

Changing the Conversation: engineered ecology: ecomimicry+ urban development & design



Generating value using
Engineered Ecology™

Managing the water ecosystem for a One Planet Region, 2017

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Aqua-Tex Scientific Consulting Ltd.

October 26th, 2017

Life without oxygen,
but no life without water



The history (future) of the world is written not
in ink but in water

青山常在，綠水長流 (Chinese Proverb)



System

A. World's Total Water Supply
1 386 million km³,
97.5 % saltwater

B. This circle represents the 2.5% that is freshwater but almost all of this is in ice or is underground

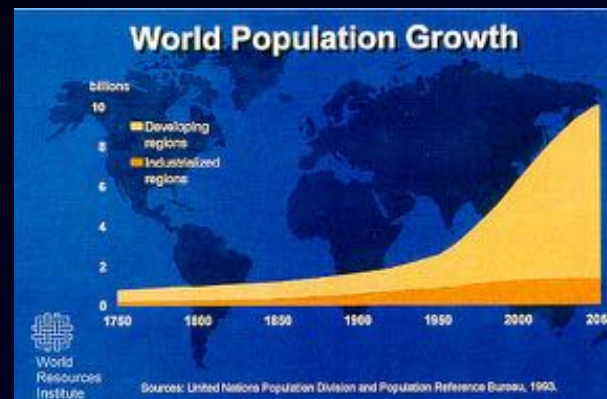
C. This dot represents the tiny amount (0.01%) that is **not** in ice or underground

DFO, 1987



Can we fix this?

Do we have a choice?



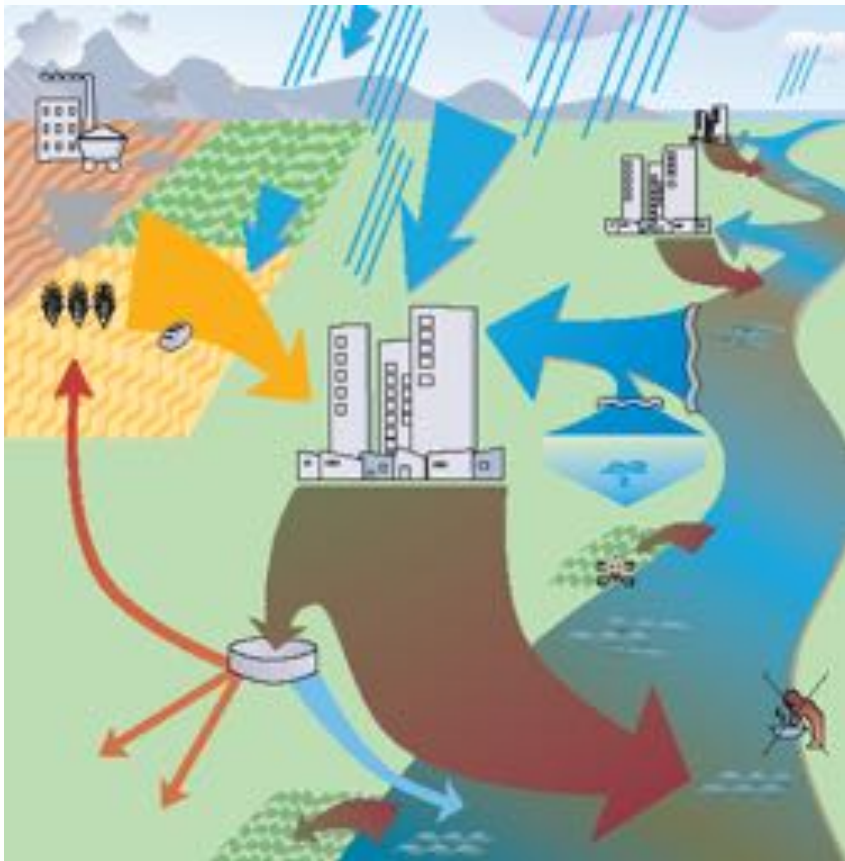


21st Century Challenge

Water + Energy + Resources + Food Security +
Natural Capital = Adaptation to a Changing Climate

We need a cultural shift

Current: use resources once & dispose of it (tax payer costs)

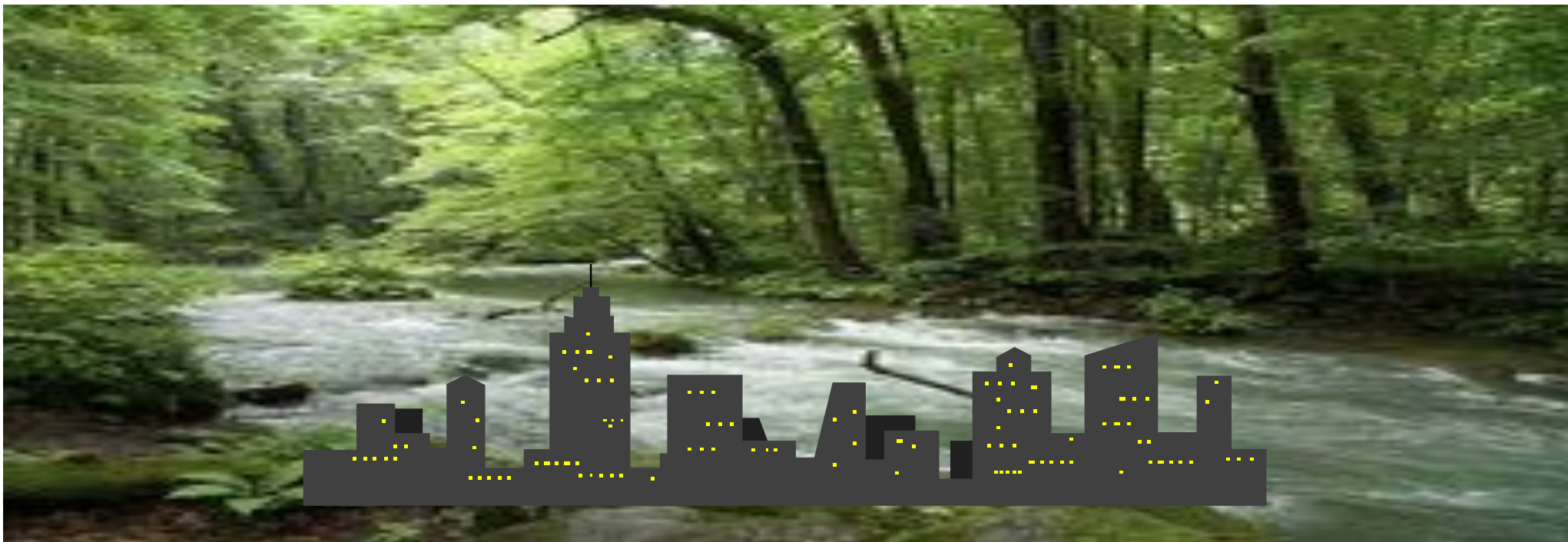


Open linear system

Integrated Resource Recovery (tax payer revenues)

