# Approaches to the explanation and learning of scientific studies for non-science stakeholders

Presentation to UNESCO

Building the Scientific Mind

Egypt 2009

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# Building scientific understanding

- This workshop will begin with a discussion of scientific studies – in particular, environmental impact as a grouping of applied sciences designed to achieve answers within a set time frame.
- All too frequently results are gauged against set criteria or standards, with those criteria poorly set for the understanding of the stakeholders (regulators, proponents, opponents, local community and indigenous people).
- The goal is to build scientific understanding and trust for decision making.

# Science

In Science the credit goes to the man who convinces the world, not to the man to whom the idea first occurred.
*Sir William Osler (1849-1919) Canadian physician.*

It requires a very unusual mind to undertake the analysis of the obvious.
*Alfred North Whitehead (1861-1947) English philosopher and mathematician.*

# Environmental Science

The work of Environmental Science describes the environment, interprets the impact of human actions (anthropogenic effects) on terrestrial and aquatic ecosystems, and develops strategies for mitigating impacts and restoring ecosystems.

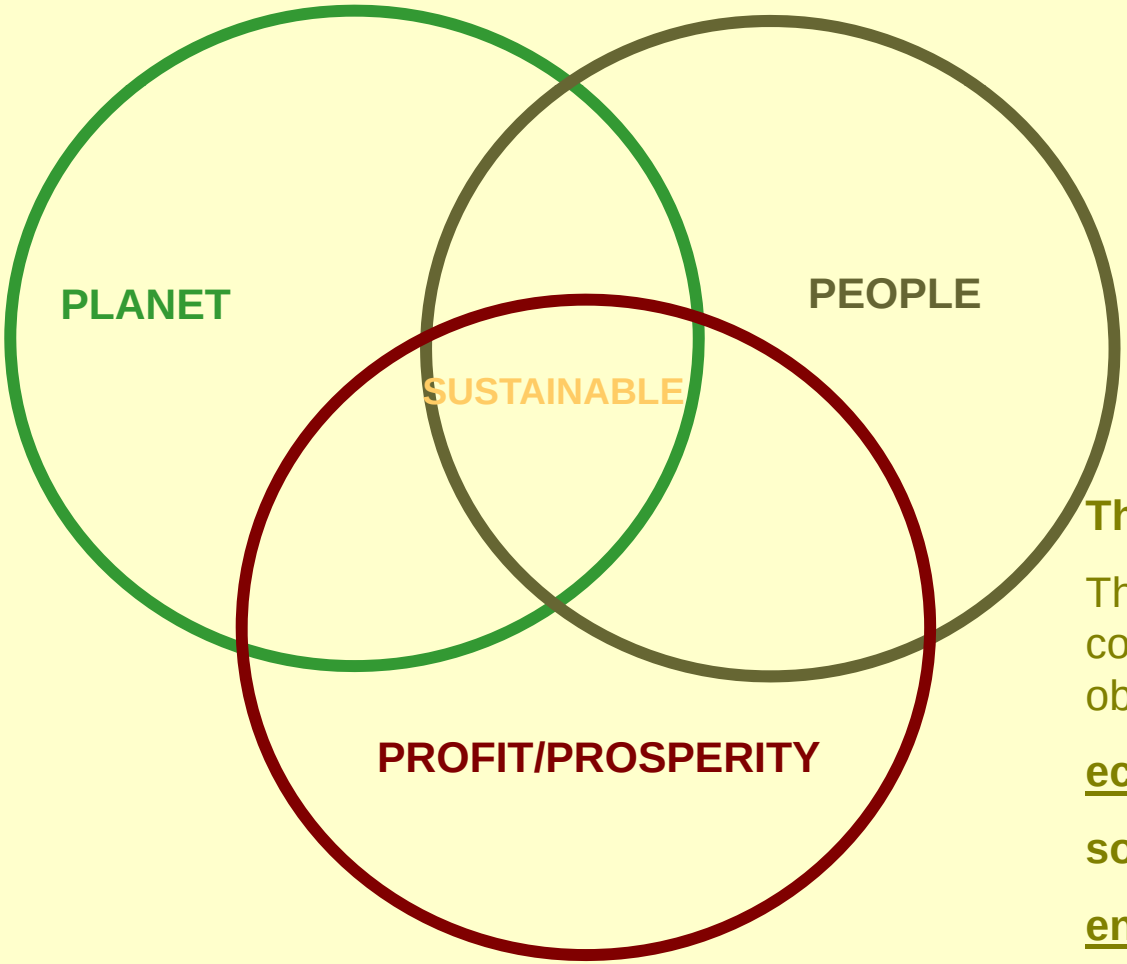
# Stakeholder Consultation

The initial approach is to engage with stakeholders and their understanding of science.

This will include:

- Sustainability,
- The win-win concept,
- Depth of knowledge (of both the study and the stakeholder), and
- The importance of preconceptions.

# Sustainability – The big picture




**Three balanced objectives**

The concept of sustainability combines three interconnected objectives :

**economic effectiveness,**

**social equity and**

**environmental protection**

# The win-win concept

- Achieved through Project Design that  incorporates elements based on the principal components of sustainability.
