Drought Indicators, Triggers and Responses

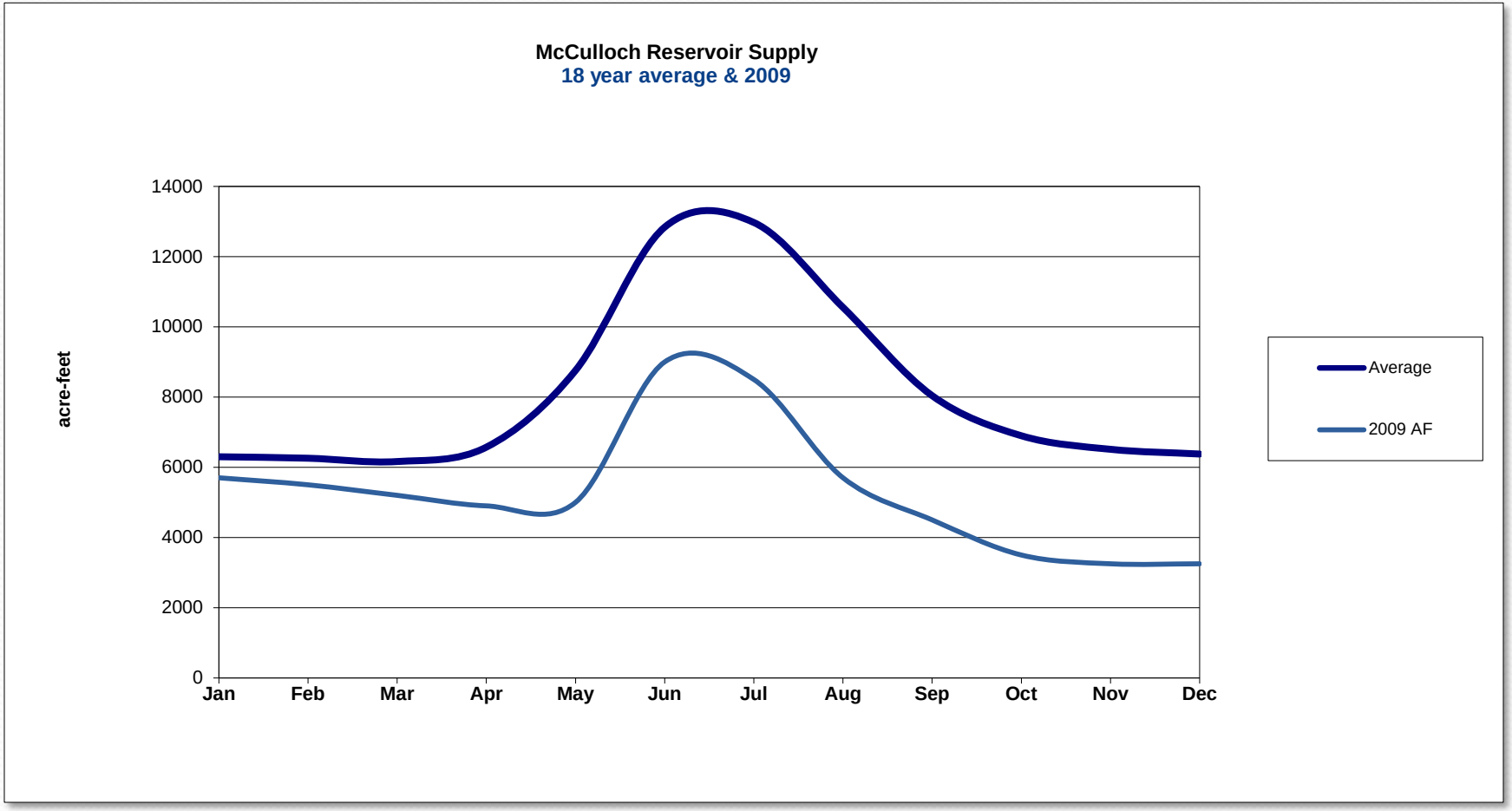
June 3, 2016

Drought Workshop

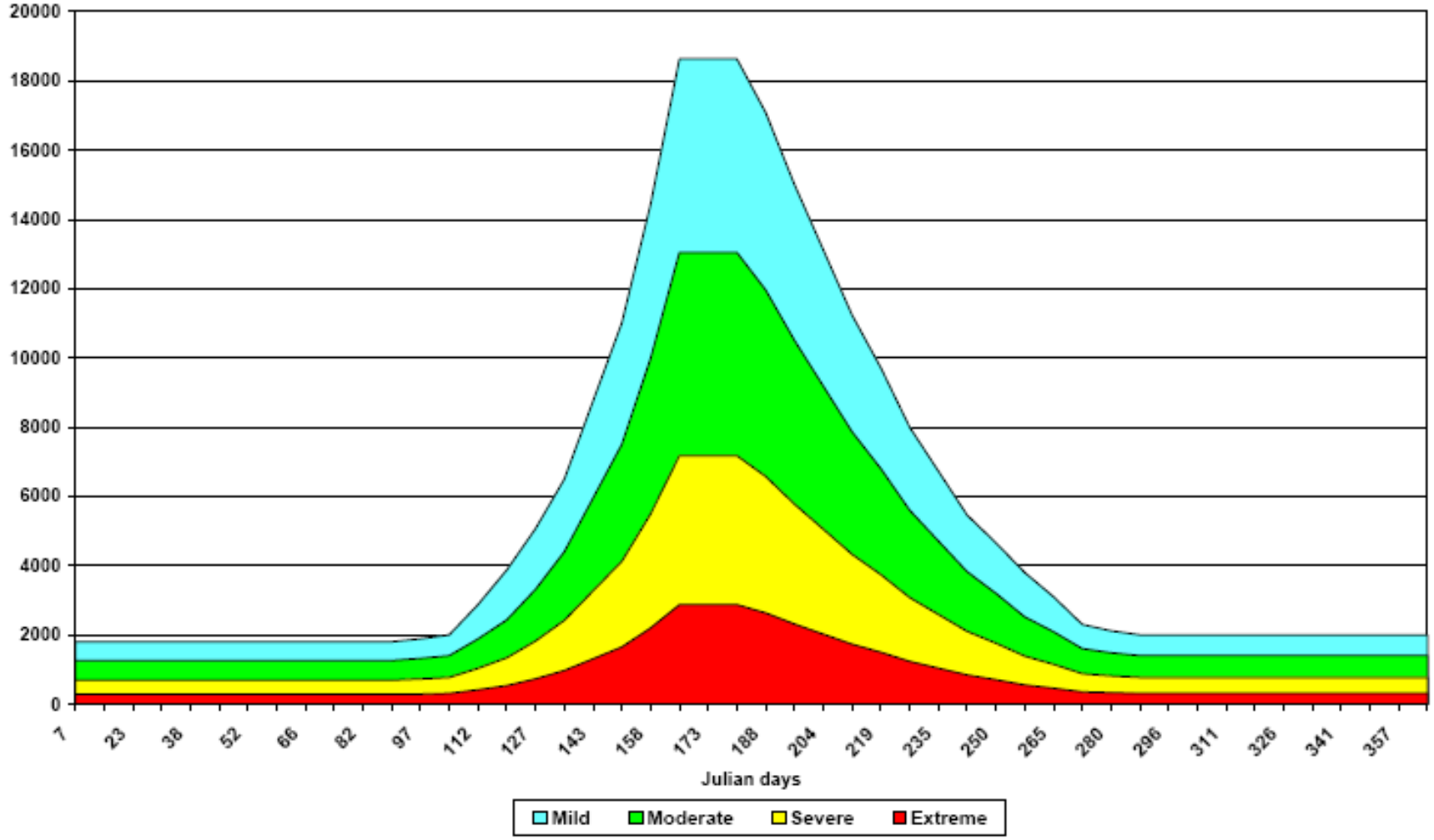
Indicators

- Low reservoir levels
- Low snowpack
- Weather trends, long term forecasts
- Experience/intuition

SEKID Trigger



Trigger Graph



Responses – demand management

- Implement demand management program
  - Ag - declare as early as possible – you can always back off
    - Domestic through newsletter and web site
    - Agricultural through allotment notices
  - Conservation targets identified in the Drought Plan
  - Enforce regulations early to set the tone
    - Staff resources for bailiff duties
    - Follow though on complaints from neighbors
    - Assess conservation effectiveness

Coordinated drought plan

Table 4.26 - Kelowna Coordinated Drought Plan (2010)