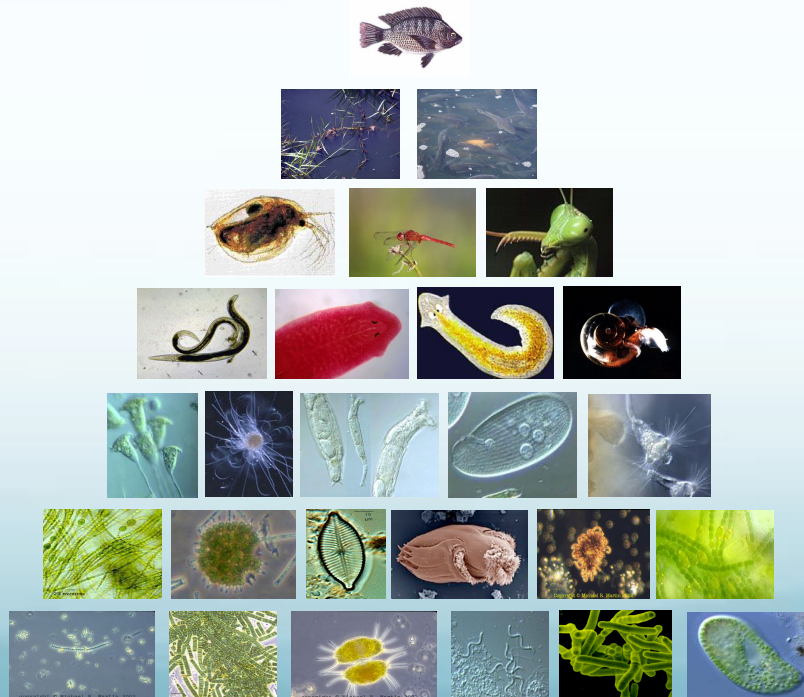


Closed loop system
Robust & resilient



Integrated Resource Management

Balance
development
on ecological
stability



When we focus on the
foundation we expand
the capability of the
values

Valuing Nature's Infrastructure



**Conventional
(Engineering)**



**“Green”
(Environmental
Engineering)**



**Ecological Approach
(Engineered Ecology™)
Resource Recovery**



Q –can ecosystem services (Natural Capital) be valued in a free market economy?

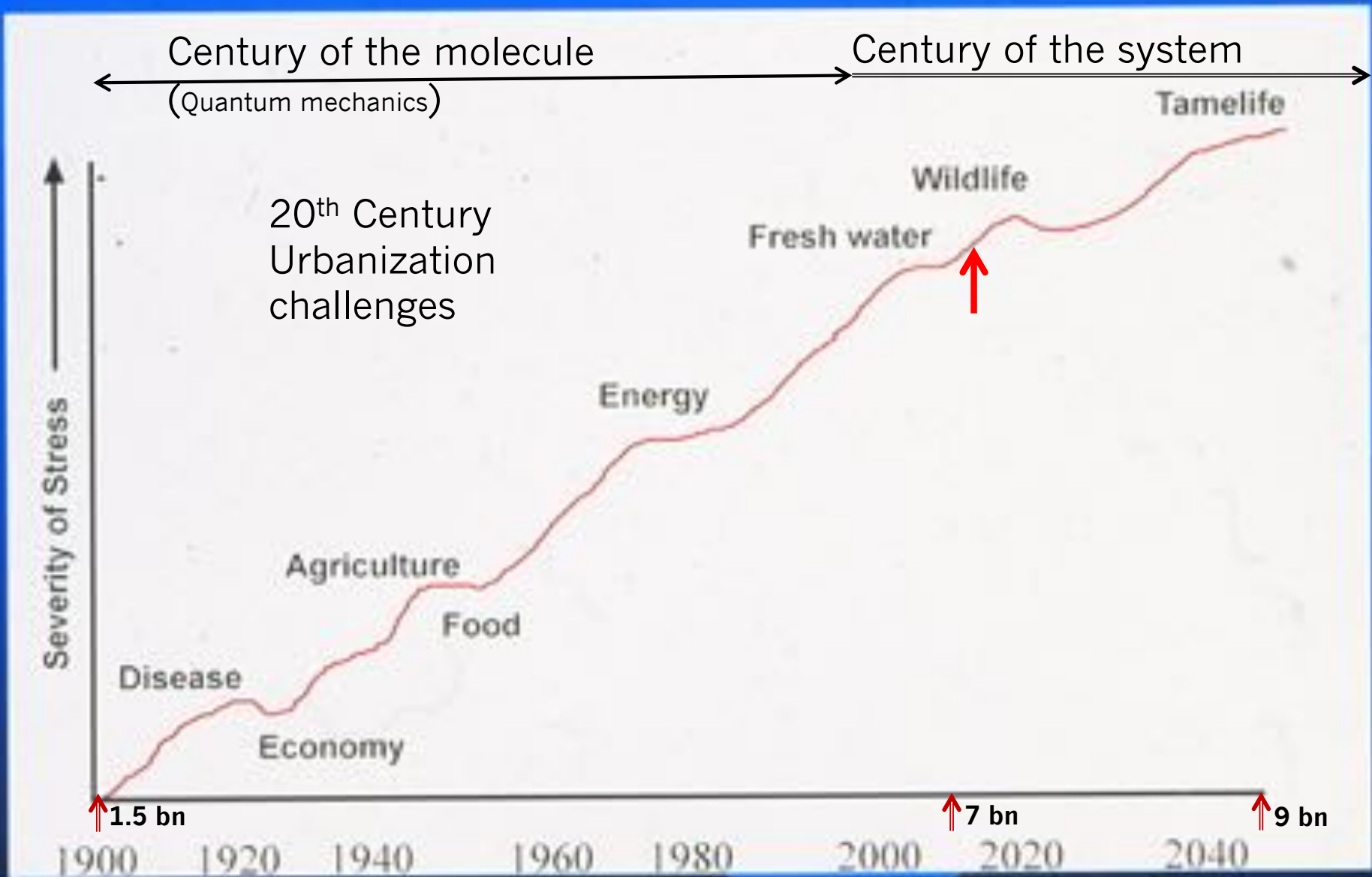
What happens if we cannot establish their value?

[Bruce Sampson, VP of BC Hydro; World Business Council on Sustainable Development]

Stationarity is Dead

“In view of the magnitude and ubiquity of the hydroclimatic change apparently now under way . . . we assert that stationarity is dead and should no longer serve as a central, default assumption in water-resource risk assessment and planning.”

Source: P.C.D. Milly et al. “Stationarity is Dead: Wither Water Management.” *Science*, 319, February 2008.



