

Climate Change Scenarios - Lakes Michigan-Huron, St. Clair and Erie



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Huron-Erie Corridor/Lake St. Clair Research Needs Workshop 3.01
Windsor, Ontario

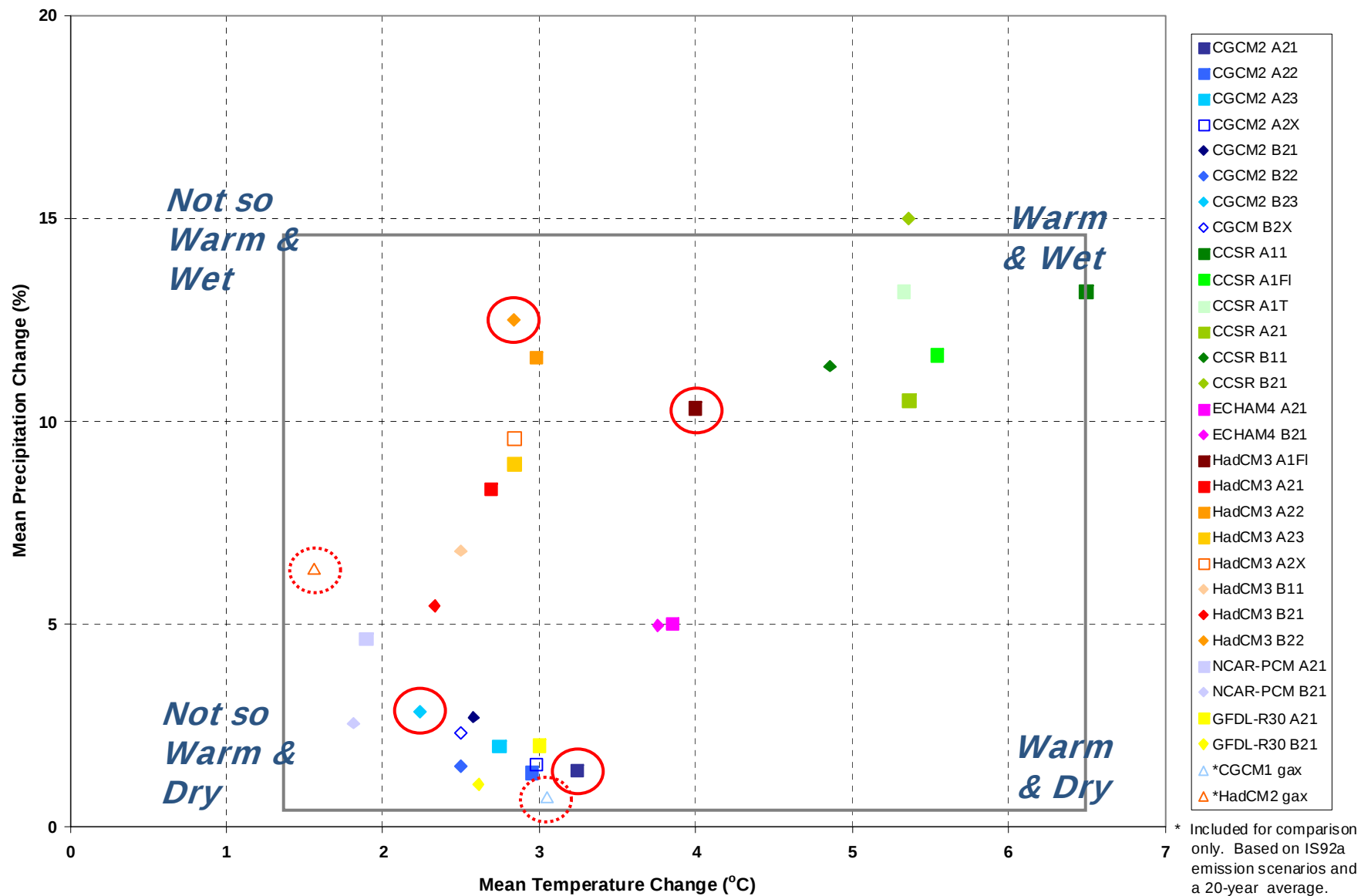
Feb 3, 2005

Most Scenarios = Low Water Levels

Lake/ River	Transient IS92a Results (with Aerosols)				Equilibrium 2xCO ₂ Results (No Aerosols)			
	CGCM1 2030	CGCM1 2050	Hadley 2030	Hadley 2050	CCC	GFDL	GISS	OSU
Superior	-22	-31	-1	-1	-23	-	-46	-47
Michigan- Huron	-72	-101	+5	+3	-162	-248	-131	-99
Erie	-60	-83	+5	+4	-136	-191	-116	-79
Ontario	-35	-53	+2	+4	-130	-	-	-
St. Lawrence at Montreal	-	-	-	-	-130	-	-	-

