Chapter 20: Blenheim Urban Springs

Introduction

There is a series of freshwater springs located within the urban area of Blenheim. Murphys, Fulton and Waterlea Creeks, along with several smaller waterways, are all groundwater fed freshwater springs. The springs are highly valued for their aesthetics qualities exhibiting sparkling clear water and aquatic life. These springs also provide the baseflow for the Taylor River during dry periods. Of all the Wairau Plain freshwater springs, these are the most accessible and are seen by thousands of Blenheim residents every day.

Many of the waterways channels have been highly modified since European settlement with the channels being deepened and straightened in order to reduce surrounding water levels to make Blenheim habitable (Fig. 20.1).

The majority of the springs flow towards the Taylor River, while those on the northern outskirts are tributaries of the Opawa River.

Groundwater fed springs typically have a stable flow and reflect the status of the underlying aquifer. Unlike rivers where the mean flow is biased by floods, the mean flow is the same as the median flow (Table 20.1).

Figure 20.1: Blenheim Urban Springs location

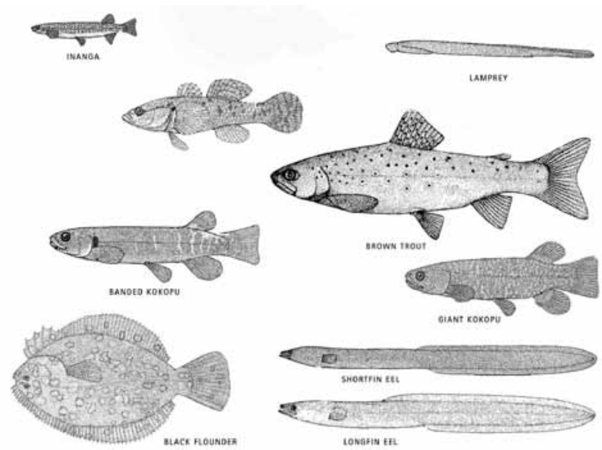

Figure 20.2: Fish species found in Blenheim's urban springs

Maintaining acceptable flows in the Southern Springs is important as the Taylor River depends entirely on its groundwater fed spring tributaries over a typical summer.

The unique combination of cool water and stable flows year round are also important for providing habitat for native freshwater fish species. Murphys Creek and Fulton Creek are the only two waterways on the Wairau Plain that are known to contain banded kokopu. Giant kokopu, a number of other native species and the introduced trout also live in the urban springs (Fig. 20.2).

Flow characteristics

The MDC measure the flow at three of the springs on a weekly basis to monitor their long-term response to regional levels of consented groundwater abstraction (Table 20.1). Flow measurements of the springs are taken immediately upstream of where they join the Taylor River. Doctors Creek flow is also monitored to provide a comparison of a catchment with hill catchment runoff to that of the groundwater moderated spring flow regimes.

Gauging Site	Date Range	Median Flow (l/s)	Mean Flow (l/s)	Minimum Flow (l/s)	Maximum Flow (l/s)	Flow Range (l/s)	Standard Deviation (l/s)	Mean Annual Low Flow (l/s)	Coefficient Of Variance
Murphys Creek at mini-railway bridge	2003 – 2008*	795	789	427 (Mar. 2003)	1100 (Sep. 2008)	700	131	528	0.166
Fulton Creek at Nelson Street	2003-mid 2009	313	324	224 (Dec. 2005)	733 (Jun. 2006)	500	62.1	232	0.192
Waterlea Creek at Parker Street	2002 – mid 2009	96	95	17 (Feb. 2002)	217 (Oct. 2003)	200	23	60	0.242
Doctors Creek upstream of Taylor River	Oct. 2002 – mid 2009	535	594	88 (Feb. 2003)	2400 (Aug. 2008)	2300	344	198	0.578