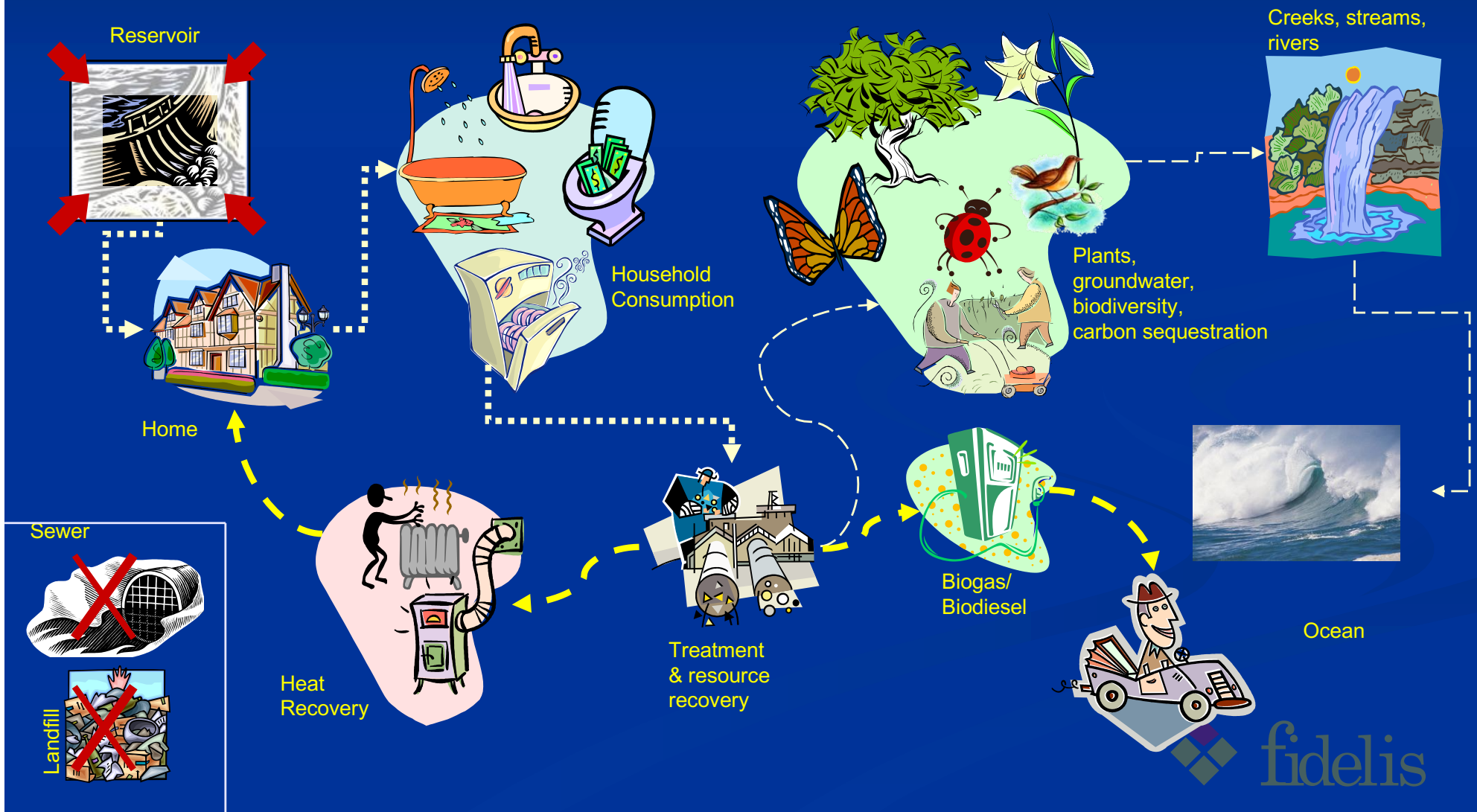
Cities of the Future

Towards integrated sustainable water and landscape management

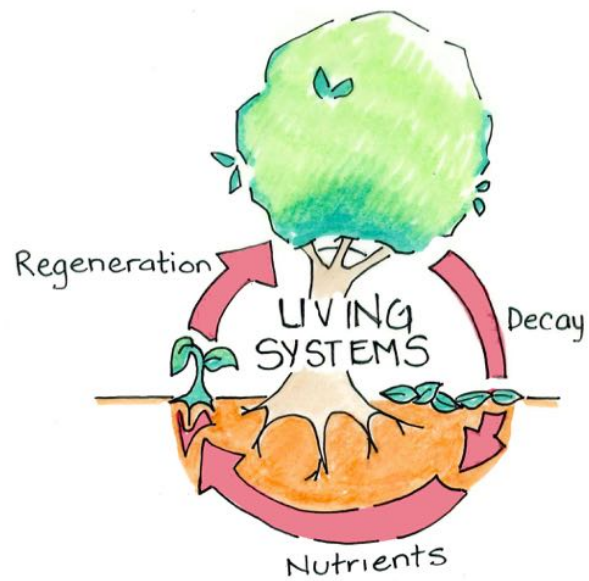
Edited by Vladimir Novotny and Paul Brown



Tomorrow's Integrated Resource Management (IRM)