GCM climate change scenario impacts on mean annual water level - changes (cm) from reference level

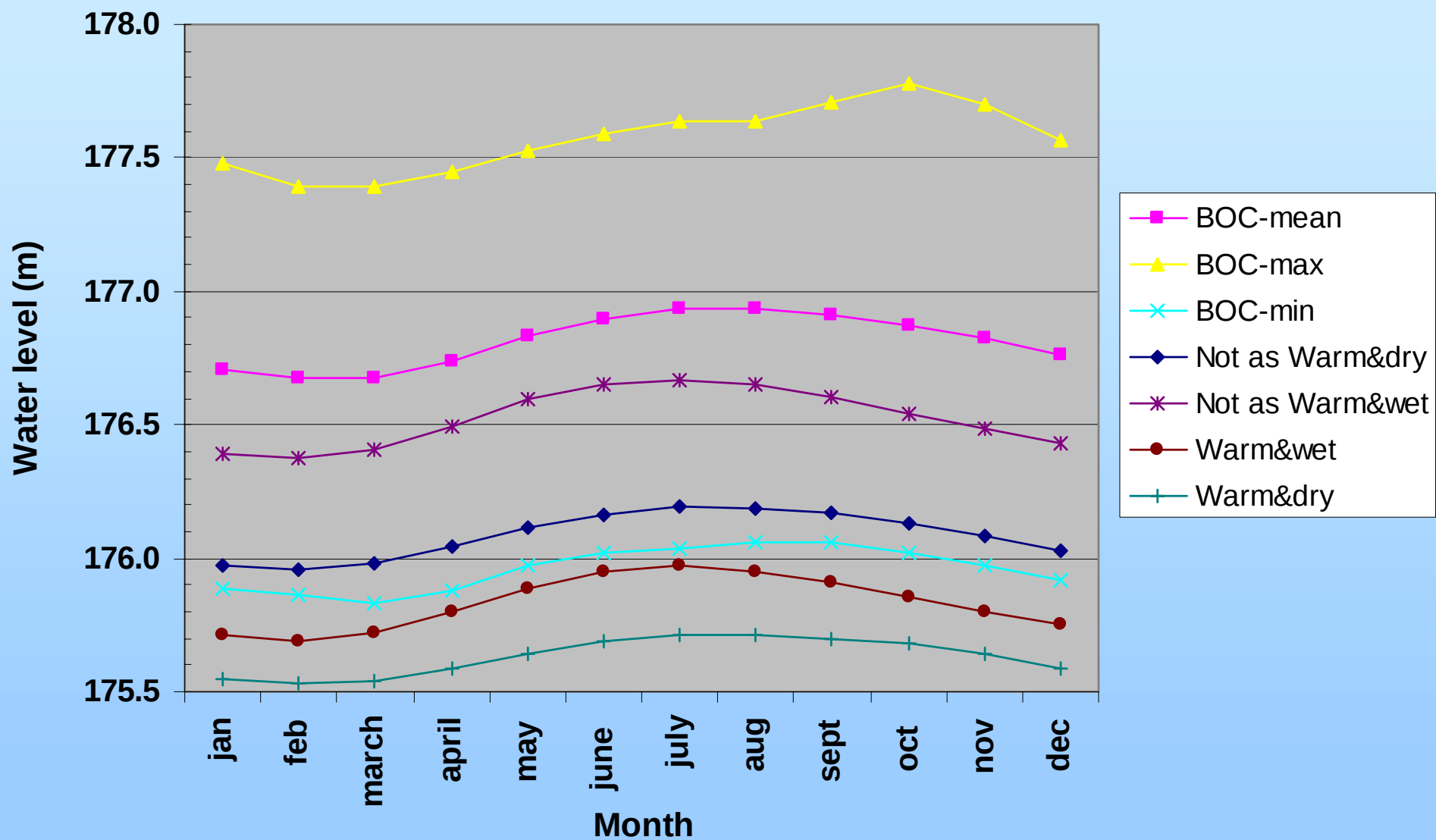
Range of T & P Conditions - Annual



Summary of area-averaged temperature change (T-°C) and precipitation change (P- %) for the four LOSLR Study climate change scenarios

