City of Austin
WATERSHED PROTECTION

A strategy for prioritizing response to chlorinated drinking water distribution line breaks in Austin, Texas

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Abstract

Chlorine from potable (drinking) water distribution line breaks or releases during maintenance has the potential to be toxic to aquatic life. EPA estimates a 1-hour no observed adverse effects concentration (NOAEC) of 0.011 mg/L total residual chlorine if spill recurrence interval is at least 3 years. The average chlorine concentration in drinking water distribution system is 1.9 mg/L. The Austin Water Utility responds to approximately 1,200 drinking water distribution line problems annually. An emergency response plan for chlorinated water line breaks with the potential to adversely impact Barton Springs, habitat for 2 federally endangered aquatic salamanders, has been previously developed. By using a recently promulgated Flow Permanence Index for Austin, Texas, streams, a prioritization mechanism is proposed to facilitate automatic dechlorination by Austin Water Utility response crews to protect the most sensitive creek reaches in Austin. Flow Permanence Index values greater than or equal to 85 are most likely to maintain perennial flow and thus are critical aquatic life refugia. Chlorinated water line breaks in Environmental Integrity Index reaches with Flow Permanence Index values greater than or equal to 85 need automatic dechlorination.

Background

Two previous analyses have been conducted by the City of Austin Watershed Protection Department (Duncan and Herrington 2010; Herrington and Turner 2009) identifying aquatic ecosystem impacts of chlorinated drinking water distribution line breaks or maintenance releases and proposing potential emergency response strategies to protect the habitat of the federally endangered Barton Springs Salamander (*Eurycea sosorum*). The Austin Water Utility uses chloramine for disinfection of drinking water, and the average chlorine residual in City of Austin distribution lines is 1.92 mg/L (Duncan and Herrington 2010). Aquatic organisms, unless locally important and sensitive, should not be affected unacceptably (NOAEC) if the 4-day average concentration of total residual chlorine does not exceed 0.011 mg/L and/or the 1-hour average concentration does not exceed 0.019 mg/L more than once every 3 years (USEPA 1986).

There are an estimated 1,200 chlorinated water line break calls received by the City of Austin annually which range widely in release volume, release duration and location. Total chlorine from a 6 inch water line break monitored by the City of Austin was in excess of the 0.019 mg/L NOAEC for more than 7,500 feet although other chlorine concentration decayed more rapidly from other breaks (Duncan and