Scaling Up



Regional



City




Neighbourhood

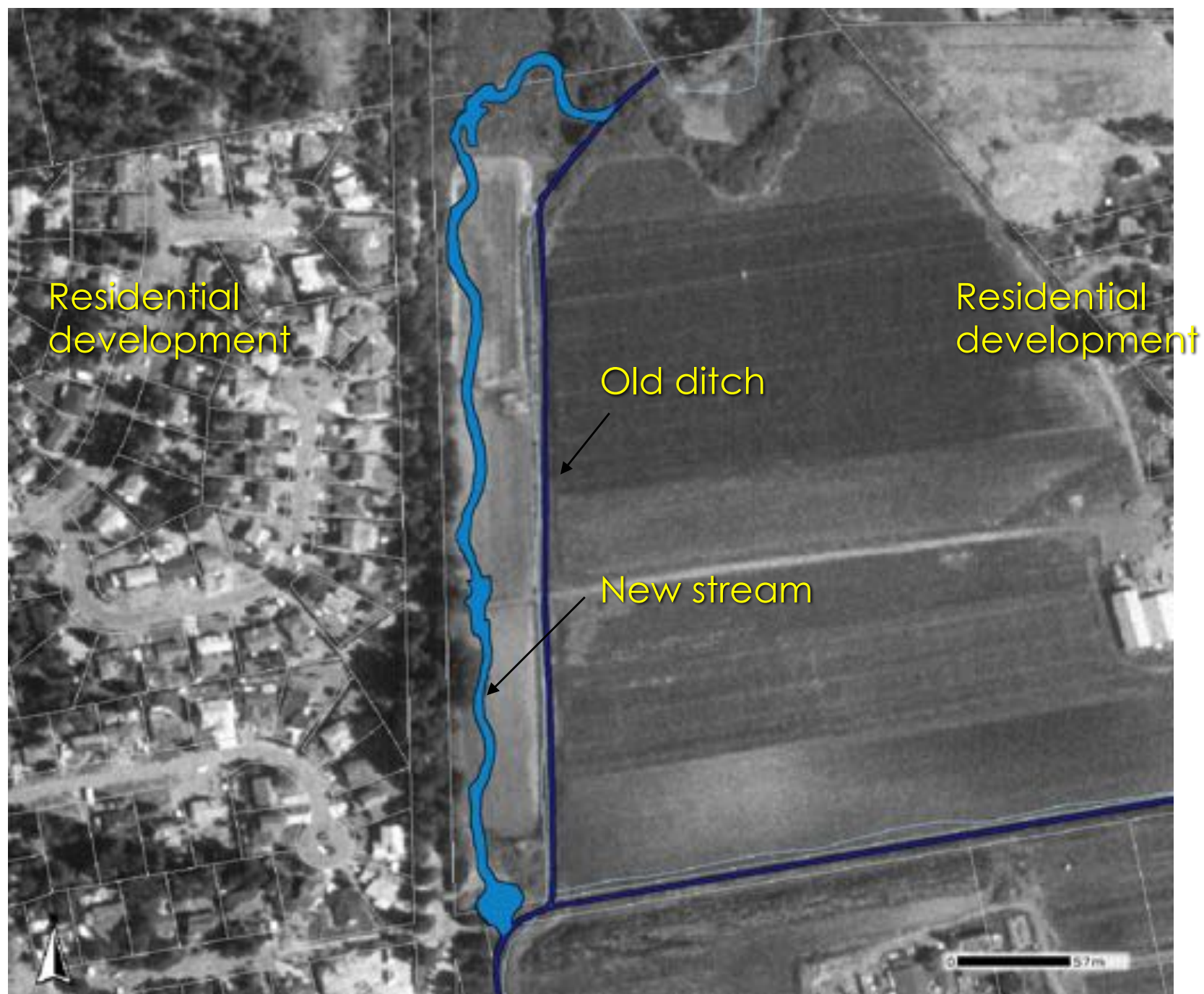


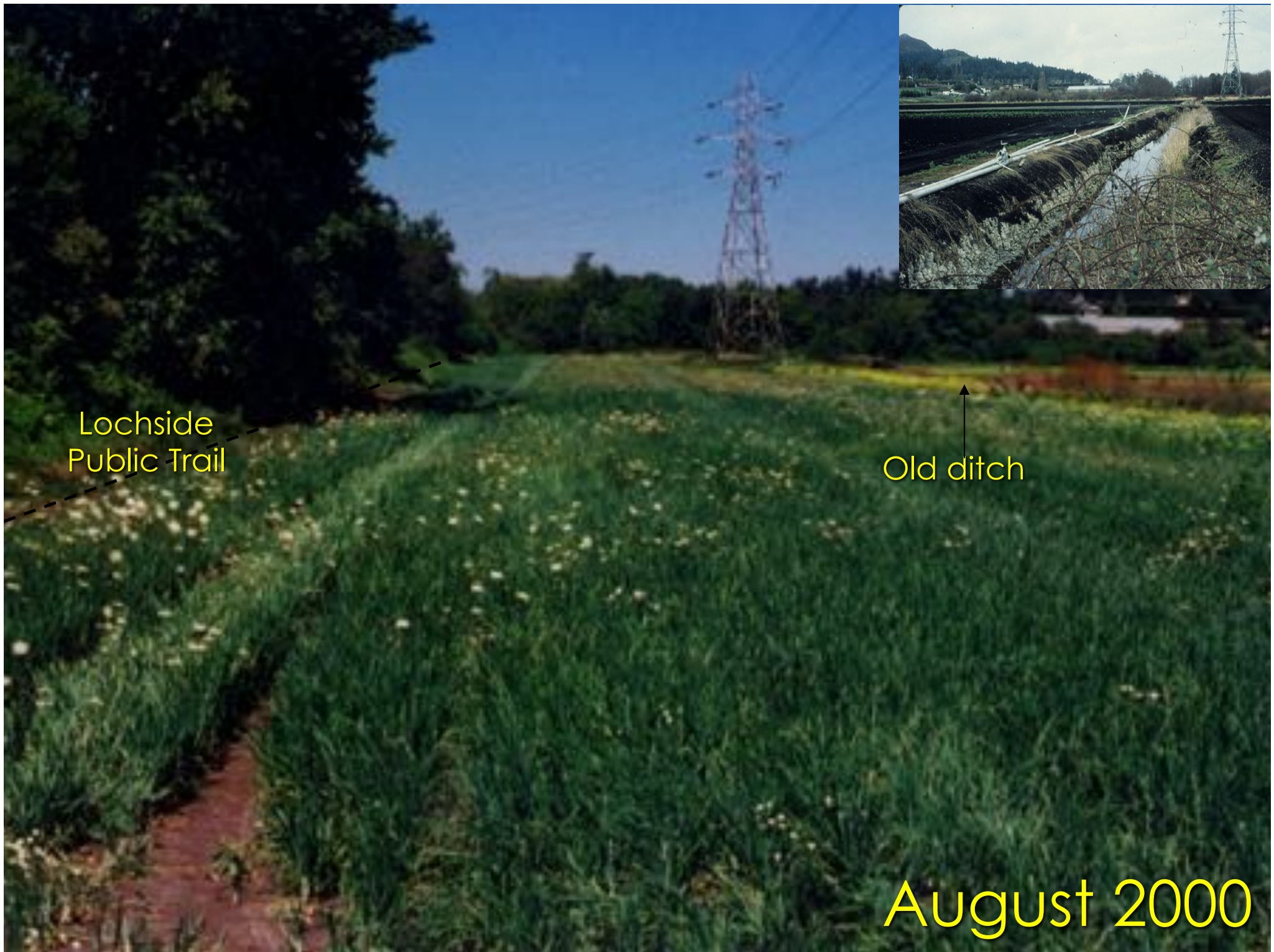
Site





*If you are thinking one year ahead, sow seed.
If you are thinking ten years ahead, plant trees.
If you are thinking one hundred years ahead,
educate the people.*





Lochside
Public Trail

Old ditch

August 2000



August 2001



2002 FCM-
CH2MHill
Sustainable
Communities
Award



May 2002



August 2000



August 2001



May 2010

Self-sustaining Valuation

- 13% more arable land
- Floodplain restored- reduced downstream flood risk
- Improved water quality
- 3.5 km potential restoration
- 40% less potable water for irrigation
- Pesticides eliminated
\$1600/ac/yr savings
- Net present value =
- \$500,000
- vs.
- \$300,000 cost to build

May 2010



Blenkinsop Valley: Green Valuation

Galey Farm Financial Summary

(PV= present value; red text =negative)

Blenkinsop (Traditional)	Municipality	Farmer
Installation of Ditch		(\$5, 200.00)
PV of Ditch O&M		(\$6, 631.69)
PV of Vandalism		(\$1,409,394.46)
Total Present Value	\$0.00	(\$1,421,226.14)

Blenkinsop (Sustainable)	Municipality	Farmer
Cost of Restoration		(\$375,000.00)
Cost of Connector Trail	(\$500,000.00)	
PV of the Cost of Financing		(\$26,607.17)
PV of Pesticide Savings (adjusted for the cost of integrated pest management)		\$497,657.18
Increased Value of the Land		\$75,000.00
PV of Potable Water Savings		\$8,548.33
PV of Flood Cost Avoidance to the Municipality	\$765,484.59	
PV of Ecological Benefit	\$12,006.19	
PV of Value of Carbon Stored and Sequestered	\$496.13	
PV of Trail Connector Benefit	\$3,302,784.65	
Total Present Value	\$3,580,771.55	\$179,598.34

	Municipality	Farmer
Net BENEFIT	\$3,580,771.55	\$1,600,824.48



Dockside Green: Before (Brownfield)