- Incorporating social value, minimizing environmental effects, maximizing environmental benefits, and ensuring that the project is financially supportable results in the “whole” being improved.
- Considering the interests of all stakeholders in the Project Design from the outset helps make it truly sustainable

# Depth of Knowledge

- Review the literature and available databases
- Conduct environmental baseline studies based on Project Location (brownfield vs. greenfield)
- Engage local communities, indigenous peoples and NGO's to access local and traditional knowledge about the project site and the project.
- Adapt the environmental baseline studies to incorporate local and community knowledge and conduct a data gap analysis
- Conduct other studies as needed to fill data gaps

# Preconceptions

- Humans have a value system that is based on a set of preconceptions – “confirmation bias”
- Early and meaningful stakeholder engagement will identify preconceptions
- Environmental study design supported by stakeholder engagement can help address preconceptions and aid scientific understanding.

# Case Study Deltaport
# Third Berth Project

Near Vancouver, Canada

# Deltaport Third Berth Project Components

- The construction of an additional berth at Deltaport and the proposed creation of approximately 80 acres of land for expanded container yard area
- Dredging adjacent to the new berth is required to expand the existing ship turning basin
- Railway support track along the BC Rail mainline adjacent to productive farmland

# Port of Vancouver


WEST VANCOUVER
NORTH VANCOUVER
INDIAN ARM
N
ENGLISH BAY
PORT MOODY
BURRARD INLET
BURNABY
VANCOUVER
NEW WESTMINSTER
RIVER
VANCOUVER INTERNATIONAL AIRPORT
FRASER
SURREY
STRAIT OF GEORGIA
RICHMOND
DELTA
TSAWWASSEN
ROBERTS BANK
BOUNDARY BAY

