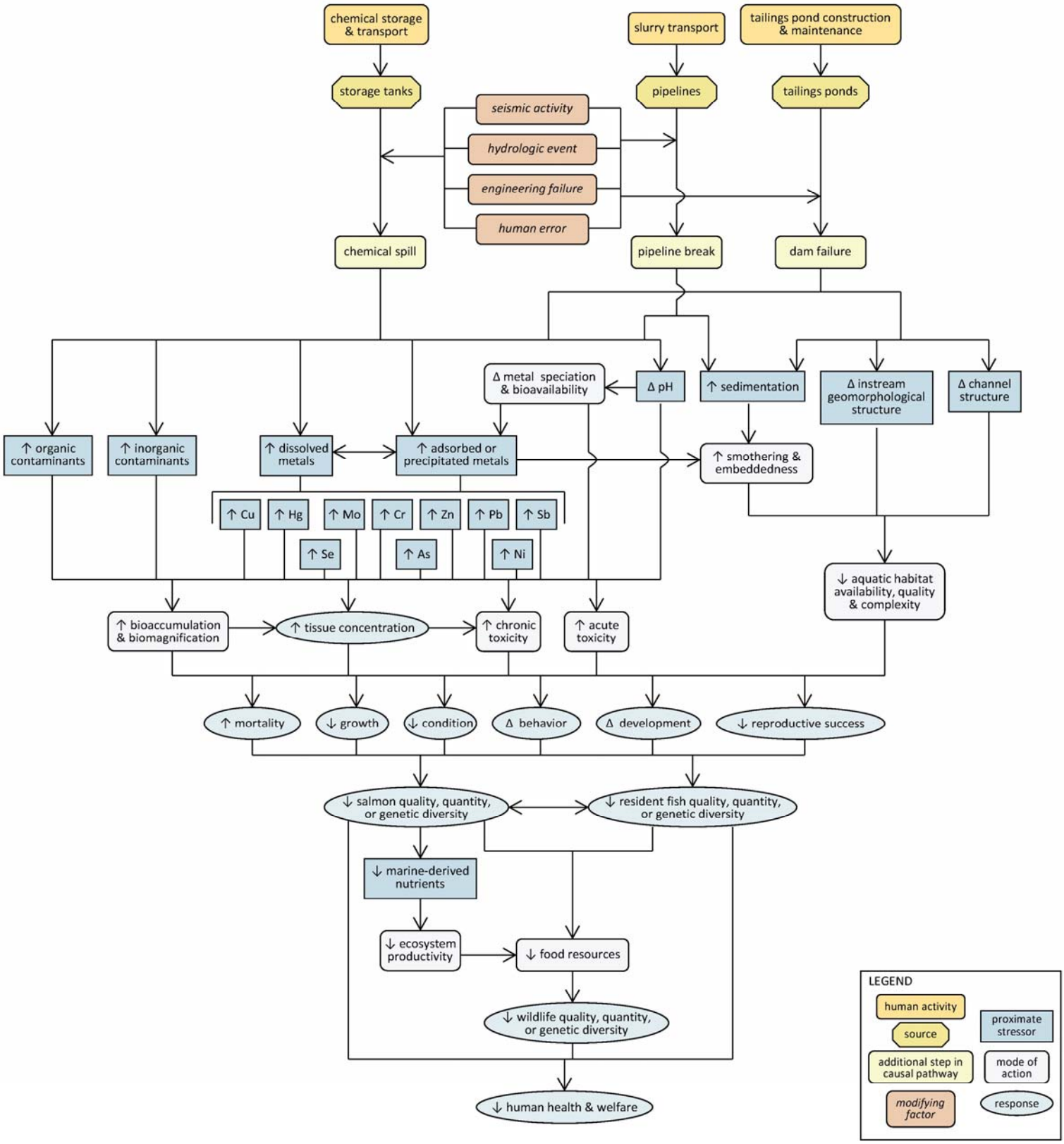
chemical storage & transport
slurry transport
tailings pond construction & maintenance
storage tanks
pipelines
tailings ponds
seismic activity
hydrologic event
engineering failure
human error
chemical spill
pipeline break
dam failure
Δ metal speciation & bioavailability
Δ pH
↑ sedimentation
Δ instream geomorphological structure
Δ channel structure
↑ organic contaminants
↑ inorganic contaminants
↑ dissolved metals
↑ adsorbed or precipitated metals
↑ smothering & embeddedness
↑ Cu
↑ Hg
↑ Mo
↑ Cr
↑ Zn
↑ Pb
↑ Sb
↑ Se
↑ As
↑ Ni
↓ aquatic habitat availability, quality & complexity
↑ bioaccumulation & biomagnification
↑ tissue concentration
↑ chronic toxicity
↑ acute toxicity
↑ mortality
↓ growth
↓ condition
Δ behavior
Δ development
↓ reproductive success
↓ salmon quality, quantity, or genetic diversity
↓ resident fish quality, quantity, or genetic diversity
↓ marine-derived nutrients
↓ ecosystem productivity
↓ food resources
↓ wildlife quality, quantity, or genetic diversity
↓ human health & welfare
LEGEND
human activity
source
proximate stressor
additional step in causal pathway
mode of action
modifying factor
response