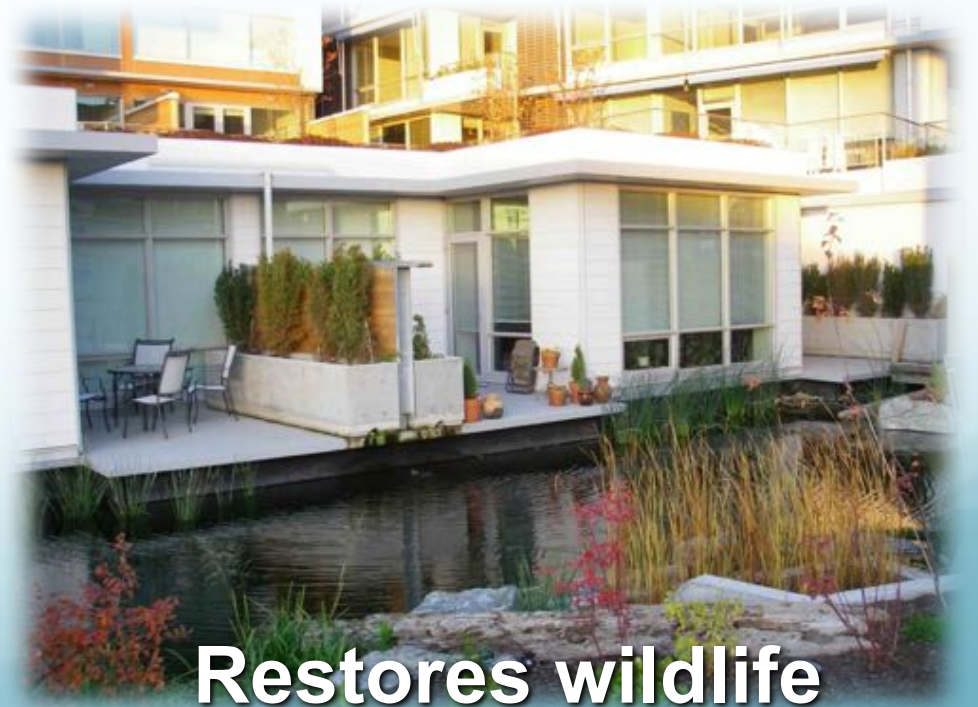
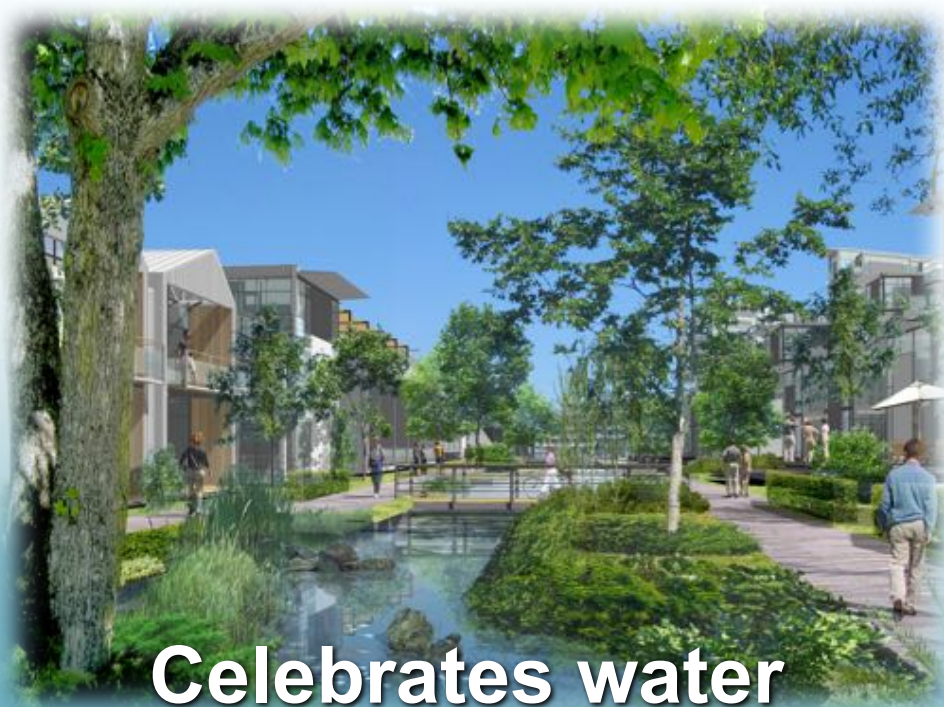


Dockside Green: After (Concept) LEED™ Platinum Redevelopment



Resource Integration
Water, Energy, Natural Capital

Regenerative, Adaptive Design





Hotel: off-site
energy sales

Biomass Energy
Plant (heat and
hot water)

Central
Waterway
(reclaimed water
& stormwater)

On-site Sewage
Treatment Plant





July 29 2013

Millennium Water - SEFC

Sustainable Master Planning – Energy

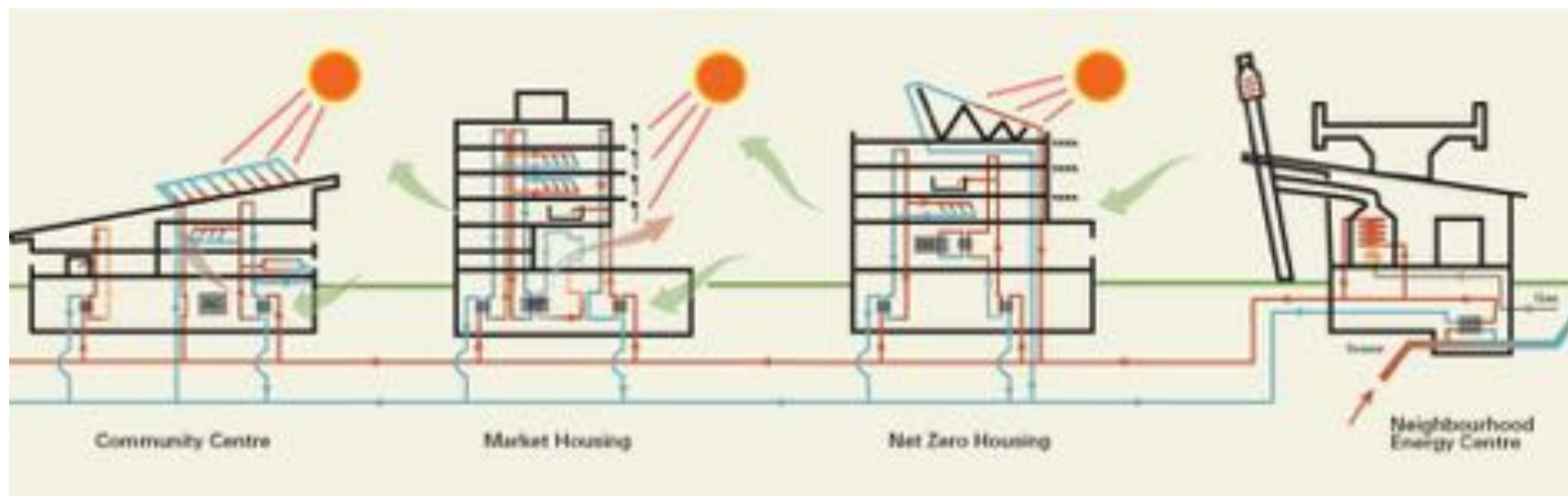
Southeast False Creek
Olympic Athlete's Village
Vancouver, BC