GCM	ANNUAL	WINTER (DJF)	SPRING (MAM)	SUMMER (JJA)	FALL (SON)
HadCM 3 A1FI Warm & Wet	T +3.99 P +10.33	+3.09 +21.52	+3.57 +19.18	+4.44 +3.06	+4.07 +4.67
CGCM2 A21 Warm & Dry	T +3.24 P +1.40	+4.32 +4.38	+3.26 +4.39	+3.17 -1.60	+2.21 +1.28
HadCM 3 B22 Not so Warm & Wet	T +2.84 P +12.51	+3.33 +20.81	+2.35 +19.93	+3.08 +7.70	+2.60 +8.00
CGCM2 B23 Not so Warm & Dry	T +2.24 P +2.84	+3.17 +5.33	+2.57 +6.60	+2.32 +0.10	+1.60 -1.35

Michigan-Huron Water Level Scenarios



Lake Michigan-Huron - Water Level Scenarios

	BASE CASE	WARM & DRY	NOT-AS Warm & Dry	WARM & WET	NOT-AS Warm & Wet
LAKE STATISTICS					
Mean	176.81	175.63	176.08	175.83	176.53
Maximum	177.78	176.62	177	176.74	177.46
Minimum	175.83	174.61	175.06	174.73	175.43
Annual Range	1.95	2.01	1.94	2.01	2.03
CHANGE FROM BASE CASE					
Annual		-1.18	-0.73	-0.98	-0.29
Winter		-1.16	-0.73	-1.00	-0.32
Spring		-1.16	-0.70	-0.94	-0.25
Summer		-1.22	-0.74	-0.97	-0.27
Autumn		-1.20	-0.74	-1.02	-0.32
Growing Season		-1.21	-0.73	-0.95	-0.25

