

# Endangered Species Act Compliance for Dreissenid Mussel Response in the Columbia River Basin States

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ENDANGERED SPECIES ACT  
COMPLIANCE FOR DREISSENID  
MUSSEL RESPONSE IN THE  
COLUMBIA RIVER BASIN STATES

Produced for the US Fish and Wildlife Service and Pacific  
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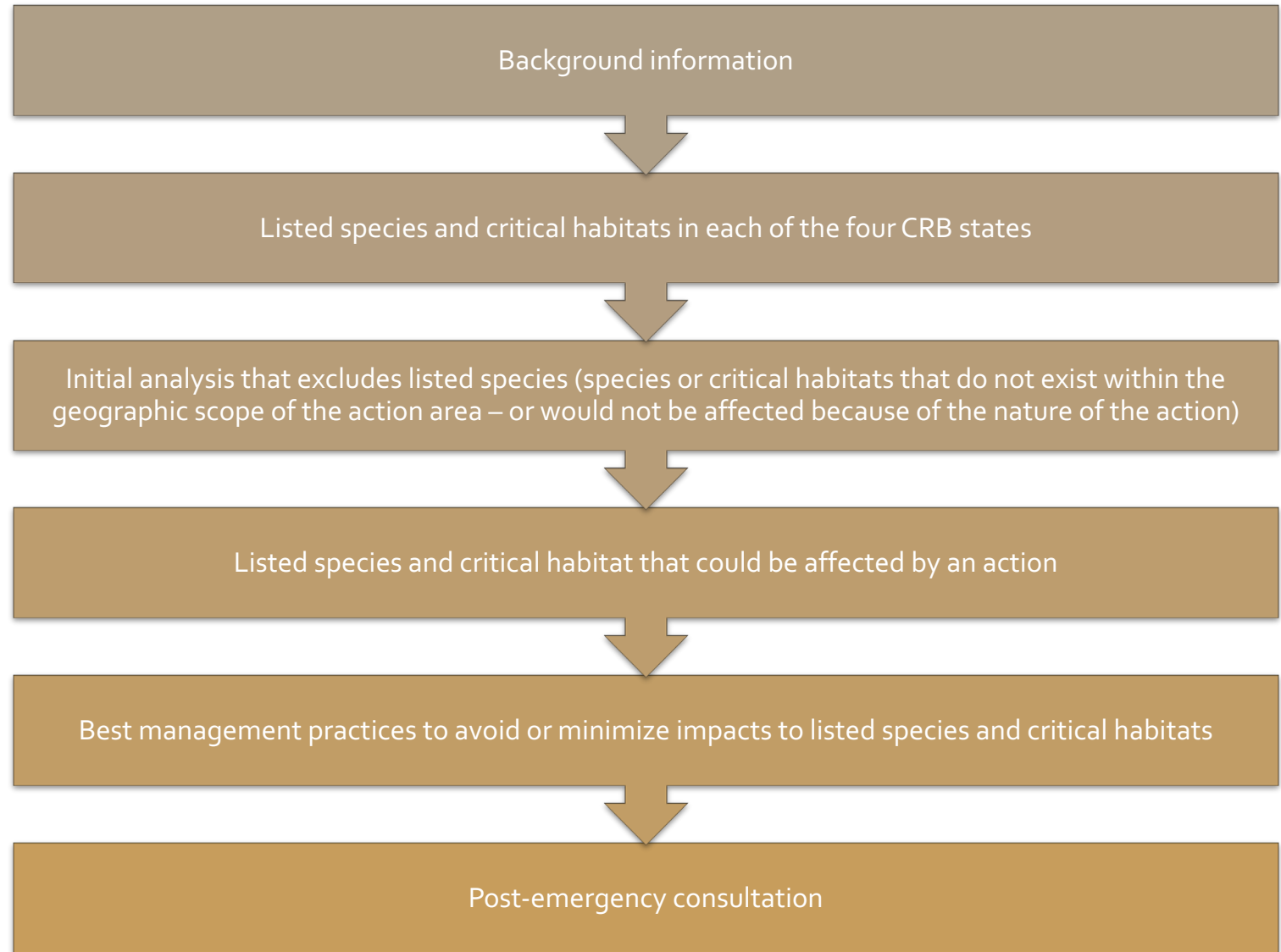


# Background

USFWS contracted with PSMFC to develop this manual to inform, expedite, and facilitate Section 7 consultations to include response actions that will minimize impacts of invasive mussel control and eradication attempts on listed species and their designated critical habitats.

Emergency consultation is an expedited consultation process that considers endangered species concerns while allowing an action agency to respond to an emergency situation.