# Deltaport Study Program

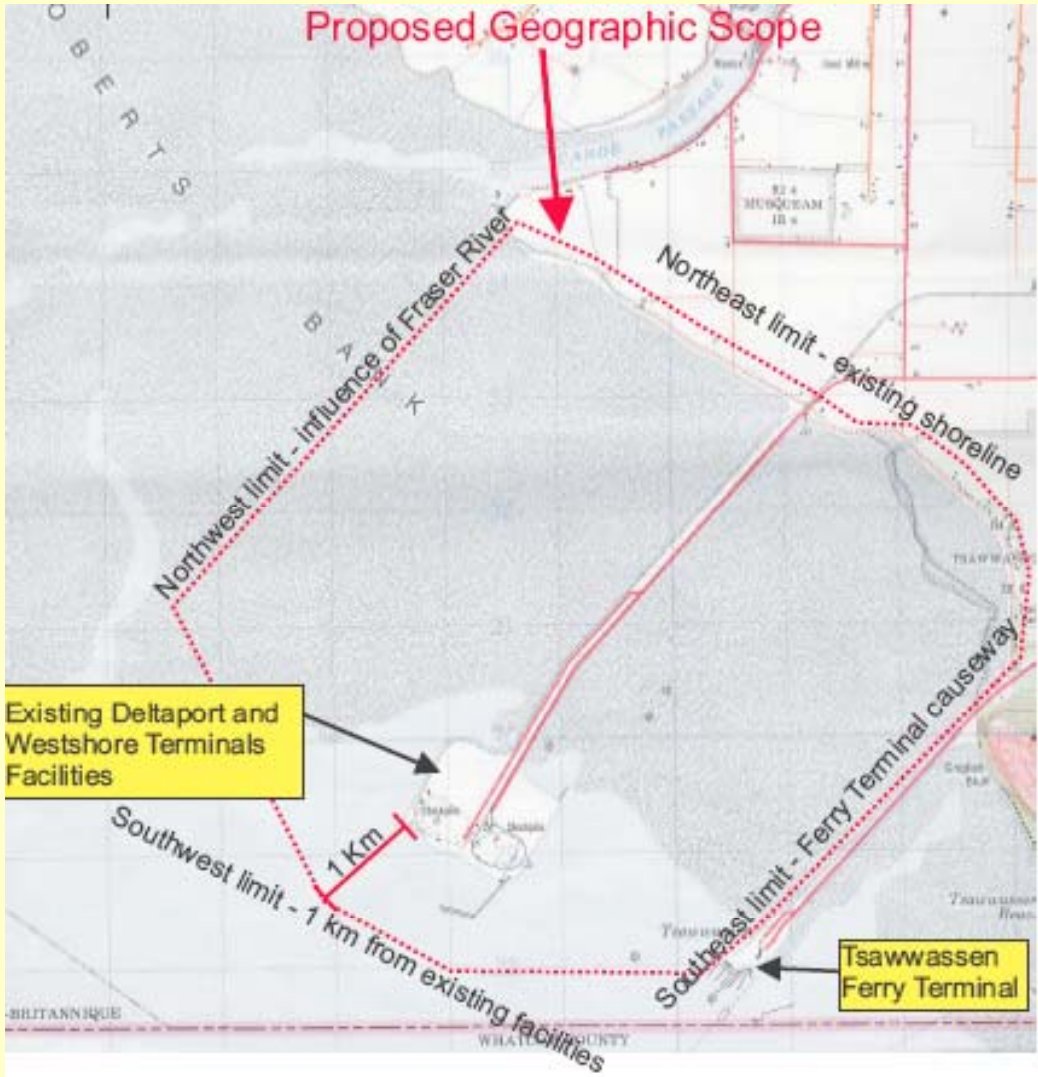
**Study Program commenced in 2003 with preparation of work plans that were reviewed with stakeholders**

**Studies were undertaken over a one year period in 2004**

- Marine Environment (including Marine Mammals)
- Coastal Seabirds, Waterfowl and Shorebirds
- Terrestrial Environment
- Coastal Geomorphology
- Air Quality / Human and Environmental Health Assessment
- Water Quality
- Sediment Quality
- Noise
- Visual and Light
- Socio economic and community
- Traditional Knowledge Studies
- Environmental Management
- Road, Rail and Vessel Traffic Studies