PROVINCE	NORMAL	STAGE 1 - DRY	STAGE 2 - VERY DRY	STAGE 3 - EXTREMELY DRY	LOSS OF COMMUNITY SUPPLY
LOCAL	NORMAL STAGE	MILD DROUGHT	MODERATE DROUGHT	SEVERE DROUGHT	EMERGENCY
INTRODUCTION AND EXPLANATION OF DROUGHT STAGES	Normal stage is to provide reasonable allotments for all typical water uses while at all times continuing to educate and inform the public. The majority of water use savings in Kelowna will be related to outdoor water use. Water conservation is to be practiced both inside and outside the home, but continued provision of home drinking water and sanitation is critical to community health.	Drought is the early stage where there is heightened awareness by the community. The primary objective at this stage is to inform the public of the potential for a more severe drought to occur. Increased monitoring and education are key to this stage. The intent is to call this stage earlier in a cycle so that the potential to move to the moderate and severe stages is reduced.	Drought condition is established with prolonged periods of no rain and hot and dry weather. Raw water supplies are becoming stressed and condition requires higher levels of reduction, monitoring, and enforcement. At this stage, more severe cutbacks in usage are implemented.	Severe drought condition is present. Large cutbacks are required to save water for critical community services of fire protection and water for drinking and sanitary purposes. All outdoor water use is cut off. Objective is to minimize use of all remaining water.	EMERGENCY RESPONSE PLANS AND PROVINCIAL EMERGENCY PROGRAM may kick in for this stage. No spare water is available. Water is used only for drinking and sanitary purposes. Fire protection may be compromised.
GOAL	Efficient on-going water use practices	10% REDUCTION IN TOTAL AND PEAK USE	20% REDUCTION IN TOTAL AND PEAK USE	35% REDUCTION IN TOTAL AND PEAK USE	MAINTAIN HEALTH OF THE COMMUNITY
RECOMMENDED COMMON DROUGHT REGULATIONS AND RESPONSE					
Domestic	Odd-even sprinkling with sprinkling allowed to all properties on the 31st day of the month U/G sprinklers 10:00pm-6:00am. Allowed response and irrigation times to spread out irrigation over a longer time so that peak use is buffered. Day of watering (odd or even) is set based on 18:00 pm start time and carrying over into the next day for six hours.	Odd-even sprinkling but no sprinkling on 31st day of month Same as normal but no sprinkling on 31st day of month	Reduced to 2 x per week No non-essential watering, sprinkling reduced to two days per week	All outdoor water prohibited None, all outdoor water prohibited, except food gardens, with hand watering by garden hose	Only lifeline service provided (if possible) None
Industrial, Commercial Institutional	Indoor - business as usual Outdoor - same as domestic U/G sprinklers	Indoor - business as usual Outdoor - same as domestic U/G sprinklers	Indoor - reduction expected for indoor uses, closer monitoring of high users Outdoor - same reduction as domestic U/G sprinklers	Indoor - all unnecessary process uses stopped, closer monitoring of high users Outdoor - all outdoor watering prohibited	Only lifeline service provided (if possible)
Class1 Parks 200ac High profile community parks, beach parks, sportsfields, cemetery	Sufficient watering to maintain healthy sports fields to accommodate high level of activity	A 10% volume reduction through irrigation system programming.	20% reduction through irrigation system programming.	35% reduction through irrigation system programming.	Shut off.
Class2 Parks 160ac Neighbourhood parks, boulevards, medians	5 days per week	A 10% volume reduction through irrigation system programming.	20% reduction through irrigation system programming.	Shut off	Shut off.
Class3 Parks 6ac Ornamental, greenspaces	3 times per week.	A 10% volume reduction through irrigation system programming.	20% reduction through irrigation programming	Shut off	Shut off.
Golf Courses	Golf courses are metered with volumetric flow restriction. Maximum water rate to golf course is 4.5 to 5.0 USgpm, depending on soils, but can be buffered by on-site storage ponds	Volumetric	A 20% reduction in total annual allotment. Majority of local golf courses have balancing reservoirs that allow for balancing of daily demands and collection of local drainage and surface runoff.	35% reduction from normal annual allotment. Annual allotment to golf course is reduced similar to that of agriculture. Application of water is expected only to high value areas such as greens.	None permitted
Agriculture	4.5 to 5.0 USgpm/acre unless soils dictate otherwise. Annual allotment based on depth of water irrigated over an area per year	A 10% reduction of normal annual allotment	A 20% reduction in total annual water allotment. If depth is 27 inches, reduced depth is to 21.6 inches.	35% reduction in total annual allotment. If depth is 27 inches, reduced depth is to 17.6 inches. Farmers informed early based on reservoir storage levels.	All outdoor use prohibited except water for livestock
COMMUNICATIONS AND ENFORCEMENT					
	Normal levels of communication and education as per the bylaws, regulations and policies of each individual water utility. Normal levels of enforcement.	Increased education. Enforcement level and efforts is increased. This may result in increased monitoring of large users and addressing complaints by the public to a higher priority level. Warnings issued and some tolerance may be allowed.	High level of education and communication is maintained. Enforcement effort is increased with a higher priority placed on tightening up all water use. Fines issued and water utilities are actively seeking efficiencies.	High education and communication. High level of enforcement. Zero tolerance policy on abusers. Enforcement may involve issuing fines, or metering curb stops, depending on utility bylaw.	High education and communication. High level of enforcement. Zero tolerance policy on abusers. Enforcement may involve issuing fines or shut-off of service, depending on utility bylaw.
TRIGGERS	PRIMARY INDICATOR		SECONDARY INDICATOR		
BMID	(April - June) Snowpack and watershed hydrology (July-October) Reservoir Storage levels		Level of drought stage in adjacent utilities and regional drought level		
CITY	(April - June) Lake inflows, (June - September) Lake inflows levels in comparison with seasonal averages		Level of drought stage in adjacent utilities and regional drought level		
GEID	(April - May) Snowpack and watershed hydrology (June-October) Reservoir Storage levels		Level of drought stage in adjacent utilities and regional drought level		
RWD	Static water level in groundwater wells		Level of drought stage in adjacent utilities and regional drought level		
SEKID	(April - May) Snowpack and watershed hydrology (June-October) Reservoir Storage levels		Level of drought stage in adjacent utilities and regional drought level		