Southeast False Creek & the Olympic Village Site





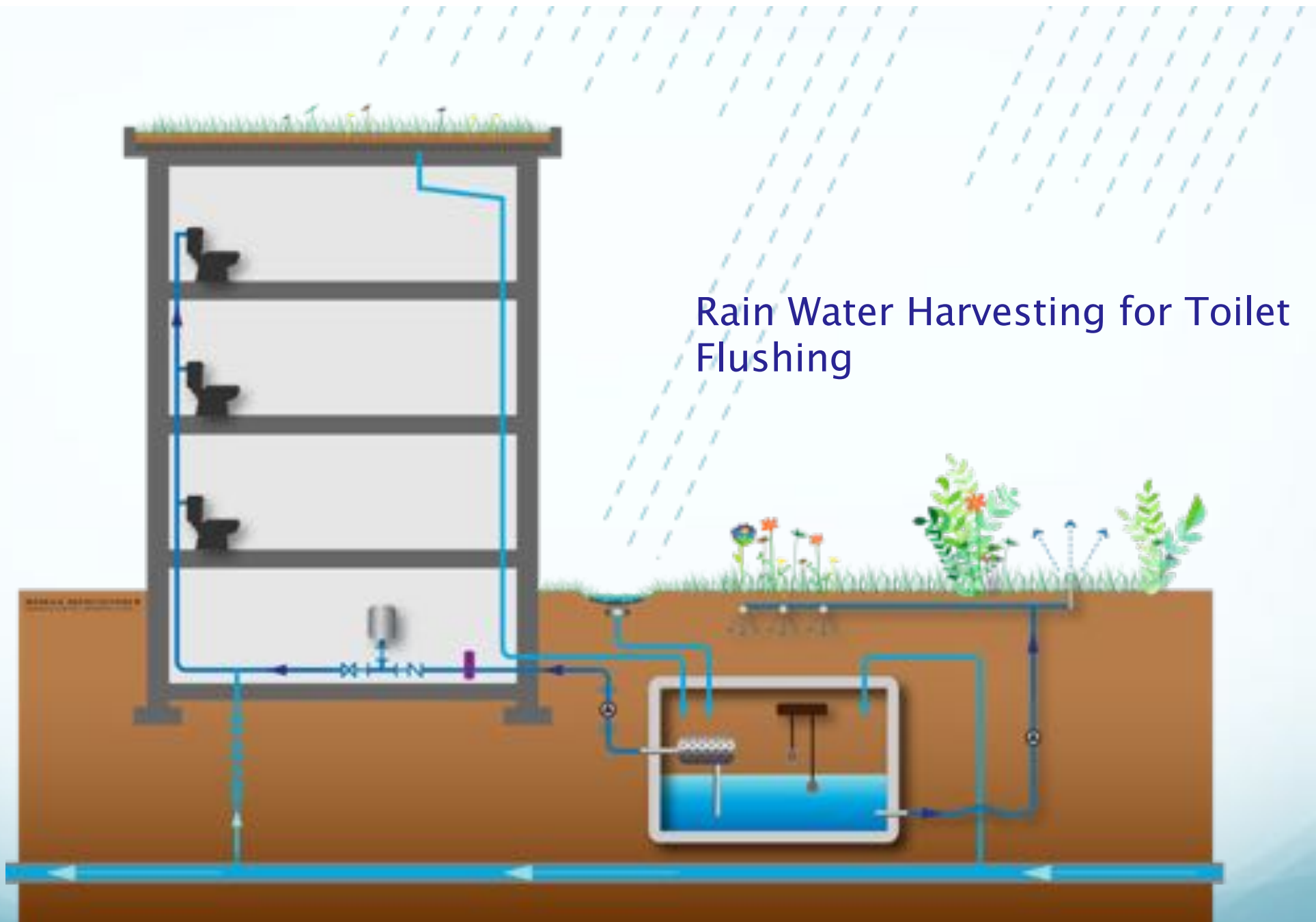
Neighbourhood Energy Utility



Parcel 10



Rain Water Harvesting for Toilet Flushing





ENERGY
USE

24%^{*} - 50%^{***}

CO₂
EMISSIONS

33%^{***} - 39%^{**}

WATER
USE

40%^{**}

SOLID
WASTE

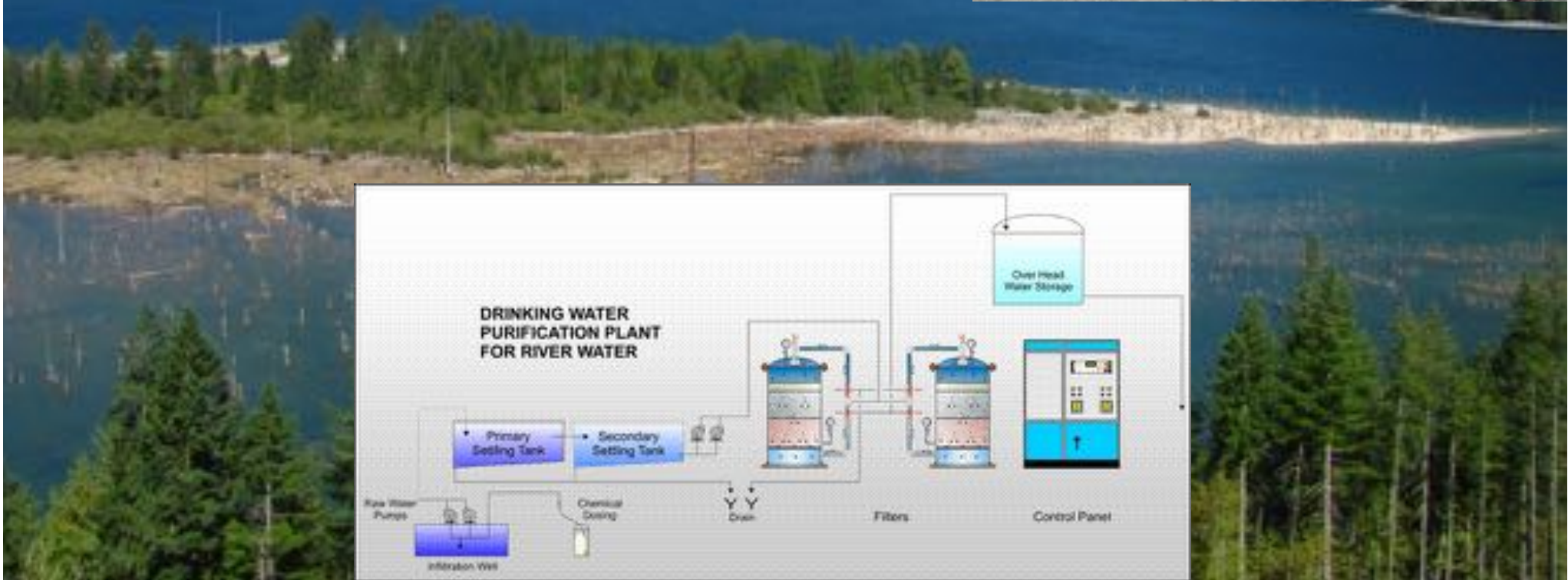
70%^{**}

Green Buildings Can Reduce...

^{*} Turner, T. & Brown, M. (2006). Energy performance of LEED for New Construction buildings. Final report.