Source: David Fay & Yin Fan, Environment Canada

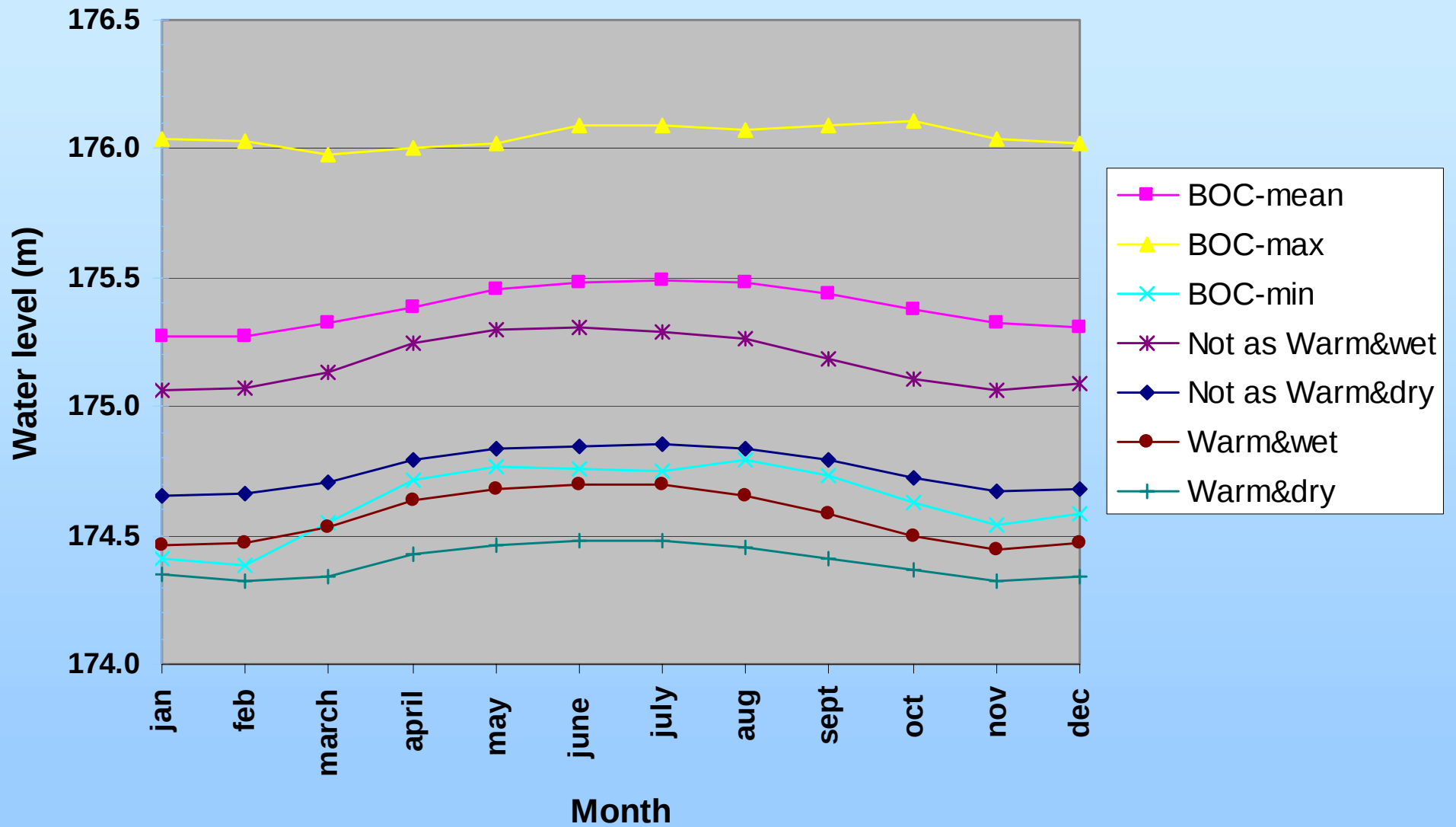
Peter's Marsh, Wisconsin Lake Michigan



- **1986:** prolonged high water has flooded the marsh

- **1999:** pale brown/whitish areas are recently exposed sand

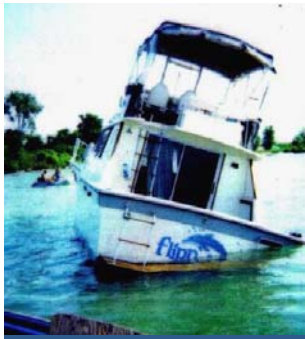
Lake St. Clair Water Level Scenarios



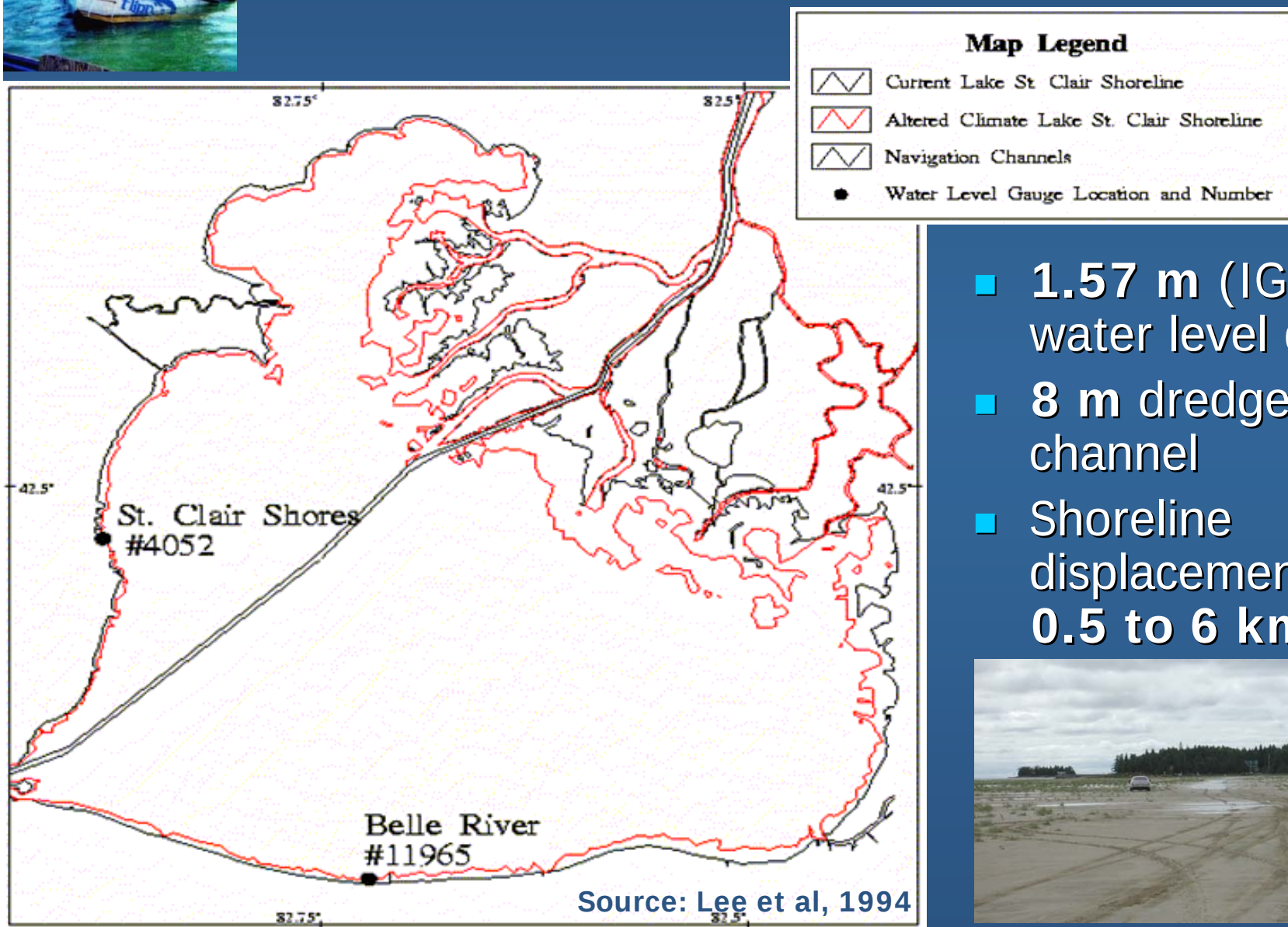
Lake St. Clair - Water Level Scenarios

	BASE CASE	WARM & DRY	NOT-AS Warm & Dry	WARM & WET	NOT-AS Warm & Wet
LAKE STATISTICS					
Mean	175.38	174.40	174.75	174.57	175.18
Maximum	176.11	175.12	175.43	175.36	175.95
Minimum	174.38	173.37	173.72	173.46	174.05
Annual Range	1.73	1.75	1.71	1.90	1.90
CHANGE FROM BASE CASE					
Annual		-0.98	-0.63	-0.81	-0.20
Winter		-0.95	-0.62	-0.81	-0.21
Spring		-0.98	-0.61	-0.77	-0.16
Summer		-1.01	-0.64	-0.80	-0.20
Autumn		-1.01	-0.65	-0.87	-0.26
Growing Season		-1.00	-0.63	-0.78	-0.18

