Stream Dissolved Oxygen
Improvement Feasibility Study
for Salt Creek and East Branch of the DuPage River

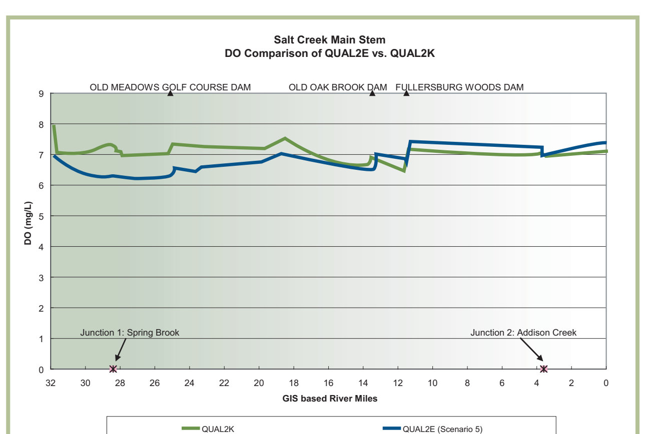
February 2006

Water Quality Modeling:

Since the TMDL reports were completed in October 2004, the DRSCW has been working to better understand the causes of degraded water quality and, in particular, to find ways to improve DO levels in Salt Creek and the East Branch of the DuPage River. The main purpose of water quality modeling is to identify locations where low DO is expected or observed and quantitatively evaluate the effects of alternatives to potentially improve DO, that is, by removal and/or bridging of dams and stream aeration (mechanical, diffused air, side stream elevated pool, and pure oxygen).

The modeling tool used in the previous TMDLs has been updated with a more user-friendly interface and convenient post-processing tools. The updated version of QUAL2E is called QUAL2K and was developed for the USEPA by Steve Chapra, et. al at Tufts University. A model simulation of Salt Creek and another simulation of East Branch that were documented in the TMDL reports were repeated using the QUAL2K model. The QUAL2K output was compared to the QUAL2E results and both models exhibited similar trends in DO and other water quality constituents, as shown in graph below.

The QUAL2K model was then utilized to simulate summer 2005 existing conditions, representing critical conditions for low dissolved oxygen. Certain model parameters were adjusted from the values used in the QUAL2E model scenarios to values that are more representative of the current physical and biochemical characteristics of Salt Creek and East Branch as determined from field investigations conducted as part of this study. This modeling effort is still underway.



Public Workshop

The second public workshop is being held to continue the interaction between the stakeholders and the project team. The project team will provide an update on this Feasibility Study. Presentations during this meeting will focus on water quality modeling, screening of dams, and screening of stream aeration technologies. The public will be invited to identify their primary issues and concerns associated with this project. This meeting will be held as follows:

Location	Date
College of DuPage Building K, Room 161 425 Fawell Blvd. Glen Ellyn, IL 60137 Parking in Lots B & A	March 9, 2006 4:30 PM TO 6:30 PM OR 7:00 PM TO 9:00 PM

For more information on the project or this meeting, please contact:

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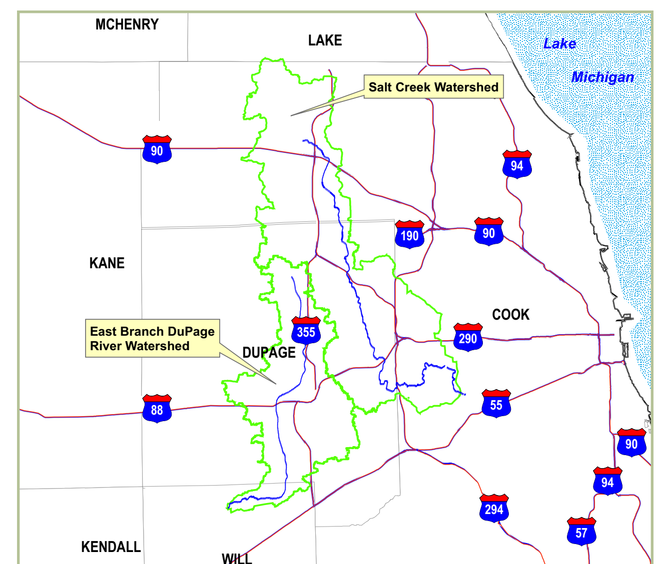
Project Website

http://www.saltcreekeastbranch.com

General Project Description:

The goal of this Stream Dissolved Oxygen Improvement Feasibility Study is to determine the feasibility and benefits of the removal or modification of dams, and of the construction and operation of in-stream aeration projects on improving dissolved oxygen in Salt Creek and the East Branch of the DuPage River. This study will identify a specific project or projects that will help meet the Total Maximum Daily Loadings(TMDLs) goals for dissolved oxygen (DO) within the project area. The DuPage River / Salt Creek Work Group (DRSCW) is most interested in projects that will address the biological impairment in a holistic manner considering all benefits to the ecosystem and surrounding community.