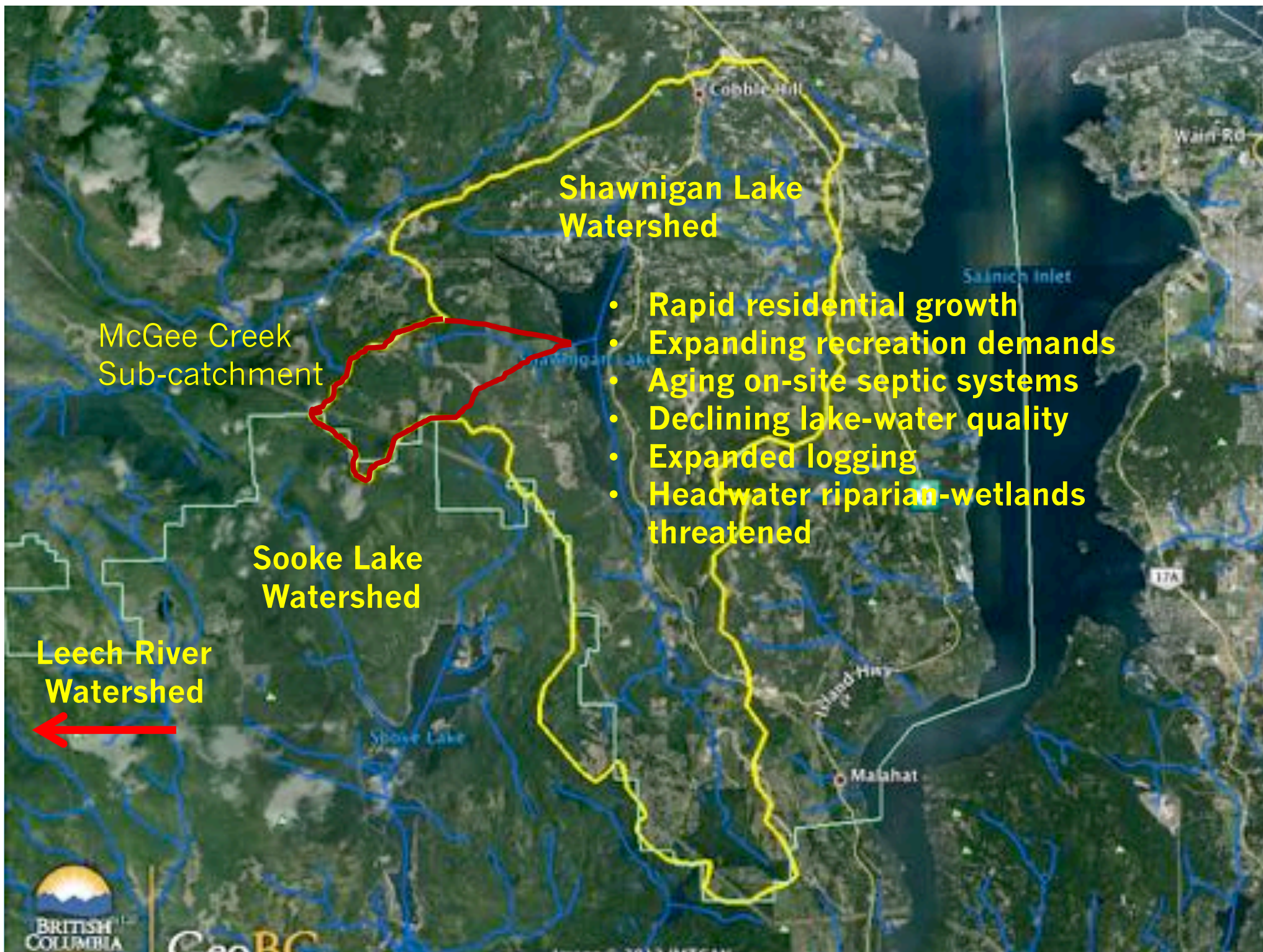
^{**} Bala, G. (2002). The Costs and Financial Benefits of Green Building. A Report by California's Sustainable Building Task Force.

^{***} GSA Public Buildings Service (2006). Boosting green building performance: A cost-benefit evaluation of 23 GSA buildings.



Deferral of a \$75 – \$100 million DWFP
Persistence Creek slope failure

- Mark Creek slides



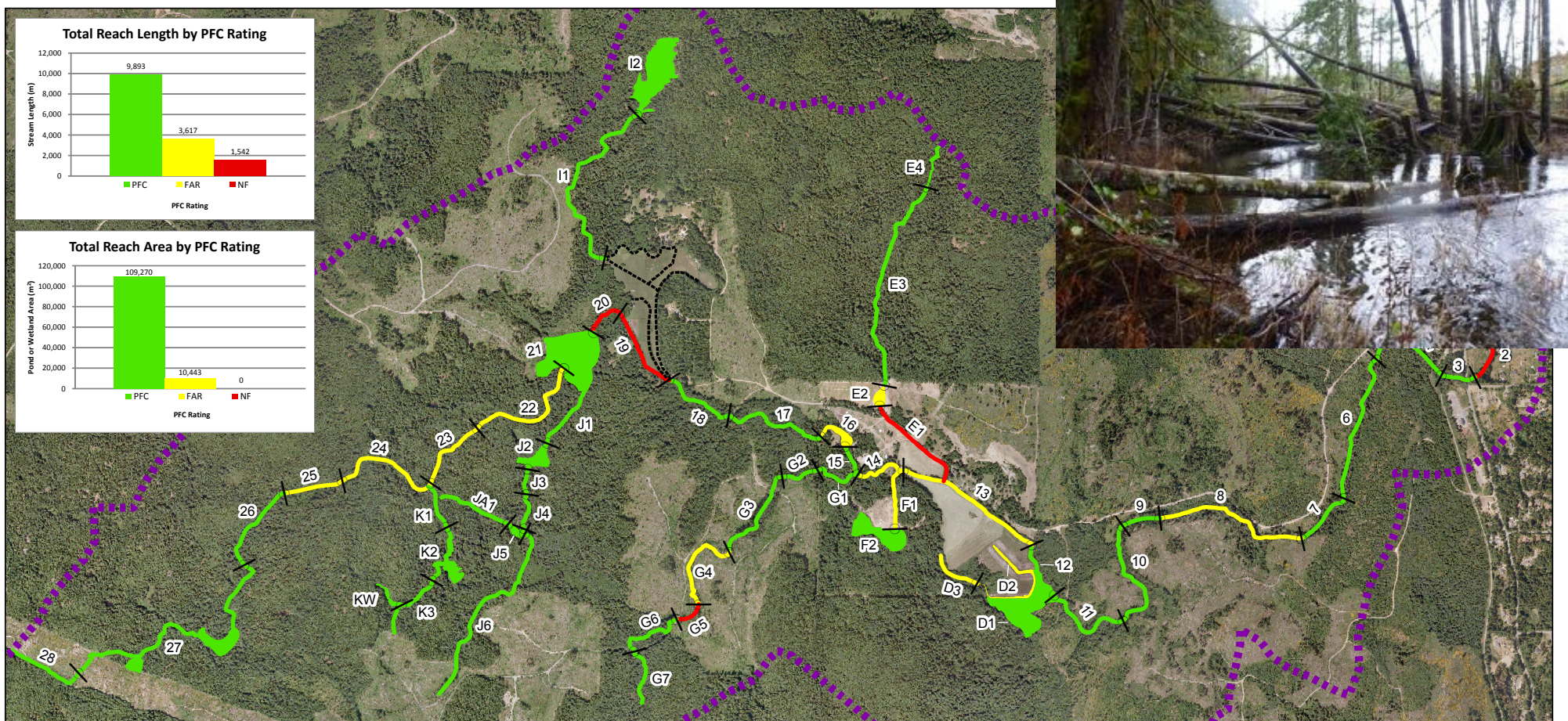
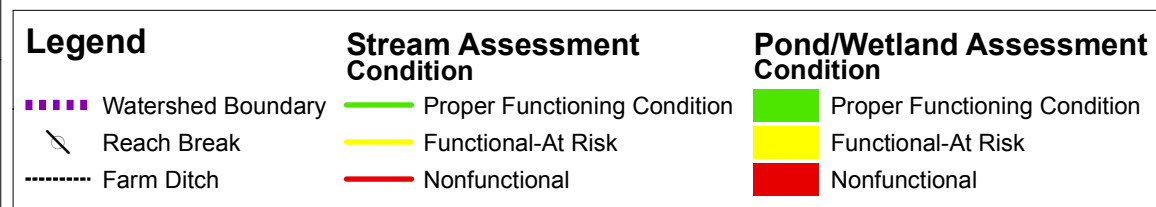


Figure 9: Proper Functioning Condition rating by reach for ponds, wetlands, and streams within the McGee Creek Watershed. Only assessed water features are shown.