Source: David Fay & Yin Fan, Environment Canada



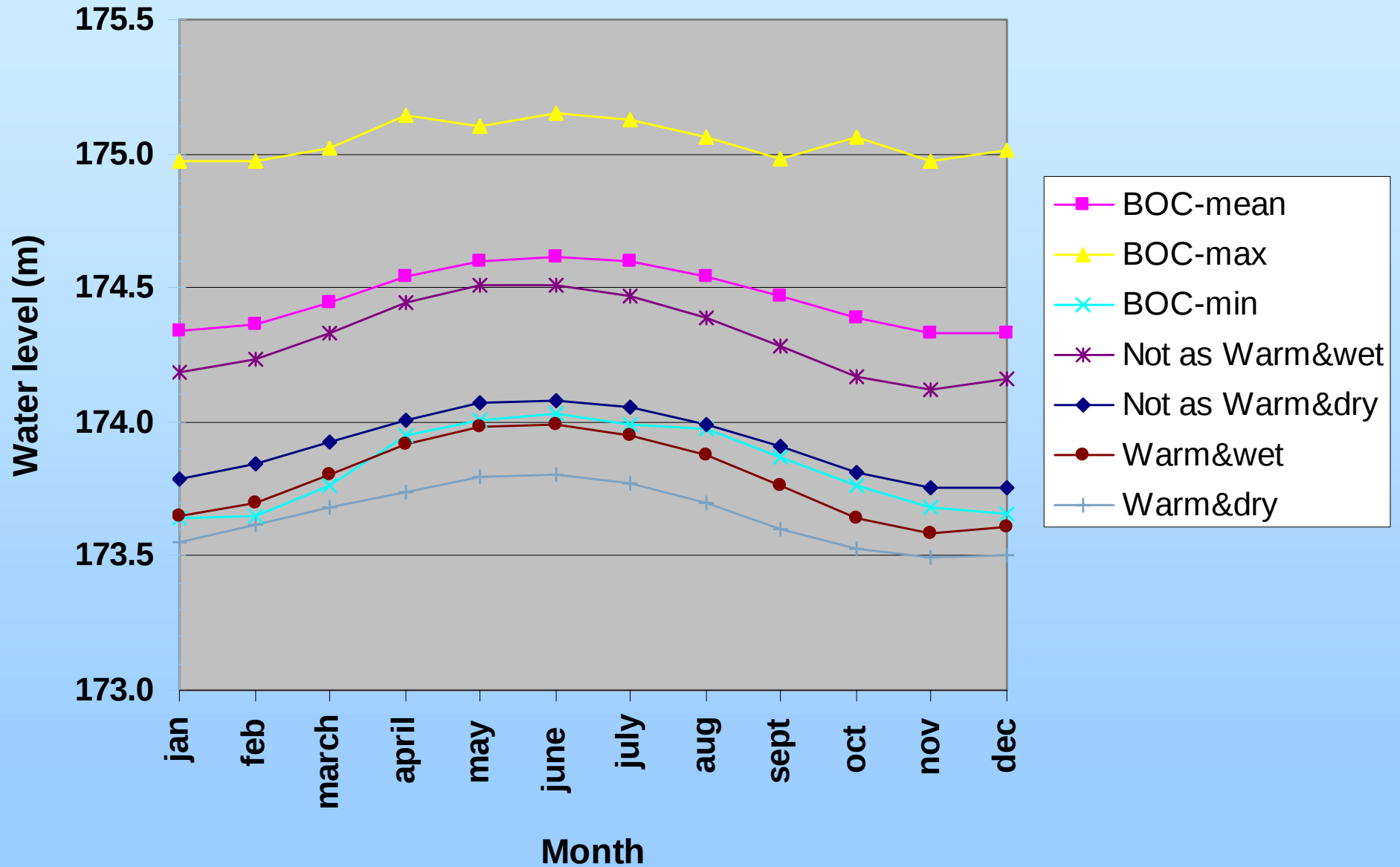
Lake St. Clair “What-if” Scenario



- 1.57 m (IGLD85) water level decline
- 8 m dredged channel
- Shoreline displacement from 0.5 to 6 km