This is the second newsletter created as part of this project. The newsletter will focus on the progress to date for the Feasibility Study, including the Existing Stream Characteristics, Water Quality Modeling, Screening for Dams and Screening for Stream Aeration Technologies.



Project Area Map

Existing Stream Characteristics

Before evaluating alternatives for improving the DO on both the East Branch of the DuPage River and Salt Creek, it is important to understand the existing stream characteristics. Factors such as stream depth, canopy cover, sediment accumulation, stream bank erosion, riparian zone composition, wetlands, stream slope, and bank heights are all important during the alternative development and evaluation process. To aid in understanding of the existing stream conditions, reconnaissance of both rivers was completed in October and November 2005. The field data was compiled into a GIS database. This database includes hyperlinks to project photographs, channel reconnaissance forms (including channel cross sections), and qualitative habitat evaluation index field sheets.

East Branch DuPage River

Both Salt Creek and East Branch of the DuPage River are highly disturbed urban streams. All of the following characteristics contribute to the low DO concentrations:

- Low channel gradients.
- Channelization – ditching, dredging and straightening of channels - is extensive on both streams.
- Floodplains for the tributary streams and main channels have been developed, filled in or separated from the waterways by large berms that concentrate flood flows into a deep narrow channel.
- Tributary drainage areas have a significant percentage of impervious areas, and stormwater runoff is directed into sewers and pipes that discharge directly into these waterways.
- Contributions from point sources, including municipal wastewater treatment plant effluents, are significant on both streams.
- Canopy cover is generally limited due to adjacent development, resulting in higher summer stream temperatures and establishment of rooted vegetation.

Screening for Dams:

Although a myriad of options exist for any given dam site, the three options being investigated for this study are:

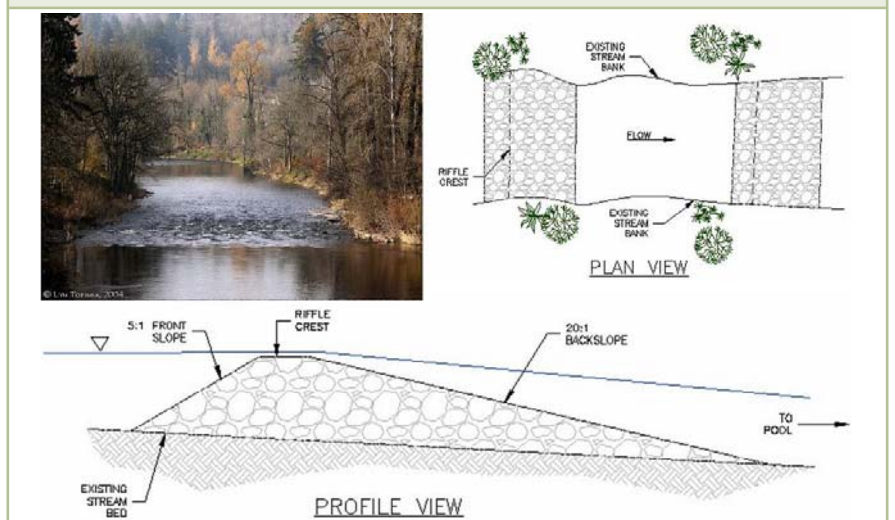
- **Complete Removal** involves the removal of the entire dam structure.
- **Removal with Constructed Riffles** involves removal of the entire dam structure followed by the construction of riffles to maintain a given upstream pool elevation.
- **Partial Removal or Bridging** involves constructing a ramp of large rocks up to the downstream face of the dam. Common variations may include partially lowering the dam crest to decrease the difference in vertical elevation or notching the crest to concentrate flow in the center of the channel.

These options are being driven by the primary design objective of improving the dissolved oxygen content of the stream. A secondary design objective is to re-establish biological connectivity, mainly in the form of faunal passage, at each site.