# ESA Manual Contents



# Emergency Consultation Process

# EMERGENCY CONSULTATION PROCESS



# Treatment Options

- Chemical Treatments
  - Muriate of Potash
  - EarthTec QZ
  - Zequanox
  - Intense Ultraviolet-B and Ultraviolet-C Radiation
  - Ozone Oxidation
- Mechanical Treatments
  - Dewatering/water level management
  - Physical removal

	Oregon	Washington	Idaho	Montana	Total # of species
Mammals	2T, 1E	4T, 3E	3T, 1E	3T, 1E	10
Birds	5T, 1E	5T, 1E	1T	3T, 2E	10
Amphibians	1T	1T	0	0	1
Fish	14T, 4E	13T, 1E	1T, 1E	1T, 1E	15
Invertebrates	2T, 3E	1T, 1E	1T, 2E	0	8
Plants	8T, 11E	8T, 4E	5T, 0E	3T, 0E	26
<b>TOTALS</b>	32T, 20E	32T, 10E	11T, 4E	10T, 5E	70

T and E Species in the CRB

## Toxicity of potash to fish species:

Based upon the acute toxicity testing of KCl using both juvenile brook trout and juvenile Chinook salmon, acute lethal effects of potash on these salmonids at these life stages are not expected at concentrations commonly utilized to control invasive dreissenid mussels (100 mg/L) (Densmore et al. 2018). Exposure concentrations of as much as 800 mg/L KCl, eight times greater than the dose of KCl used as a molluscicide, were applied to these fish in static systems for 96 hours; there was no evidence of mortality attributable to KCl exposure among either species (Densmore et al. 2018). Behavioral or gross morphological effects on these fish from KCl-based molluscicide applications at levels up to 800 mg/L were also not indicated (Densmore et al. 2018). Several listed fish species forage on invertebrates, particularly during juvenile life stages. The ecotoxicity of muriate of potash on invertebrates is 48 hours @ EC<sub>50</sub> @ 337–825 mg/L (*Daphnia magna*), and 96 hours @ LC<sub>50</sub> @ 940 mg (*Physa heterostropha*) (Mosaic 2004). Daphniid exposure trials – LC<sub>50</sub> @ 196 mg/L for 48 hours; significant mortality of sensitive aquatic invertebrates is not expected at the KCl concentrations used to control dreissenids (Densmore et al. 2018). Crayfish exposure trials resulted in mortality and temporary paralysis at concentrations of 800 and 1,600 mg/L for at least 24 hours (Densmore et al. 2018). Other ecotoxicology studies: *Lepomis macrochirus* – LC<sub>50</sub> – 2010 mg/L (Mosaic 2014) Substantial differences exist in the accuracy of models to predict organism survival to introduced toxins, such as potassium, calcium, and magnesium (Pillard et al. 2000).

<p><b>Bull trout</b> <i>(Salvelinus confluentus)</i></p>	<p>Threats to any of the nine Primary Constituent Elements:</p> <ol style="list-style-type: none"> <li>1. Springs, seeps, groundwater sources, and subsurface water connectivity</li> <li>2. Migration habitats</li> <li>3. Food base</li> <li>4. Complex aquatic environments</li> <li>5. Water temperature</li> <li>6. Spawning and rearing habitat</li> <li>7. A natural hydrograph</li> <li>8. Sufficient water quality and quantity</li> </ol>	<p>Of the nine PCEs, potash could potentially affect the migration habitats, water temperature, and spawning and rearing habitat of bull trout by altering the water chemistry during critical life stages/use of shallow portions of CRB water bodies.</p> <p>Disturbance to any water body can increase sedimentation and suspended solids, which can be detrimental to fish, resulting in lethal effects, sublethal effects that alter the physiology of the fish, and behavioral effects that change the activity of the fish and could contribute to mortality through time (Newcombe and MacDonald 1991). Increased turbidity can cause behavioral changes to fish, including stress, reduced feeding, impacts to growth rates, interference with cues necessary in homing and migration, and death (Lloyd 1987). Bull trout are highly susceptible to sediment inputs (USFWS 1998a, Bash et al. 2001).</p> <p>Young bull trout less than 200mm in length forage on invertebrates.</p> <p>Adult bull trout in the vicinity of the action area would have</p>	<p>Salvage or move fish out of contained treatment sites</p> <p>Implement BMPs to avoid introducing invasive species</p> <p>Minimize disturbance at the shoreline and in benthic portions of the water body to minimize turbidity</p> <p>Prior to an action in an area with a known bull trout population or critical habitat, determine total suspended solid concentrations, and gather information on the size</p>
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# Deliverables

- Effects analyses on all relevant T and E species in the CRB, with the exception of NMFS trust species.
- BMPs to avoid or minimize take for T and E species and their critical habitats.