Lake Erie Water Level Scenarios



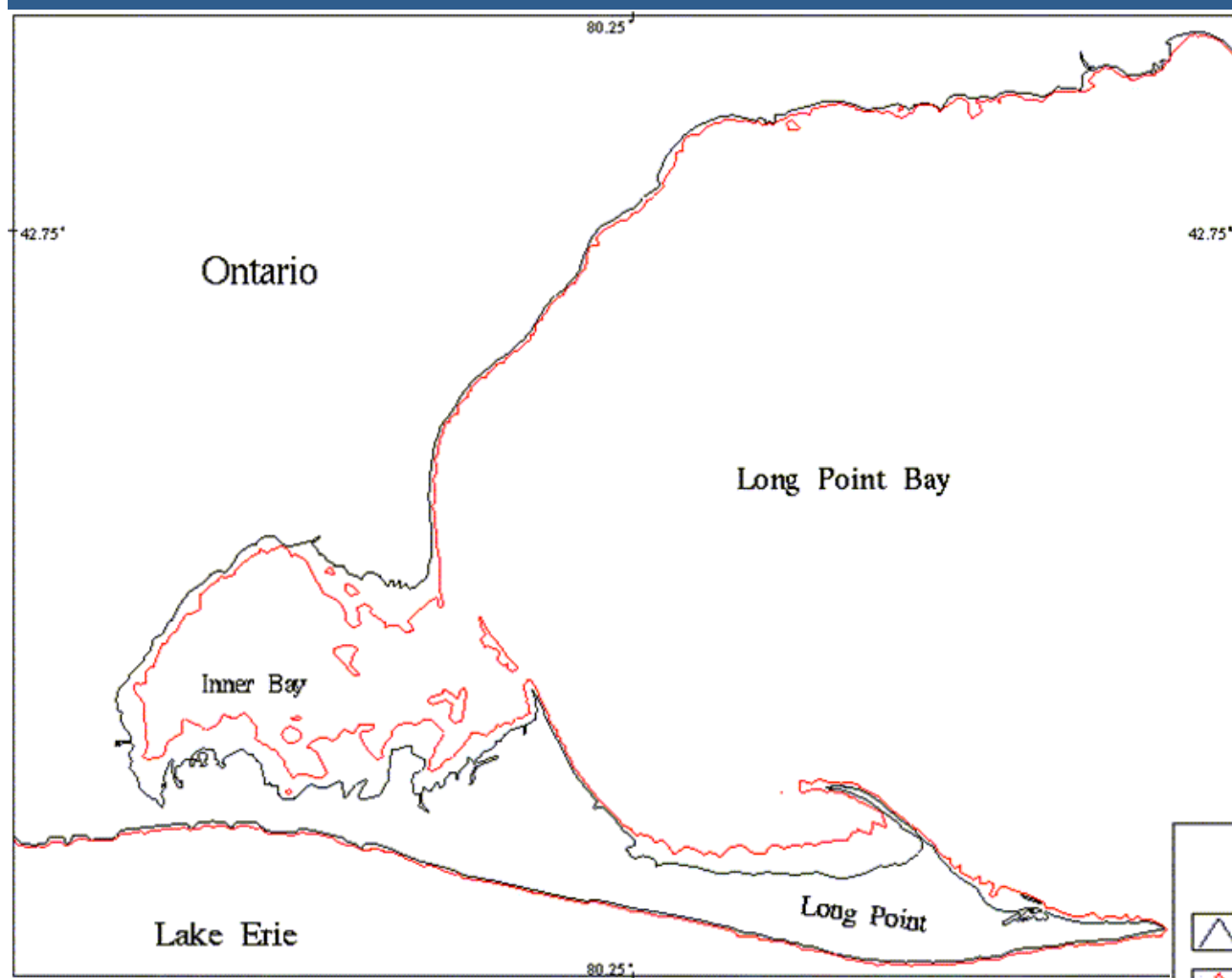
Lake Erie - Water Level Scenarios

	BASE CASE	WARM & DRY	NOT-AS Warm & Dry	WARM & WET	NOT-AS Warm & Wet
LAKE STATISTICS					
Mean	174.46	173.65	173.92	173.79	174.32
Maximum	175.15	174.34	174.58	174.56	175.08
Minimum	173.64	172.8	173.08	172.88	173.41
Annual Range	1.51	1.54	1.5	1.68	1.67
CHANGE FROM BASE CASE					
Annual		-0.81	-0.55	-0.67	-0.15
Winter		-0.79	-0.55	-0.69	-0.15
Spring		-0.79	-0.53	-0.62	-0.10
Summer		-0.83	-0.54	-0.64	-0.13
Autumn		-0.85	-0.57	-0.73	-0.21
Growing Season		-0.81	-0.53	-0.63	-0.11

Source: David Fay & Yin Fan, Environment Canada



Lake Erie (Long Point) “What-if” Scenario



- 1.48 m (IGLD85) water level decline
- Surface area of Inner Bay reduced by 32 %
- Shoreline moves from 0.2 km to greater than 2 km

Map Legend

- Current Lake Erie Shoreline
- Altered Climate Lake Erie Shoreline

Source: Lee et al, 1994

Most Scenarios = Lake Levels Decline

- **Decrease** in mean water levels in the Great Lakes
- **Seasonal Shift**



■ Sandy Point, 2001



■ Howdenvale, 2001

Oliphant, Lake Huron 2004



■ Government Dock

A photograph showing a long, wooden pier or dock extending into a body of water. The dock is made of weathered wooden pilings and has a small structure at its end. A small boat is visible in the water near the dock. The sky is overcast with grey clouds. In the foreground, there is a rocky shoreline with some debris.



■ Public Harbour

A photograph of a large, white and blue ship, possibly a ferry or tugboat, docked at a pier. The ship has a white upper hull and a blue lower hull. The pier is made of concrete or stone. The background shows a line of trees and a cloudy sky. The foreground is a flat, sandy or muddy area.

Mouth of Ox River, Wisconsin (Nov. 20, 1999)



Source: <http://www.uwgb.edu/biodiversity/news/marshes.htm>

Long-term Water Levels - 1865-2004