* excludes 2009 when water started being purged to waste from municipal supply

Table 20.1: Flow statistics summary

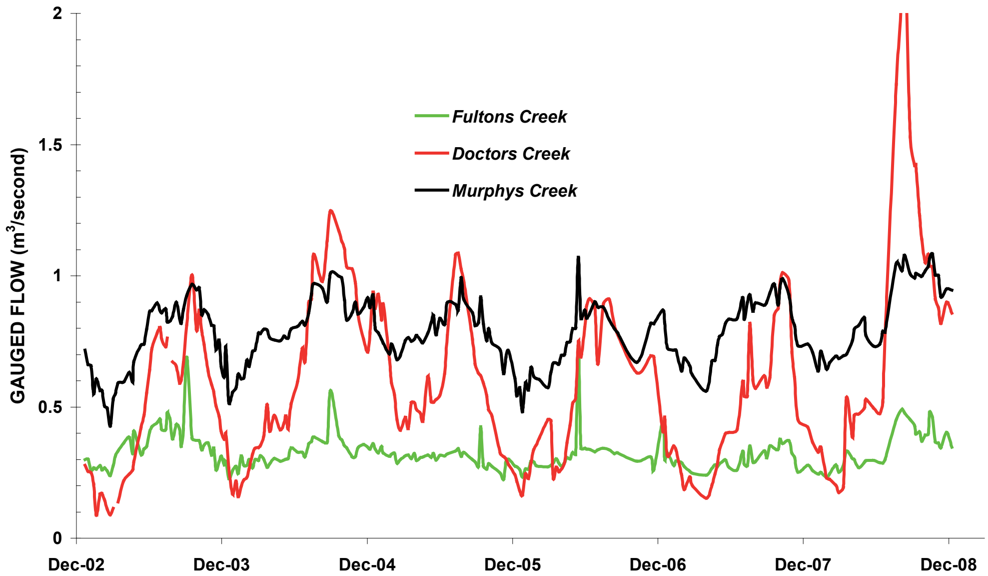

Figure 20.3: Spring tributary flow to Taylor River

catchments (Fig. 20.3). This is reflected in the relative contributions supplied by each spring to the Taylor River flow (Fig. 20.4). Fulton Creek generally provides a minor input with the majority originating from Doctors Creek during the wetter months and Murphys Creek during summer and autumn.

All three springs respond differently to rises in groundwater or well level (Fig. 20.5). Fulton and Murphys Creek flows are closely related to groundwater elevation, with only a minor contribution from rainfall or stormwater indicated by the scatter. The different responses of Murphys and Fulton Creek reflect the greater degree of confinement of Fulton Creek and the flow of Doctors Creek increases exponentially as the area of seepage expands at groundwater levels of greater than 7.5 metres elevation. The long flat shape of the Doctors Creek hydrograph reflects the combined influence of both groundwater and surface runoff sources of recharge.

Of those that are measured regularly Murphys Creek has the largest flow, followed by Fulton Creek with Waterlea Creek being significantly smaller. Many others exist such as Caseys Creek and Golf Course Creek, but their flow is not measured on a regular basis by the MDC. As each of the springs has a different flow, it is not obvious which has the most stable regime. The coefficient of variance accounts for these size differences by dividing the standard deviation by the mean flow. Murphys Creek has the smallest coefficient of variance inferring it has the highest inputs from groundwater compared to rainfall runoff or stormwater inputs. Doctors Creek is the most variable by virtue of its surfacewater inputs.

Doctors Creek experiences the highest peak flows as a result of hill catchment runoff. Murphys Creek and Fulton Creek are predominantly groundwater fed systems and they have small, low elevation

Murphys Creek

Murphys Creek is the most studied of the urban springs and the least modified in terms of its channel network. It's headwaters rise west of Severne Street and its channel meanders through residential areas, before joining the Taylor River downstream of High Street at the mini-railway bridge.