Issues common to all dam modifications include permitting, reservoir sediment, and flood impacts. The permitting process for any of the three dam options will include federal, state and county requirements and approvals. Next, reservoir sediments are typically the largest factor governing dam removal, due to potential for contaminated sediments and transport to downstream areas. Finally, quantifying the flood impact of any modification to a dam is of utmost importance. The project may cause a positive or negative change in the floodplain boundary on adjacent properties.

Dam removal, partial removal or bridging, and removal with constructed riffles

Complete Removal



Removal with Constructed Riffles

Partial Removal or Bridging

Dam	Removal	Removal with Riffles	Bridging
Oak Meadows Dam	Yes	Yes	Yes
Old Oak Brook Dam	Yes	Yes	Yes
Fullersburg Woods Dam	Yes	Yes	Yes
Churchill Woods Dam	Yes	Yes	No
Prentiss Creek Dam	No	No	Yes

to the physical and biological nature of streams, each with its advantages and disadvantages over the other when looking at specific portions of the system. The project team conducted an initial qualitative analysis or screening of these alternatives. Additional quantitative evaluations will be conducted in the next step of the project to determine the water quality benefits and hydraulic characteristics associated with each of the viable alternatives in the table above.

Screening for Stream Aeration Technologies:

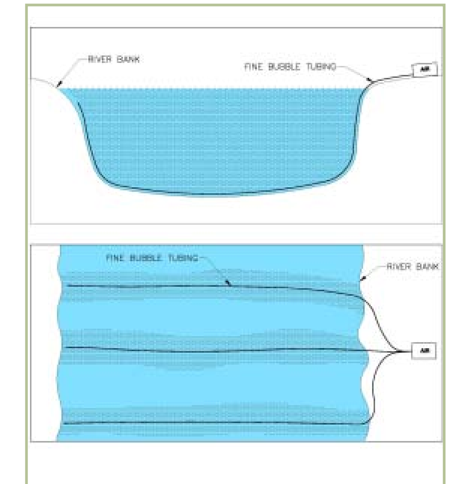
Numerous aeration technologies have been developed and utilized to increase dissolved oxygen in water. The project team evaluated this variety of available aeration technologies and identified a group of technologies that would be feasible for implementation in Salt Creek and the East Branch of the DuPage River. There are three major categories of technologies as follows:

- **Air-Based Alternatives** are designed to expose as much water volume as possible to the atmosphere in order to increase oxygen in the water. As water is exposed to the atmosphere, oxygen absorbs into the water until the pressure of the oxygen in the atmosphere and the water are the same.
- **High-Purity Oxygen Alternatives** are based on contacting the water column with a concentrated source of oxygen, with or without pressure above ambient atmospheric condition. Specialized liquid oxygen vessels store the oxygen under pressure and utilize onsite vaporization to convert liquid oxygen to gaseous oxygen.
- **Side-Stream Alternatives** involve partitioning a portion of the total river flow off and utilizing either air-based or high purity oxygen based technologies. The amount of water partitioned is site dependent by typically ranges from 5% to 40% of the total flow.

Critical categories for evaluating these technologies included the ability to increase DO to the state standard of 5.0 mg/L, navigation impacts and efficiency of transfer at shallow depths. Other criteria included ability to increase DO concentration above saturation, constructability complexity and costs, operation and maintenance issues, public concerns, and environmental impacts. In total, eight different categories were utilized to score each aeration technology. The following technologies represent the strongest candidates for enhancing DO conditions give the conditions present in Salt Creek and the East Branch of the DuPage River:

- **Air-Based Alternatives** – fine bubble tubing.
- **High-Purity Oxygen Alternatives** – oxygen diffusers, U-tube aerators, aeration cones, low-head oxygenators, and sealed columns.
- **Side-Stream Alternatives** – Side Stream Elevated Pool Aeration, Pressure Columns, Side Stream Channel, and Bubbleless Aeration.

In addition to the highest ranking technologies, there are several technologies that are moderate candidates for enhancing DO. These alternatives may be applicable only if very specific site and operational

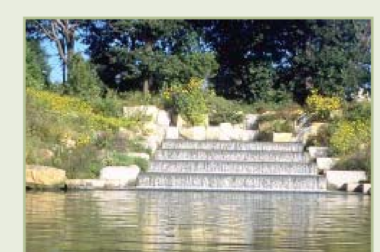


Fine bubble tubing example

Typical liquid oxygen tanks

conditions are met. These conditions would include such things as space or elevation change or the need to apply alternatives in pools above dams. The alternatives most suitable for meeting the project objectives will be more closely evaluated on a site specific basis in the next phase of the project.

Side Stream



Elevated Pool

Aeration Example