# Marine Environment Study Area

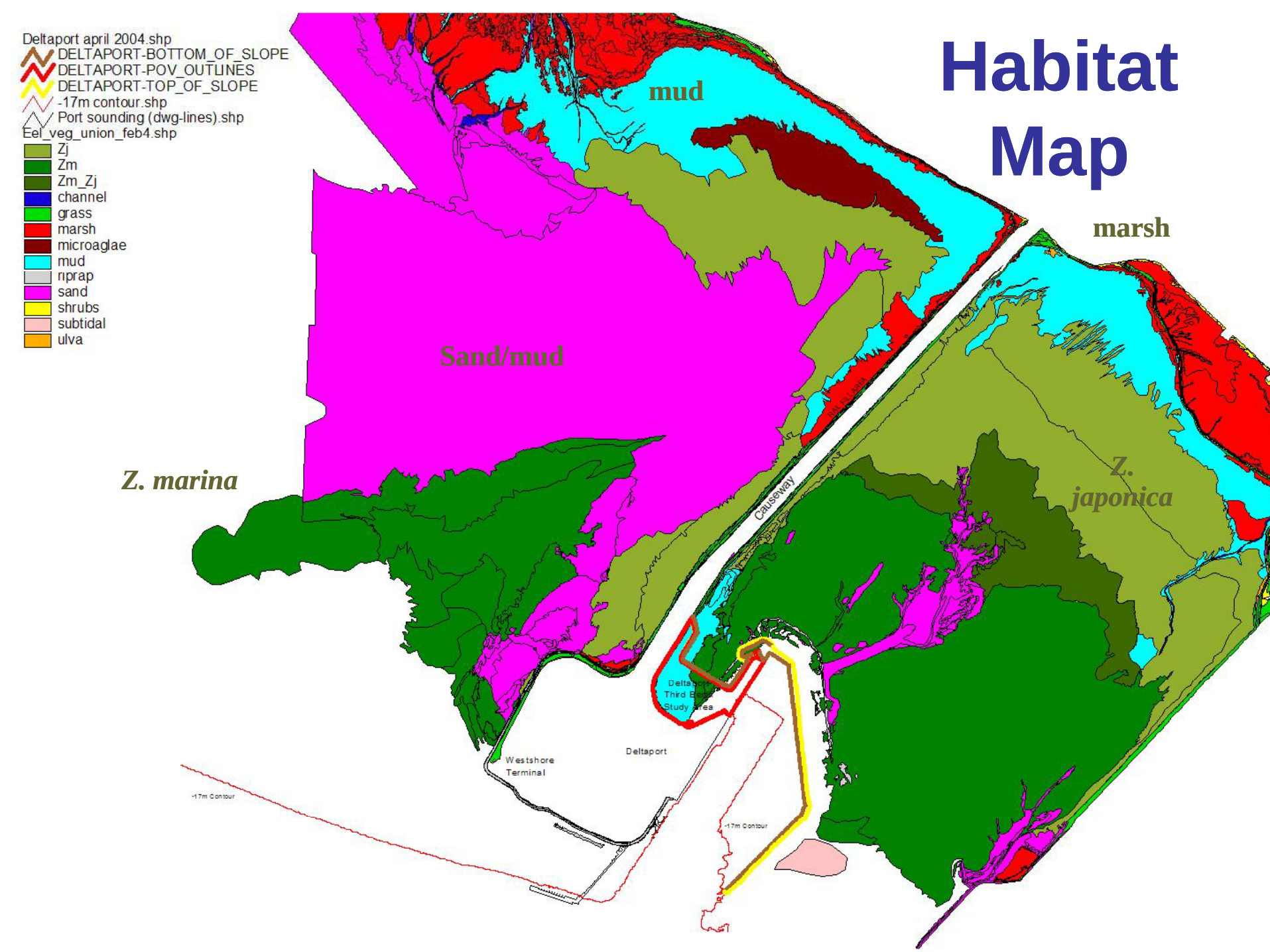
- Within 1 to 5 km from the existing port facilities
- Field studies conducted over a 1 year period (July 2003 to July 2004)
- TFN involvement
- Program included a detailed literature review of past studies