Effective demand management key

Government of Canada / Gouvernement du Canada
Policy Research Initiative / Projet de recherche sur les politiques

SUSTAINABLE DEVELOPMENT
BRIEFING NOTE

Does Pricing Water Reduce Agricultural Demand?
An Example from British Columbia

Highlights

- The pricing program established in 2000 in the South East Kelowna Irrigation District (SEKID) has had a significant impact on the demand for water per hectare.
- The metering and education programs established in the same area in 1994 (six years before the pricing program) did not have a strong impact on water use.
- There was a long-term decline in irrigation water use per ha in SEKID prior to the metering and pricing programs, possibly due to the gradual replacement of older technology, a shift toward crops that are less water-demanding, or gradually heightened awareness over time.

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Background

Agriculture is the largest consumer of water in Canada, as in most countries. With expansion of irrigation agriculture in many regions, and possible increases in drought and reductions in supply due to global warming,[1] finding ways to encourage agricultural water use efficiency without impairing productivity is urgently needed.

Volume-based pricing of water has long been promoted as a tool for managing demand, though in Canada, there are few rigorous studies of its effectiveness. Those studies that are available are restricted to largely urban domestic water use.[2] In addition, as volumetric pricing requires metering (which is itself an educational tool), it has been difficult to separate the effects of metering and education from those of pricing.

The South East Kelowna Irrigation District (SEKID) in interior British Columbia, presents a rare opportunity to disentangle the effects of metering and education from the effects of pricing. A preliminary analysis, comparing water use in drought years before and after the implementation of metering and pricing, suggested a minor reduction in water use due to metering and education, and a larger effect from pricing (Pike, 2005).

This Briefing Note, the fifth in a series on economic instruments for water demand management,[3] explores the SEKID example in greater detail. Presenting the first rigorous analysis of the effect of water pricing in Canada that takes weather into account, we find no strong evidence of an effect from metering and education. Pricing, however, seems to have significantly reduced water use.

