



US Army Corps
of Engineers
Fort Worth District

Exposure Pathway Evaluation by Receptor Group

**Only realistic exposure route through ingestion*

Receptor	Pathway Elements*			Complete Pathway?
	Source	Medium	Exposure Point	
1. Public Water Supply Users	+	+	-	No
2. Users of Local Surface Water/Shallow GW	+	+	+	Yes
3. Commercial/Industrial Workers	+	+	-	No
4. Agricultural Workers	+	+	+	Yes
5. Recreational Users	+	+	+	Yes
6. NWIRP Vicinity Residents	+	+	+	Yes

Summary of Human Receptor Findings

No Exposure:

- Through public water supply
- Through consumption of beef

Potential Exposure:

- Through consumption of garden produce irrigated with stream water
- Through consumption of wild vegetation along streams
- Through consumption of fish caught in area
- Through ingestion of stream water while swimming





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Ecological Exposure

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Ecological Exposure

- Aquatic and terrestrial receptor groups were examined in both the laboratory and field
- Assessment Context
 - Perchlorate may adversely affect plants and animals
 - Potential transfer to human food chain



Ecological Receptor Groups: Plants

Plants near perchlorate-contaminated streams take up perchlorate

Aquatic Plants

- Perchlorate in aquatic plant species appears to exist in pseudo-equilibrium with perchlorate concentrations in the water
- Plant concentrations lag changes in water concentrations and represent a better indicator of long-term exposure than water

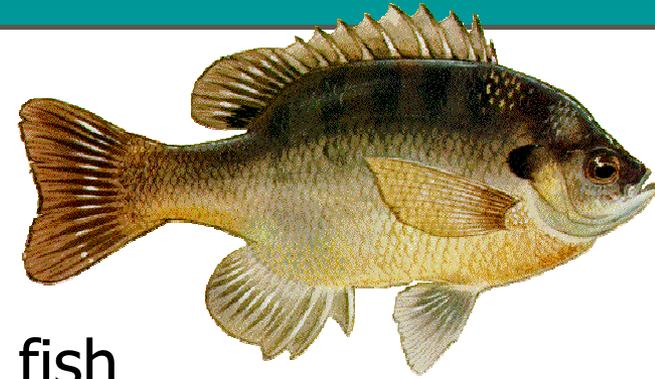
Terrestrial Plants

- Perchlorate concentrations in terrestrial plants were more variable than in aquatic plants
- Perchlorate can be released once plant leaves drop and decay



Ecological Receptor Groups: Aquatic Animals

Fish



- Perchlorate was detected sporadically in fish
 - Most of the perchlorate detections were in fish less than the legal catchable size
- When detected, perchlorate concentrations in fish were higher than those in water
- Fish collected from perchlorate-contaminated streams had alterations in thyroid histology
 - The relationship between changes in thyroid histology and population-level effects in fish is unclear



Exposure Receptor Groups: Aquatic Animals

Frogs

- Native frogs were affected by perchlorate
 - Increase thyroid follicle cell height but no colloid (area where thyroid hormones are stored) depletion
- Surface water from the study area did not affect thyroid function in frogs
- Perchlorate did not affect gonadal phenotype (sexual organs) in native and laboratory frogs
- Water from S Creek affected the ratio of male and female frogs
 - More females



Exposure Receptor Groups: Terrestrial Animals

Small Mammals and Birds



- Perchlorate was detected
 - Mice and songbirds near contaminated streams
 - Kidneys and livers
 - Perchlorate concentrations were high enough to alter thyroid histology and thyroid hormones
 - Ecological relevance is unclear
- No perchlorate in doves



Exposure Receptor Groups: Terrestrial Animals

Medium Mammals

- No perchlorate in raccoons or opossum trapped near contaminated streams
- No alterations in thyroid histology
- Thyroid hormone levels were normal



Exposure Receptor Groups: Terrestrial Animals

Large Mammals

- No perchlorate in blood from cattle drinking only perchlorate-contaminated water
- No perchlorate in edible tissues
- Thyroid hormones were normal