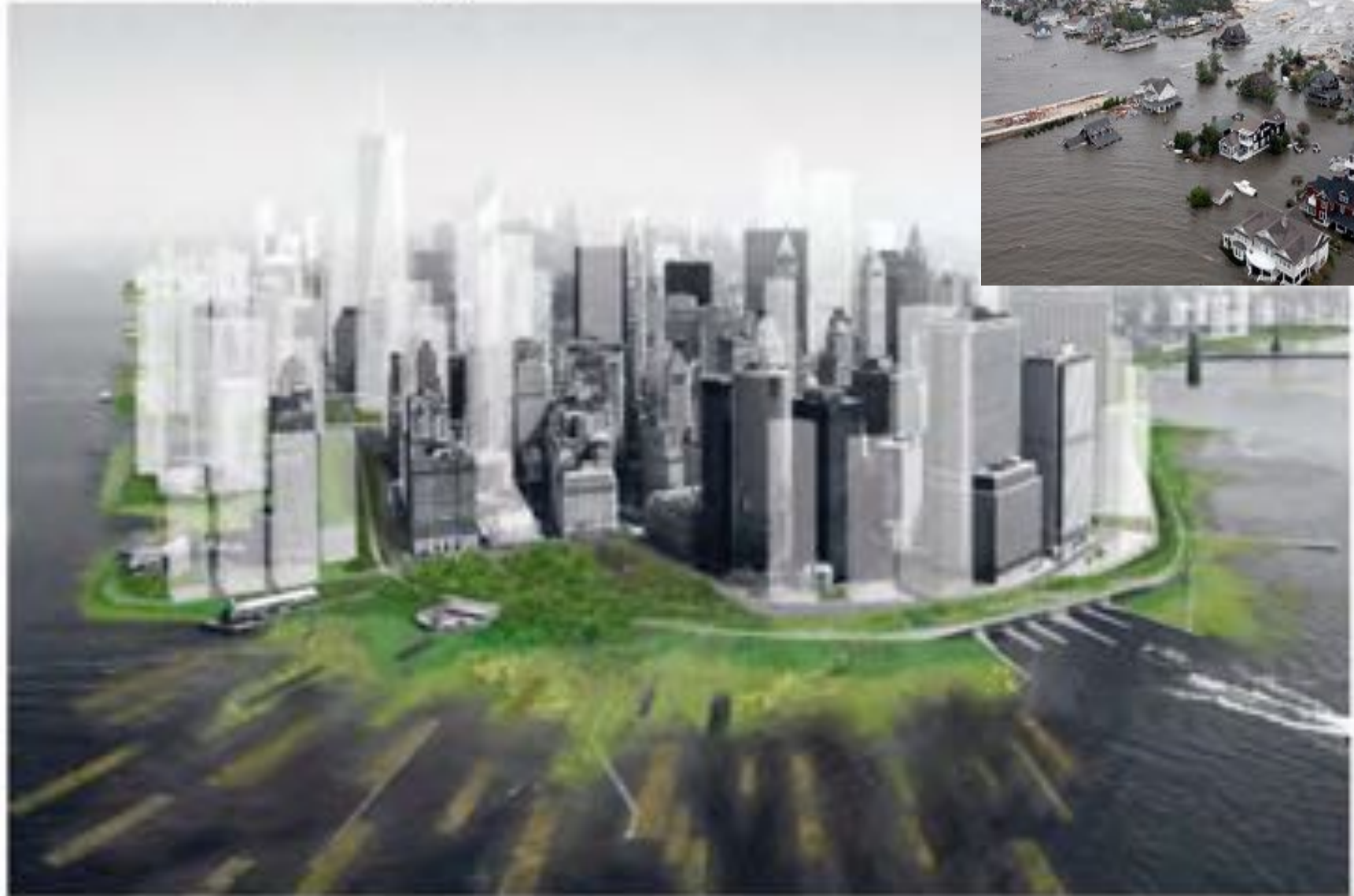


Lease ecosystem services from land owner (Timber West)

- Riparian buffers
- Wetlands
- 75 year lease; first Right-of-refusal to renew
- Gross vs. net valuation
- Long term forest land management
- Preserve DWQ in Shawnigan Lake
- Avoid expensive DW filtration
- Ecosystem services as municipal infrastructure



Protecting the City, Before Next Time



Architecture Research Office and diandaudio

URBAN WETLANDS A rendering of Lower Manhattan that shows tidal marshes to absorb waves.

By **ALAN FEUER**

Published: November 3, 2012



Q –can ecosystem services (Natural Capital) be valued in a free market economy?

Small ponds and riparian-wetlands bury carbon at flux rates greater than tropical forests, temperate grasslands, & oceans





1890



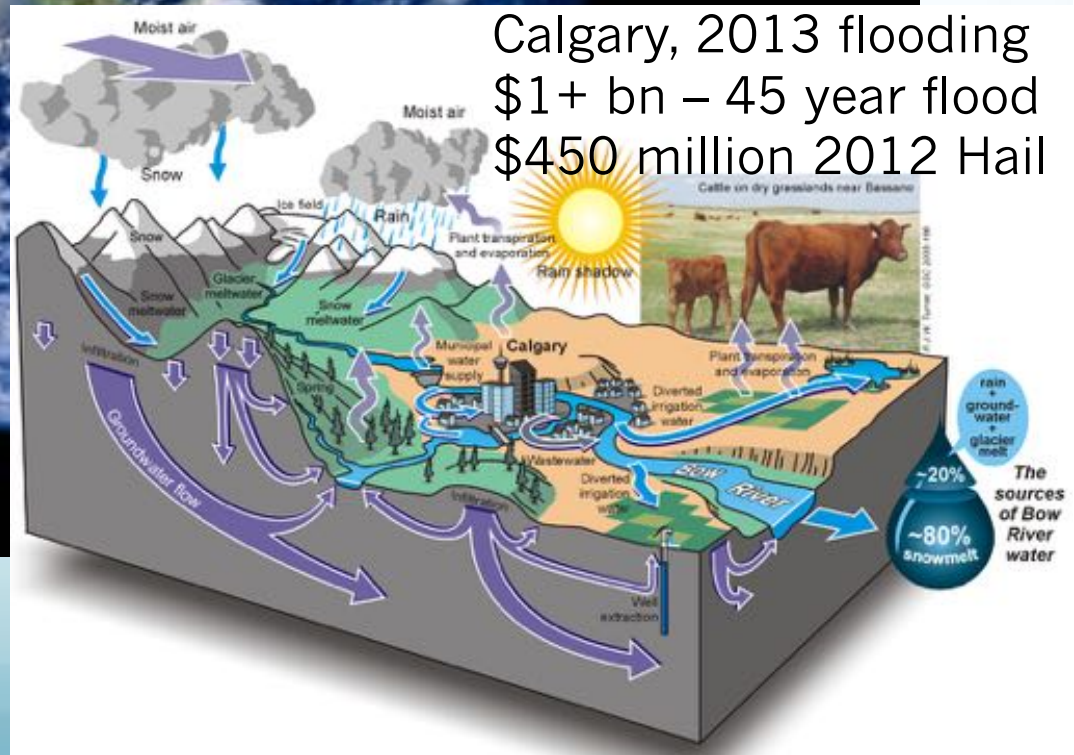
2012 Sandy = \$38-50 bn
2005 Katrina = \$100 bn



Houston – *we have a problem*



2010





We need a 21st Century Moon-shot



Houston – we have a solution

A Regenerative Economy in a
“*New Age of integrated &
inter-dependent design*”

**WE HAVE MET
THE ENEMY
AND HE IS US.**



©
1971
Walt
Kels