The South East Kelowna Irrigation District

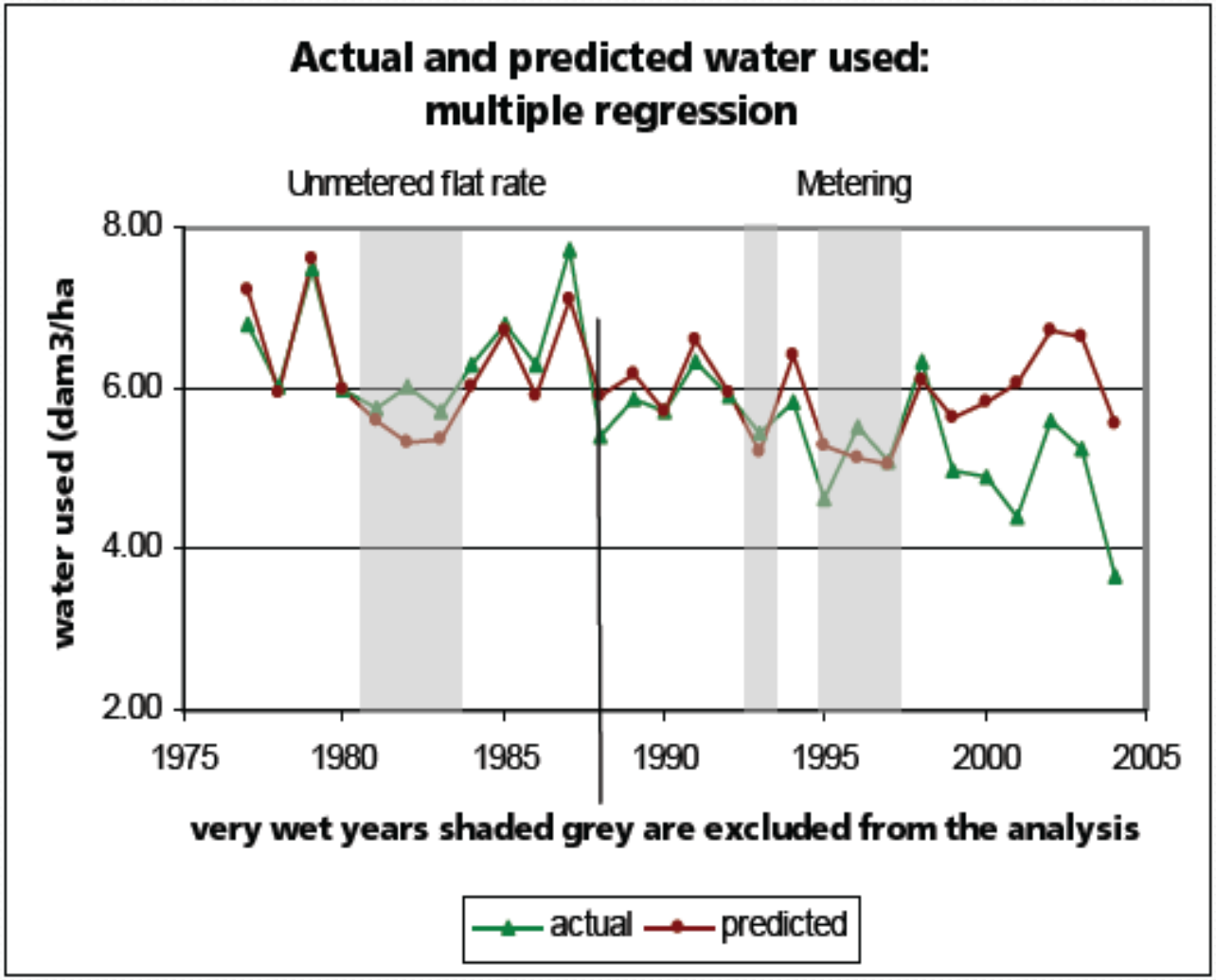
The SEKID serves 2,282 ha of mainly orchard land in the semi-arid Okanagan Valley of southern British Columbia. It currently has 2,300 water connections, including 400 irrigation connections. Approximately 85 percent of the water used in the SEKID is for agricultural irrigation. The SEKID draws its water from reservoirs that are primarily replenished by spring melt of the snow pack in the 65 km^2 watershed. It is considered highly vulnerable to climate change, which is expected to both reduce the snow pack and increase irrigation water demand.