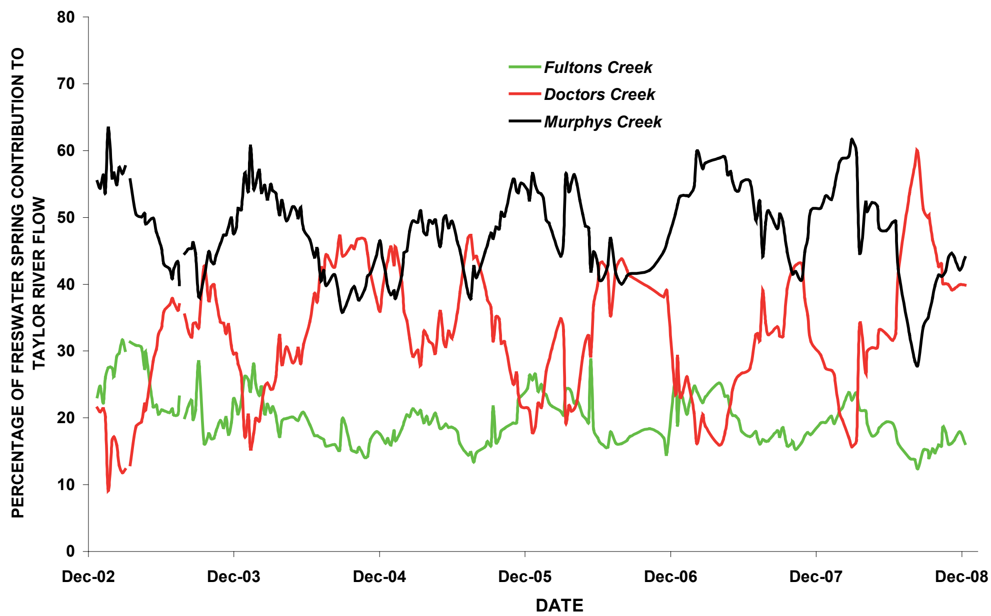

Figure 20.4: Spring flow as a proportion of Taylor River flow

Under typical summer conditions the upper reaches are dry. This is largely due to natural recession, but local well pumping is also known to cause intermittent fluctuations in summer. Just west of Severne Street an emergent freshwater spring retains water all year (Fig. 20.6).

The headwaters of Murphys Creek are more sensitive to pumping or natural recession than the lower reaches, where

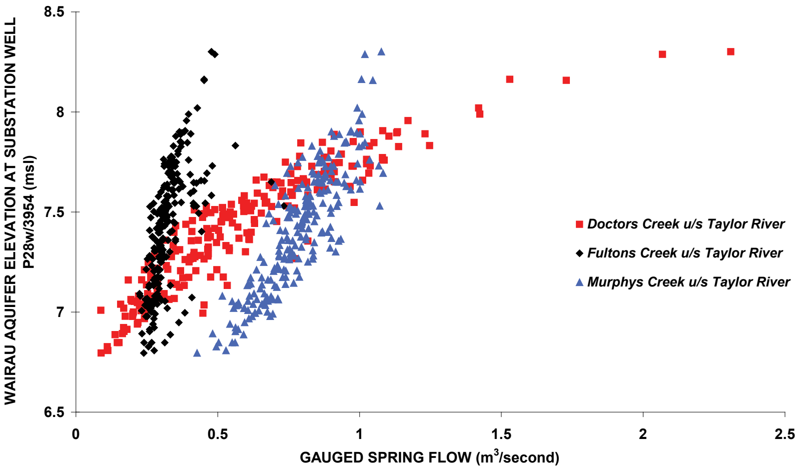

Figure 20.5: Gauged spring flow versus groundwater elevation at the substation well (3954) near the corner of Old Renwick and Murphys Roads

there will always be perennial flow. By the times Murphys Creek reaches the Taylor River its channel has broadened and deepened to be around three metres wide and 0.4 metres deep, with water flow velocities averaging 0.7 m/s.

The clear flow of Murphys Creek despite a flood in the neighbouring Taylor River catchment reflects its groundwater source (Fig. 20.7).

A lot can be learnt about the underlying aquifer from its interaction with its dependant springs. The most straightforward observation is how it gains flow along its travel path (Fig. 20.8).

Figure 20.6: Freshwater spring at the source of Murphys Creek

Figure 20.7: Clean groundwater from Murphys Creek entering the Taylor River

Flow is measured at five sites along the channel from the headwaters near Severne Street, to upstream of the confluence with the Taylor River at the Mini-Railway bridge. The results of monitoring these sites show Murphys Creek consistently gains flow from groundwater, over a two kilometre length of channel at an average rate of 0.4 l/s per metre.

The rate of influent groundwater seepage is not constant down the length of Murphys Creek, with the greatest contribution occurring in the upper reaches. This reflects the isolating effect of the confining layer as it thickens in an easterly, downstream direction.

Stable natural flows also made Murphys Creek ideal for driving a water wheel to power a flour mill in the early days of Blenheim. Today only its foundations remain upstream of the mini-railway bridge.

The analysis of aquifer test results from the MDC public water supply wellfield on the corner of Colemans and Middle Renwick Roads show the influence of surface flows. A significant proportion of water pumped from this wellfield comes from Murphys Creek, or would be groundwater that would have otherwise ended up in Murphys Creek.

