Optimizing control of invasive parrotfeather (

Myriophyllum aquaticum) in Washington with herbicides and knowledge of environmental constraints

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Overview

- Parrotfeather: distribution and impacts
- Field herbicide tests (2015-2020)
- Distributional changes over time (1996 – 2016)
- Management conclusions
Parrotfeather: Distribution and Impacts
Parrotfeather: impacts

- Forms dense mats that interfere with infrastructure, impede flow\(^5,6\)
- Outcompetes native vegetation
- Reduces oxygen by blocking air/water exchange and emergent shoots that release oxygen to the air\(^7,8\)
- Altered invertebrate communities\(^8\)
- Associated with fish that tolerate dense vegetation and reduced oxygen\(^8\)

\(^5\) Guillarmod 1979, \(^6\) Moreira et al. 1999, \(^7\) Hussner, 2009, \(^8\) Kuehne, Olden & Rubenson 2016
Parrotfeather: distribution

- Favors slow-moving wetland habitat
- Tolerates cold, drawdowns, some salinity\(^1,2\)
- Does not tolerate high/variable flows\(^3,4\)
- Only female plants in N. America; spreads vegetatively
- Mechanical or physical control are not advised

\(^1\) Wersal et al. 2013, \(^2\) Thouvenot et al. 2012, \(^3\) Moreira et al, 1999, \(^4\) Hussner & Lösch 2005
Field herbicide tests (2015-2020)
Field Herbicide Tests

2015 – 2016
- Imazapyr
- 2,4-D + carfentrazone
- Imazapyr + carfentrazone

Evaluated plots six weeks after treatment (6WAT) and twelve months after treatment (12MAT)

Point-transect method
Results

Imazapyr treatments had highest effectiveness in both time periods

Addition of contact herbicide did not improve effectiveness

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*Kuehne et al. (2018)*, *Field-based control of herbicides for control of parrotfeather (Myriophyllum aquaticum)*, *Journal of Aquatic Plant Management*
Field Herbicide Tests

2018 – 2019
- Imazapyr
- Triclopyr

Compared early and late-season application timing

Evaluated plots at 8WAT and 12MAT

October 2019, Late season treatment, 8WAT
Results

Significant natural reductions in the early-season treatment sites

Better control in late-season treatment at 8WAT, but did not result in substantially different control 12MAT
Summary: herbicide tests

- Imazapyr had highest efficacy, with triclopyr a close second
- Can expect ~50-75% control at 6-8WAT
- Can expect ~15-25% control at 12MAT
- Control at 12MAT did not substantially differ with treatment timing
- Tank mixing (e.g., + carfentrazone, glyphosate) did not increase short or long-term control
Distributional change: Chehalis River, WA 1996-2016
Historical Longitudinal survey

Chehalis to Montesano (90 km)

Mainstem and side channels surveyed by canoe and airboat in 1996-1997

Locations georeferenced using coordinates, site descriptions
Contemporary Longitudinal Survey

Chehalis to Montesano (90 km)
Mainstem and side channels surveyed by canoe in 2015 and 2016
Parrotfeather extent (abundance) mapped using handheld GPS

1. Longitudinal survey of mainstem and adjacent wetlands
2. Mapped extent
3. Calculate abundance from polygons
Kuehne et al. (2022), Twenty year contrast of non-native parrotfeather distribution and abundance in an unregulated river, *Hydrobiologia*
Disappearance, low abundance

Persistence, high abundance

Expansion, low abundance

River Kilometer

1996

2016

2016 Abundance (m², 1000s)

Kuehne et al. (2022)
Abundance and persistence of parrotfeather over time associated with middle reaches of the river, unconstrained floodplain

Suggests natural constraints on distribution and abundance, probably due to high/variable flows

Management and control efforts more likely to be successful in upstream reaches

Altering the hydrologic regime (e.g., adding a dam) may facilitate expansion and persistence
Management Conclusions

- Optimizing control of invasive plants is an iterative process
- Field-based testing is recommended to assess variation that can influence effectiveness of control (e.g., sites, year effects)
- Evaluating natural constraints on distribution can help focus management efforts where they are most likely to be effective
Organizations and agencies:
WA Dept of Natural Resources
WA Dept of Fish and Wildlife
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The Chehalis Tribe

Field assistance:
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