Canada

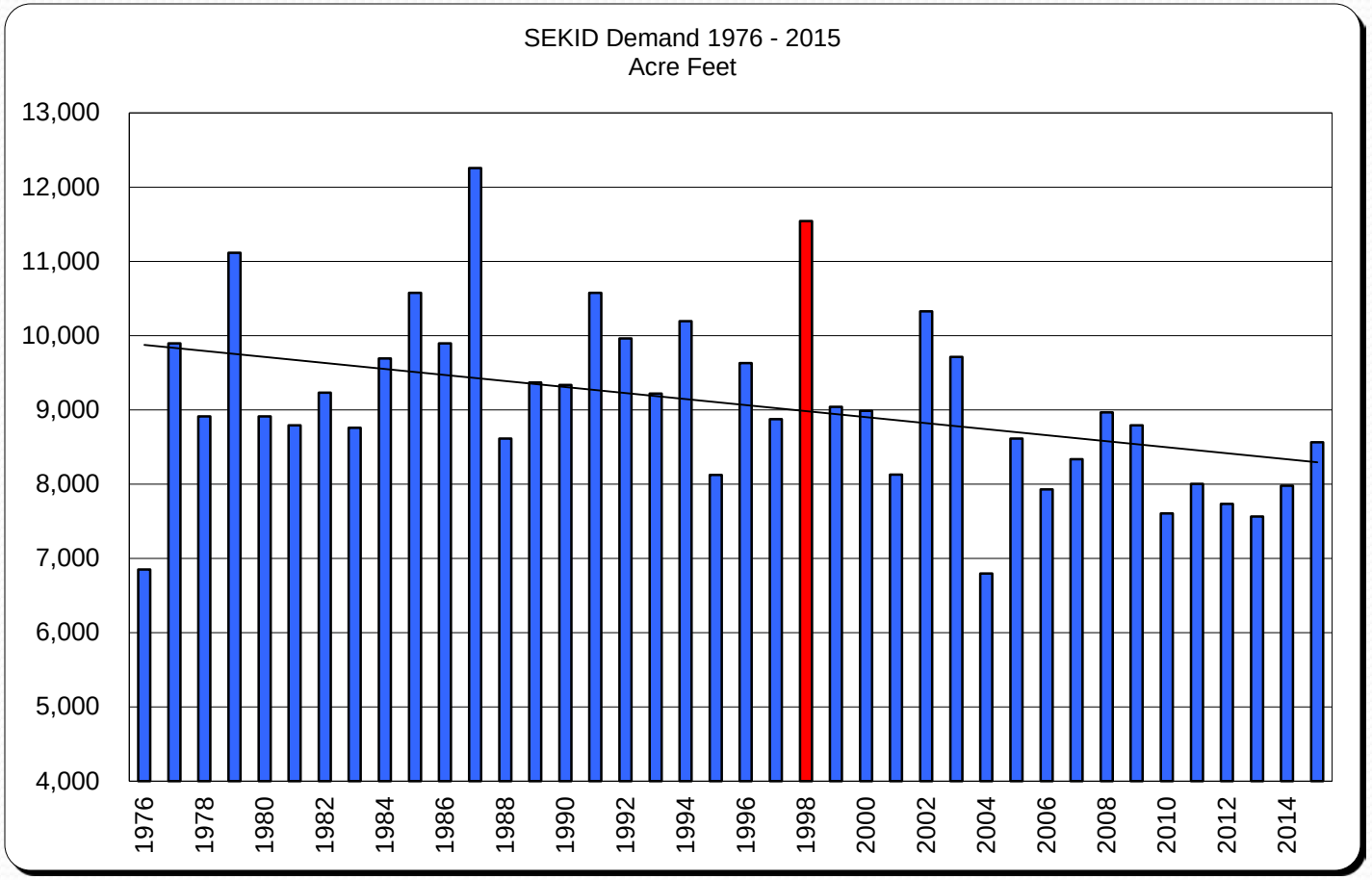
"Presenting the first rigorous analysis of the effect of water pricing in Canada that takes weather into account…"

"The Pricing program established in 2000 in the South East Kelowna Irrigation District (SEKID) has had a significant impact on the demand for water per hectare"

Assess demand management programs



Long term water use trend



Responses – supply management

- Increase storage capacity
- Maintain surplus water balance
- Storage Capacity:

McCulloch	13,475
Turtle	1,640
Fish, Browne, Long Meadow	755
Total Storage:	15, 870

- Long-term dependable supply: 12,930
- Drought Contingency: 2,940

Discussion