History of the control of burrowing shrimp…

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…and non-native eelgrass

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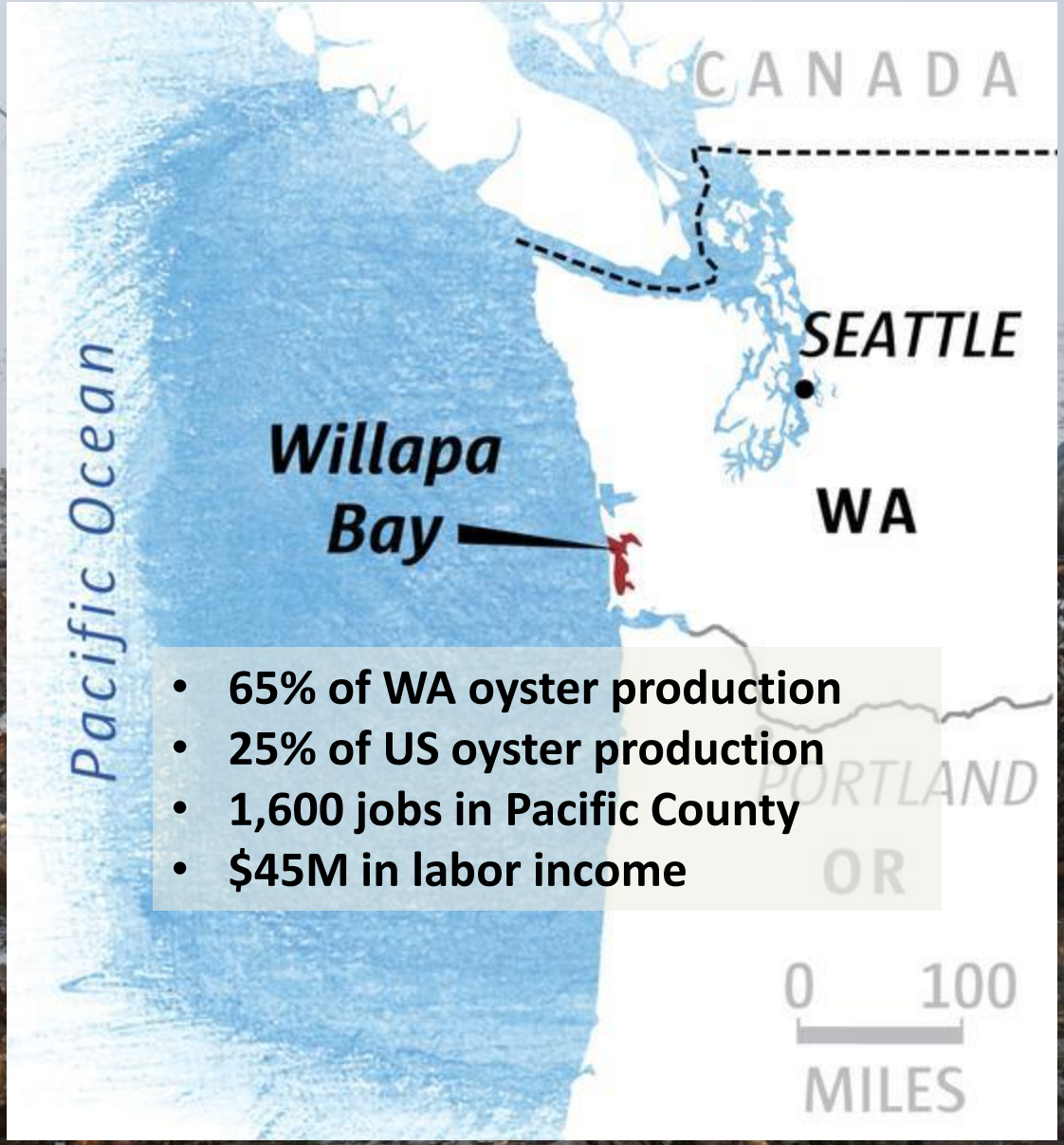

- 65% of WA oyster production
- 25% of US oyster production
- 1,600 jobs in Pacific County
- $45M in labor income

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Burrowing shrimp

- Since the 1950s, two native species of burrowing shrimp (ghost shrimp, Neotrypaea californiensis and mud shrimp, Upogebia pugettensis) have caused impacts to commercial clam and oyster production by disrupting the structure and composition of the substrate, causing these shellfish to sink and suffocate.