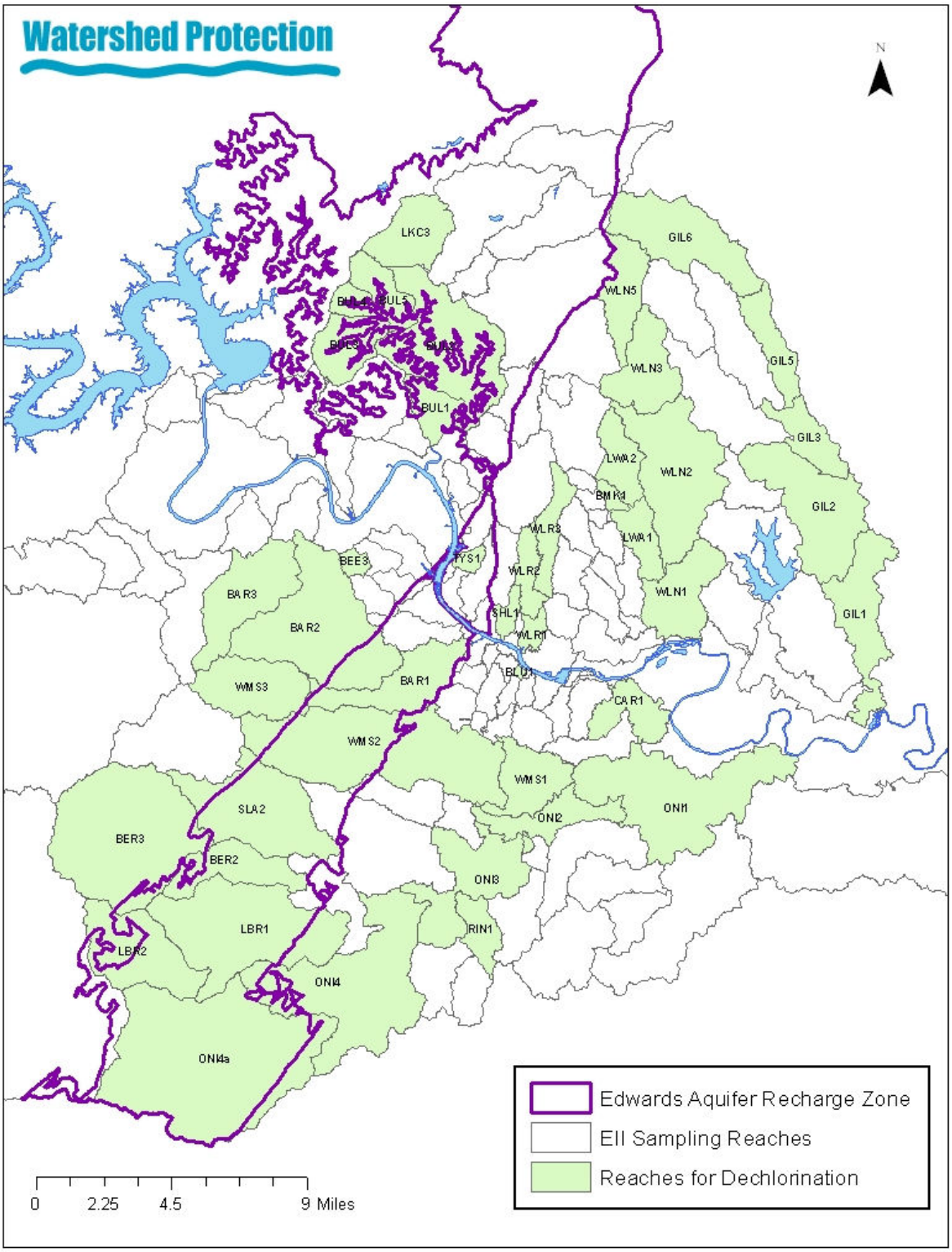
Herrington 2010). While dechlorination of all water line breaks would be most protective of aquatic life in receiving waters, the number of calls annually is too large for dechlorination of all breaks and not all water line breaks may have adverse aquatic life impacts. Prediction of ultimate receiving water concentration of chlorine is complicated by distance from receiving water, surface type and organic content of the drainage conveyance from the break to the receiving water and the diluting flow volume of the receiving water. This variability complicates development of a feasible dechlorination response strategy that is protective of aquatic life.

The City of Austin maintains routine monitoring in 50 watersheds across Austin as part of the Environmental Integrity Index (EII) program (City of Austin 2002). EII data was recently used in combination with additional field surveys to create a Flow Permanence Index for Austin streams (Porras 2013). The presence of stream flow has been demonstrated to be a primary explanatory variable in predicting benthic macroinvertebrate community composition in Austin streams (City of Austin 2011). Austin streams with perennial flow are likely to be critical refugia for aquatic life in this semi-arid region, and thus most likely to be significantly and adversely impacted by chlorine.

Proposed Response Methodology

The 75th percentile of the Flow Permanence Index calculated for EII sampling reaches (Porras 2013) was established as the threshold for identifying a subset of Austin streams likely to maintain critical perennial refugia for aquatic life. That threshold corresponds to a Flow Permanence Index value of 85 (out of 100). Additionally, any water line break as identified in the Barton Springs Catastrophic Spill Response Plan requiring dechlorination to protect federally endangered salamanders in the Barton Springs Segment of the Edwards Aquifer Recharge Zone should be dechlorinated. Combining reaches over the Barton Springs Segment Recharge Zone with Flow Permanence Index values greater than 85 identifies 43 out of 122 EII reaches (Figure 1). As standard practice, the Austin Water Utility response crews should dechlorinate water line breaks or maintenance releases within these identified segments.

Figure 1. Environmental Integrity Index reaches over the Barton Springs Segment of the Edwards Aquifer Recharge Zone or with Flow Permanence Index (Porras 2013) values greater than 85. Green reaches



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