# Fishes & Macroinvertebrates - sites sampled





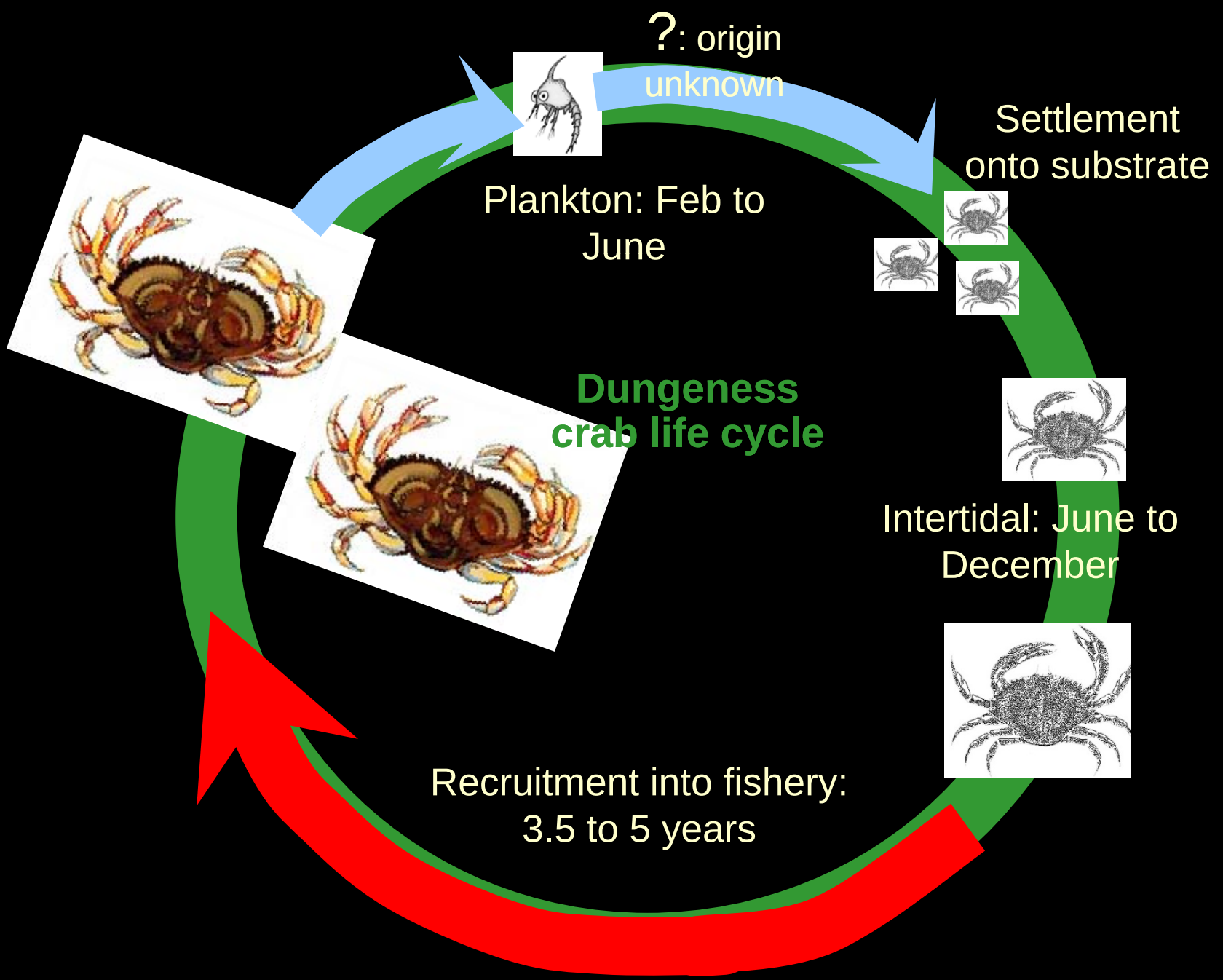

Deltaport april 2004.shp
DELTAPORT-BOTTOM_OF_SLOPE
DELTAPORT-POV_OUTLINES
DELTAPORT-TOP_OF_SLOPE
-17m contour.shp
Port sounding (dwg-lines).shp
Eel_veg_union_feb4.shp
Zj
Zm
Zm_Zj
channel
grass
marsh
microalgae
mud
riprap
sand
shrubs
subtidal
ulva
Habitat Map
mud
marsh
Sand/mud
Z. marina
Z. japonica
Causeway
Deltaport Third Berth Study Area
Westshore Terminal
Deltaport
-17m Contour
-17m Contour

