
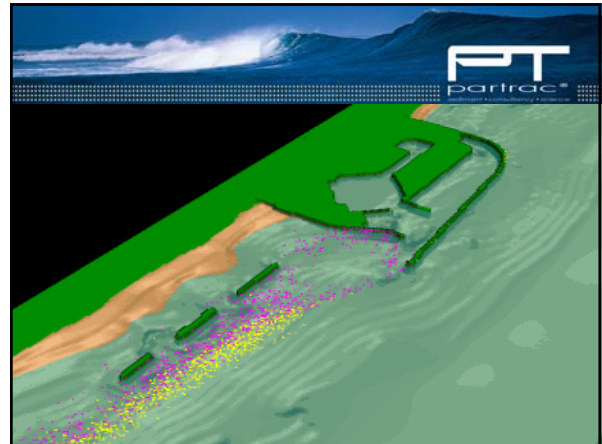


Solute and Particle Tracing: Rivers/Estuaries/Wetlands

Dr. Kevin Black

Partrac Ltd.


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The Particle Tracking Method

'.....introduction of a mass of *uniquely identifiable* particles into a water body and tracking this across space and through time'.


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Some Applications

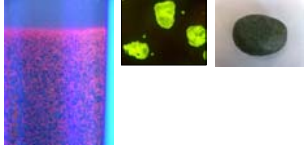
- Source - Sink Identification
- Transport Pathway Visualisation
- Environmental Impact Assessment
- Soil Loss & Water Quality
- Environmental Siltation Assessment
- Particulate Flux Magnitude and Direction

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'Dual signature' Technology

- Fluorescent, para-magnetic
- Size range silts to cobbles, & neutrally buoyant particles
- In situ* capture

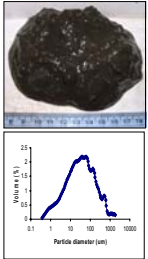


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Methodology

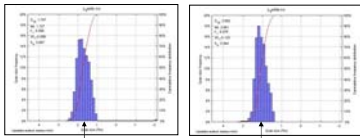
- Collect sample from environment of interest
- Measure bio-physical props.
 - size,
 - density,
 - settling velocity
- Manufacture tracer batch
- Verify props*.
- Inject into environment, & capture



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Verification of Tracer Hydraulic Properties



Example grain settling velocity spectra

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Tracer Injection



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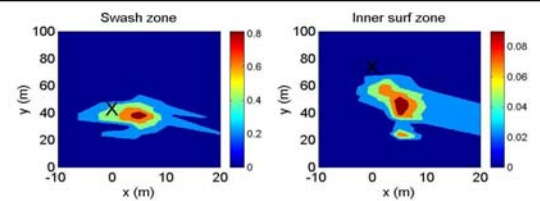
Tracer Sampling



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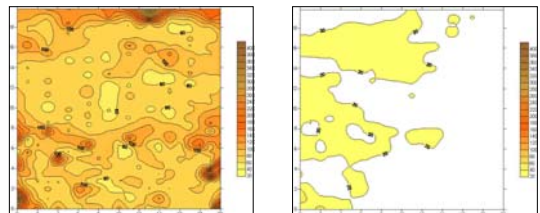
Beach Processes 1 (Duck, NC)



P003.03.2008.0004v01 - Immersed weight longshore transport rate $i_b = (\rho_s - \rho) g n U_{mean} K_o$ 10

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Beach Processes 2



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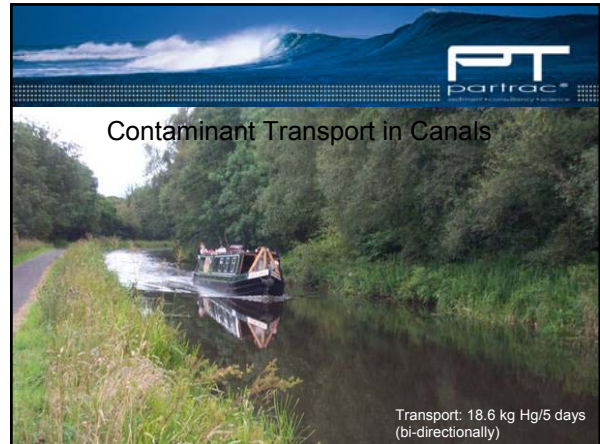
Highway Runoff





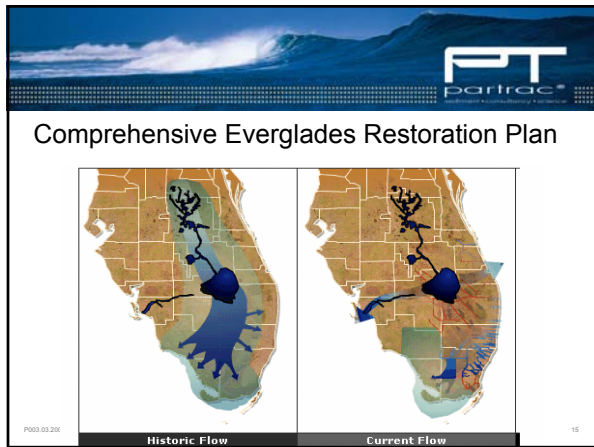
Terrestrial Soil Loss

- Critical transport conditions (due to rainfall)
- Characteristic transport path length
- Timing of loss to rivers

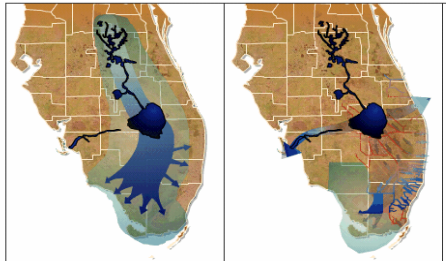


Contaminant Transport in Canals

Transport: 18.6 kg Hg/5 days (bi-directionally)

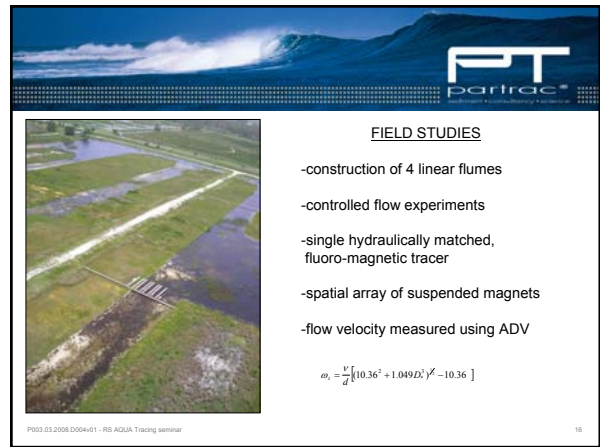


Comprehensive Everglades Restoration Plan



Historic Flow Current Flow

P003.03.20C 15



FIELD STUDIES

- construction of 4 linear flumes
- controlled flow experiments
- single hydraulically matched, fluoro-magnetic tracer
- spatial array of suspended magnets
- flow velocity measured using ADV

$$w_s = \frac{v}{g} [10.36^2 + 1.049D^2]^{1/2} - 10.36$$

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