging Substances of Concern

- Organic contaminants from medicines, household products, personal care products, food, etc.

Compound	Occurrence (%)	Median conc'n (ng/g TS)	Compound	Occurrence (%)	Median conc'n (ng/g TS)
HHCB	100	3470	Fluoxetine	84	53.9
Triclocarban	100	1930	Naproxen	81	98.1
AHTN	100	1340	Clarithromycin	74	41.8
Miconazole	100	441	Thiabendazole	74	17.9
Diphenhydramine	100	420	Erythromycin-H ₂ O	74	12.5
Carbamazepine	100	66.6	DPMI	73	82.5
Triclosan	97	6085	Ibuprofen	68	522
ATII	96	255	Diltiazem	68	29.8
Ciprofloxacin	94	3610	AHDI	64	158
Ofloxacin	87	276	Caffeine	61	266
Bisphenol A	86	325	Norfloxacin	58	558
Azithromycin	84	205	Gemfibrozil	52	56

Managing Benefits and Risks – Emerging Substances of Concern

- Emerging substances of concern are not covered by the guidelines
 - significance of pharmaceuticals, personal care products, etc. is still uncertain
 - many research programs in Canada and elsewhere are working to understand their environmental effects
- Field studies consistently show positive crop responses to biosolids when applied at agronomic rates

CCME Biosolids Task Group

- The Canadian Council of Ministers of the Environment (CCME) is developing a Canada-wide approach for managing biosolids
- CCME Biosolids Task Group has completed:
 - an inventory of contaminants and assessment of the removal efficiency of different treatment processes
 - a calculator for greenhouse gas emissions from various disposal options
 - a summary of regulations across Canada
- Currently under development:
 - a beneficial use policy
 - guidelines for beneficial use
 - communications package

CCME Beneficial Use Policy (*draft*)

- CCME promotes the “beneficial use” of the nutrients, organic matter and energy contained within municipal wastewater biosolids, sewage sludge and treated septage, rather than wasting these valuable resources.
- A beneficial use must:
 - demonstrate product efficacy
 - minimize potential risks to the environment and human health
 - minimize emissions of greenhouse gases

CCME Beneficial Use Policy (*draft*) *Cont'd*

- Beneficial use includes :
 - land application of biosolids to grow vegetation when it is done according to current regulations.
 - anaerobic digestion of sludge, where methane and digestate are recovered to generate energy. This energy is considered “carbon neutral”.
- Beneficial use does not include:
 - landfilling, even if gas is collected and used for energy.
 - incineration of municipal wastewater biosolids that does not result in a positive energy balance or that emits significant amounts of nitrous oxides (greenhouse gases).

CCME Biosolids Management Guidelines

- CCME guidelines will identify factors that should be addressed in Provincial guidelines
 - covers land application and combustion
- Land application factors will include
 - land management objectives (agriculture, forestry, reclamation, horticulture)
 - nutrient management
 - contaminants
 - pathogens
 - site and landscape factors
 - transportation
 - stockpiling

Future Directions for Alberta

- CCME initiative may lead to revised Alberta land application guidelines
 - review agronomic basis for N and P application rates
 - harmonize metal loading with Alberta Tier 1 guidelines
 - establish pathogen limits
 - biosolids management plans?

Future Directions for Alberta

- Guidelines may be expanded to allow beneficial use as a soil amendment under non-agricultural uses
- Regulatory and management requirements will be different than traditional agricultural uses
 - reclamation on specified land must meet Alberta Environment and Water criteria for equivalent land capability
 - e.g. Mines, gravel pits, wellsites. borrow pits
 - Sustainable Resource Development will be involved on public lands
 - forest plantations have longer rotations and different nutrient demands
 - e.g, Poplar plantations, biomass production

Summary

- Alberta supports a beneficial use policy for biosolids management
- Current guidelines allow agricultural land application as a soil amendment
- CCME Biosolids Task Group is developing a Canada-wide approach for biosolids management
- Alberta may revise guidelines to better align with this approach
- New guidelines would include limits for pathogens, revisions to loading limits for nutrients and metals and land application guidance for other land uses

Thank You & Questions