To verify the effect pumping from wells has on Murphys Creek, the MDC installed a water level recorder in the channel where it crosses Nelson Street. The water level recorder shows that pumping from the municipal supply wells in Middle Renwick Road lowered water levels in Murphys Creek (Fig. 20.9). Based on known flow characteristics, pumping effects are likely to reduce channel flow by an estimated 30 l/s or 5% of the gauged flow at the Taylor River confluence.

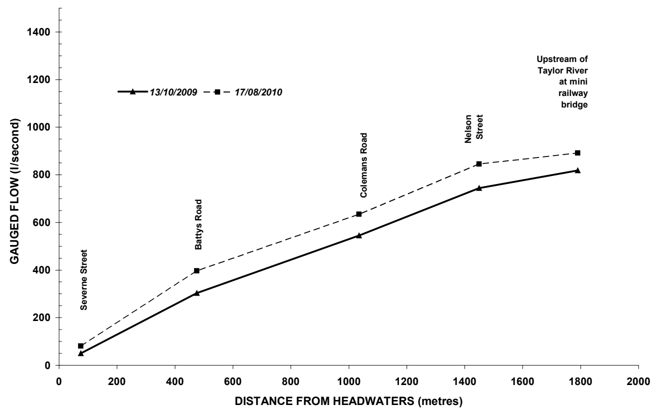

Figure 20.8: Murphys Creek longitudinal flow profile

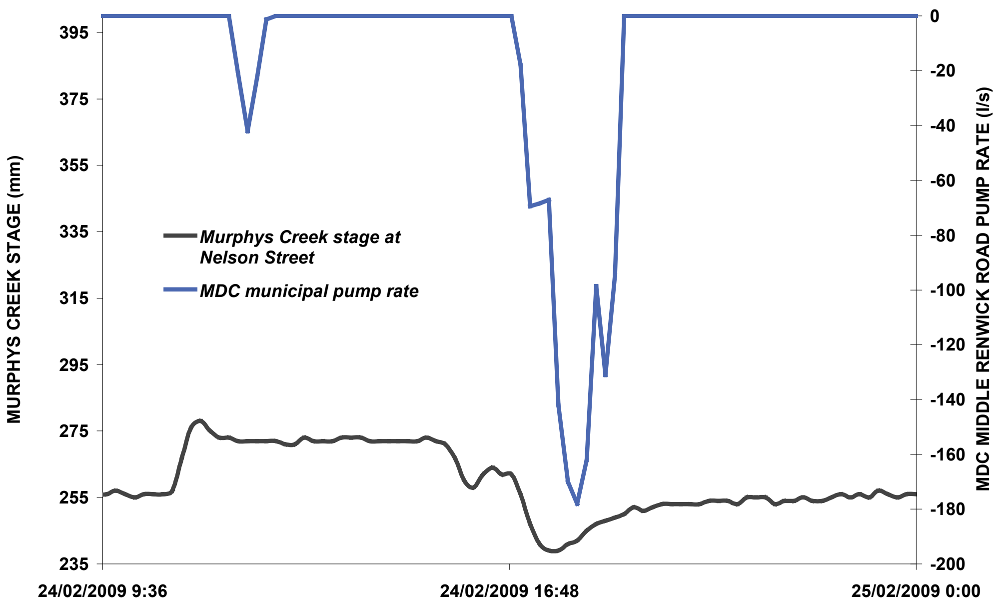

Figure 20.9: : Influence of pumping on Murphys Creek flow

A similar situation is likely to occur at the other main well-field supplying Blenheim with drinking water at Grove Road. While the confining layer is thicker here and isolates the effects of pumping more, there is likely to be a link with Taylor River flow because of the high rate groundwater is pumped from wells.

Other Urban Springs

Many other groundwater fed springs exist in western and northern parts of Blenheim. Fulton Creek for example, rises in Murphys Road before meandering through Pollard Park (Fig. 20.10). Other smaller lesser known spring fed streams include Caseys Creek, flowing beside Old Renwick Road towards Lansdowne Park, and Waterlea Creek which pops up in the race course. Many other springs emerge in private gardens and are incorporated into the urban landscape.

Figure 20.10: Fulton Creek at Pollard Park

References

Pattle Delamore Partners Ltd, 2004. Analyses of MDC Pumping tests at Drain N, Mills & Ford, and Middle Renwick Road, report prepared for the Marlborough District Council