# *Valued Ecosystem Components*

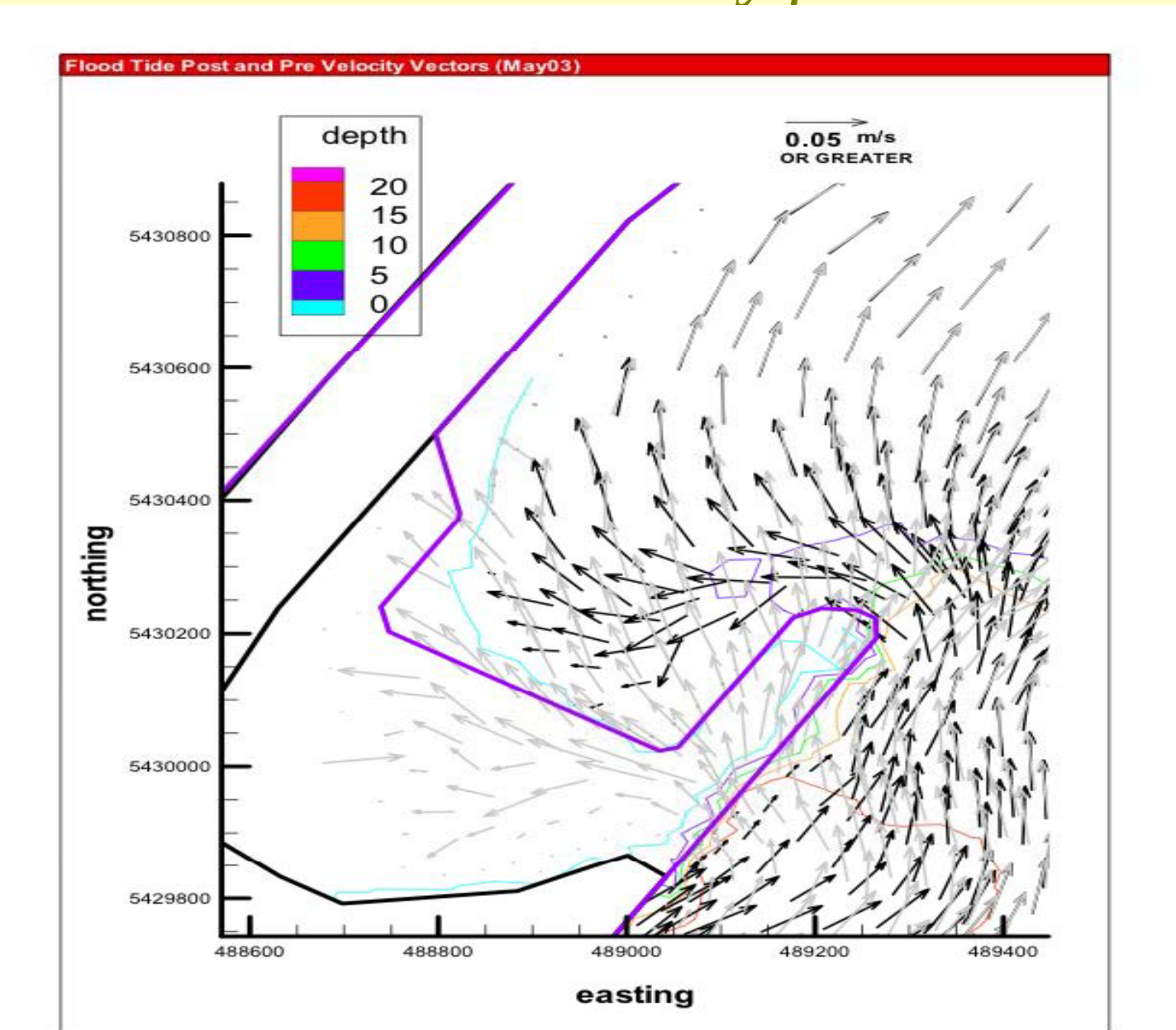




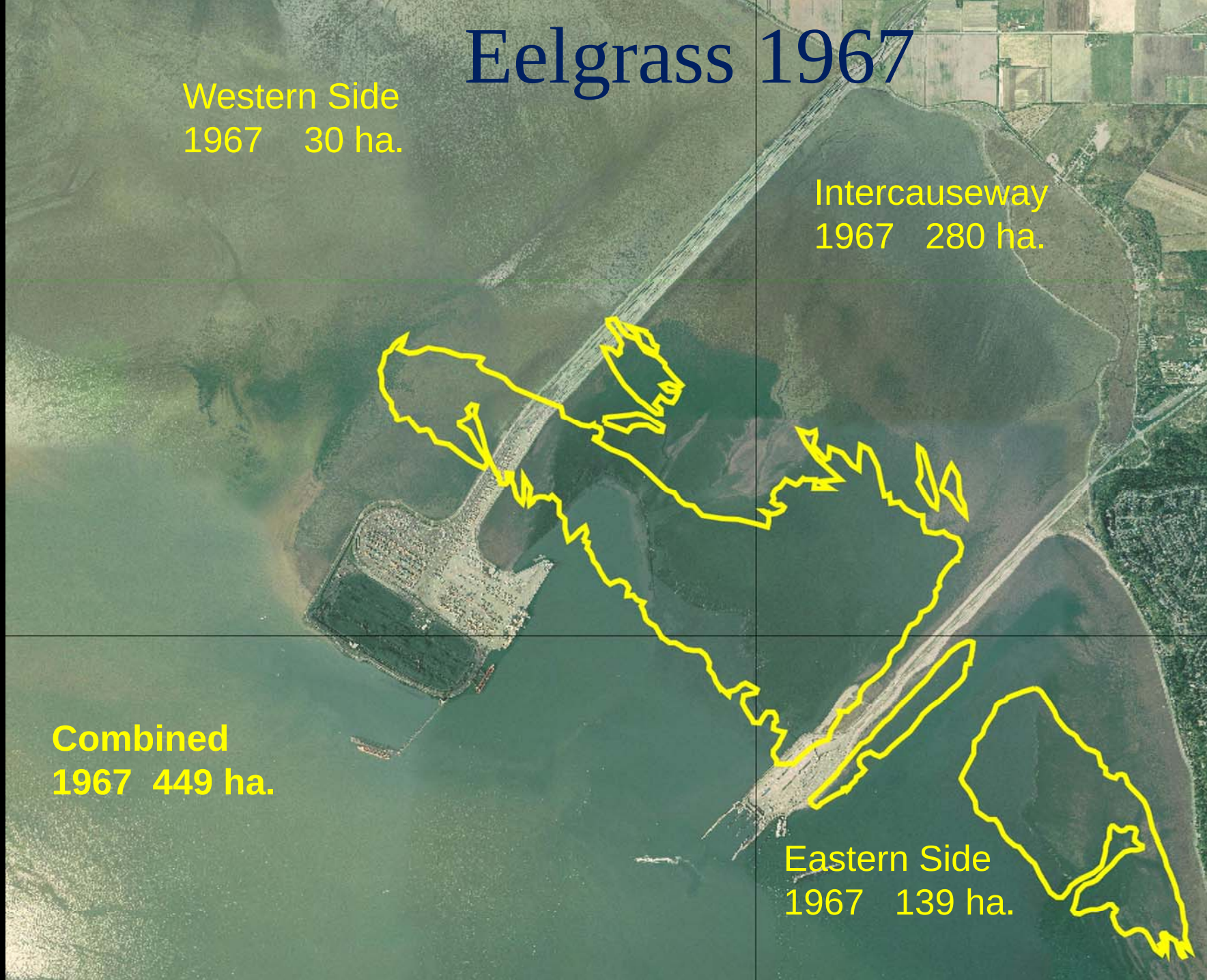

- ***Eelgrass***
- ***Juvenile Dungeness crabs***
- ***Juvenile salmonids***

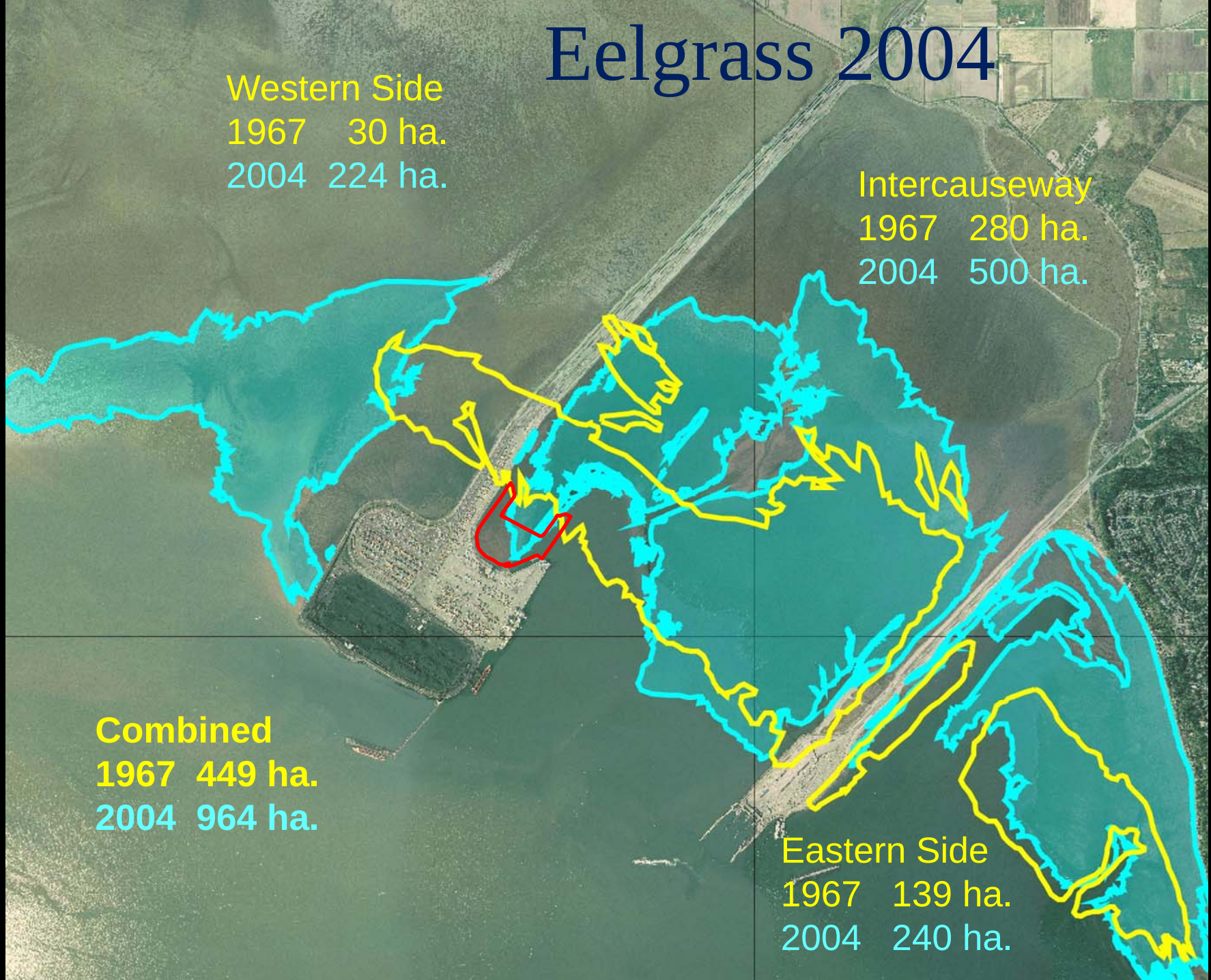

?: origin unknown
Settlement onto substrate
Plankton: Feb to June
Dungeness crab life cycle
Intertidal: June to December
Recruitment into fishery: 3.5 to 5 years

# *The crab megalops are transported to the area: water velocity plot*



# *Change design to avoid impacts*


Eelgrass 1967
Western Side
1967 30 ha.
Intercauseway
1967 280 ha.
Combined
1967 449 ha.
Eastern Side
1967 139 ha.


Eelgrass 2004
Western Side
1967 30 ha.
2004 224 ha.
Intercauseway
1967 280 ha.
2004 500 ha.
Combined
1967 449 ha.
2004 964 ha.
Eastern Side
1967 139 ha.
2004 240 ha.

# Marine Environment Impact Assessment Results

- **Impact:** Loss of intertidal mudflat, subtidal mudflat, eelgrass and salt marsh.
- **Mitigation:** Reduce Project Footprint
- **Compensation:** Create replacement habitat that supports juvenile salmon and crab rearing areas

# Workshop