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Burrowing shrimp

- In recognition of the destructiveness of burrowing shrimp during the late 1950s, WDF begin testing various methods of control.
- The pesticide Carbaryl was found to be the best control method and was then used for large-scale commercial control of burrowing shrimp in oyster beds in Willapa Bay and Grays Harbor starting in 1963.

Burrowing shrimp

- Between 1975 and 1981, WDF, in cooperation with WDA and the EPA developed a review and approval policy for the use of Carbaryl .
- In 1985 the Carbaryl application rate was reduced from 10 lb/acre to 7.5 lb/acre.
- In the 1993, WDOE became the lead agency for Carbaryl applications replacing WDF.

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Burrowing shrimp

- In 2001 the Willapa Bay/Grays Harbor Shellfish Growers, WDFW, WDOE, WDA, Washington State Commission on Pesticide Registration, Pacific Coast Shellfish Growers Association and the Pacific Shellfish Institute signed an MOU to develop an Integrated Pest Management Plan (IPM).

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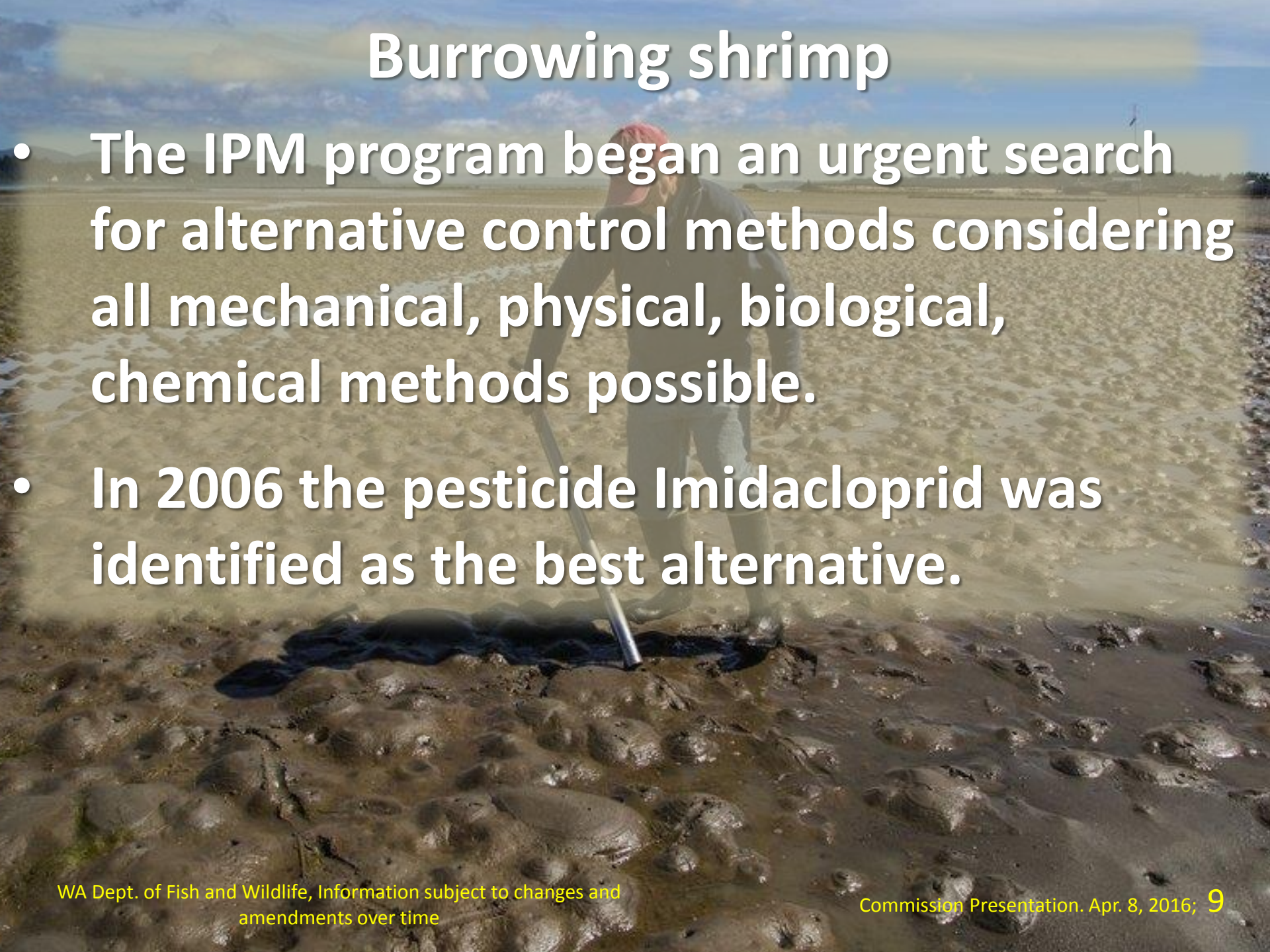
Burrowing shrimp

- The goal of the IPM was to move away from using Carbaryl for burrowing shrimp control and towards alternate control methods that could be more species specific, economical, reliable and environmentally responsible
- In 2003 the NPDES was appealed by WA Toxic Coalition; in a settlement the growers agreed to end the use of carbaryl by 2012.

Burrowing shrimp

- The IPM program began an urgent search for alternative control methods considering all mechanical, physical, biological, chemical methods possible.
- In 2006 the pesticide Imidacloprid was identified as the best alternative.



Burrowing shrimp

- In 2006 research efforts began to focus on the fate, transport, and biological effects of Imidacloprid in the environment as well as the efficacy of applications. Some of this work was funded by the WDFW Oyster Reserve Account.

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RCW 77.60.160 / Oyster reserve land account.

(2) (a) Up to forty percent for: (i) The management expenses incurred by the department that are directly attributable to the management of the oyster reserve lands; and

(ii) The expenses associated with new bivalve shellfish research…As used in this subsection, "new research and development activities" includes an emphasis on the control of aquatic nuisance species and burrowing shrimp. New research and development activities must be identified by the department and the appropriate oyster reserve advisory committee;

…all remaining revenues received from the Willapa harbor oyster reserve shall be used to fund research activities as specified in subsection (2)(a) of this section.

Burrowing shrimp

- In April 2015 WDOE issued a NPDES permit for use of Imidacloprid.
- The issuance of this permit created a significant backlash on traditional and social media. In May the growers subsequently cancelled their NPDES permit.
- In 2015 no oyster grounds were treated for burrowing shrimp.

Non-native eelgrass

- Japanese eelgrass, Zostera japonica, was likely introduced to Willapa Bay in oyster seed shipments in the 1930‘s.
- From introduction until around about 1998 Japanese eelgrass remained relatively confined in plant density and location.

Non-native eelgrass

- Since 1998 Japanese eelgrass has expanded in an "explosive" fashion to form thick blankets at low tide covering large portions of Willapa Bay.
- This cover has affected water drainage, sediment temperature, nutrient composition and hindered burrowing shrimp control and shellfish harvest.

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Non-native eelgrass

- In 2009 funding from the WDFW Oyster Reserve account began investigations into the effects of Japanese eelgrass on estuarine ecology, impacts to commercial shellfish production, and to develop, prepare and submit a full risk assessment for the use of Imazamox on Japanese eelgrass in Willapa Bay.

Non-native eelgrass

- Up to 2011, WDFW listed all species of Zostera (eel grass) on the WDFW Priority Species and Habitat list.
- In 2011, WDFW changed the listing from all Zostera species to only Zostera marina (native eelgrass).
- WDFW continues to list native eelgrass as a Priority Habitat and Species.

Non-native eelgrass

- In 2012, listed as a class C noxious weed by the Washington State Noxious Weed Control Board.
- In October 2012 at the shellfish industry request, WDOE began the process for the issuance of an Environmental Impact Statement (EIS) to cover control activities.

Non-native eelgrass

- In March 2014 the final EIS was issued.
- In April 2014 the permit allowing for applications of Imazamox beginning in May 2014 was issued.
- Since then 600 acres have been sprayed.
- The current permit ends in May 2019.