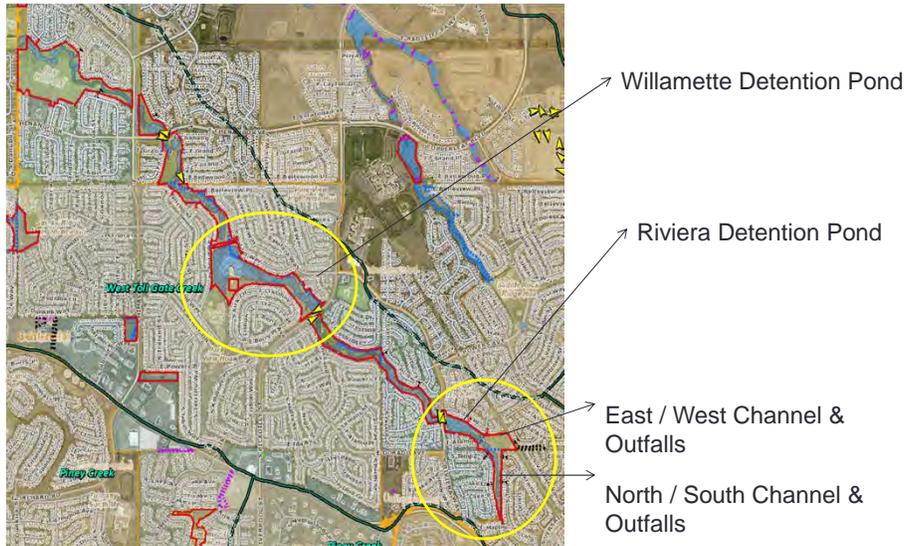


## Outfall and Channel Restoration



## West Tollgate- GIS Mapping



## West Tollgate- Google Earth History

- Channel Section from East / West

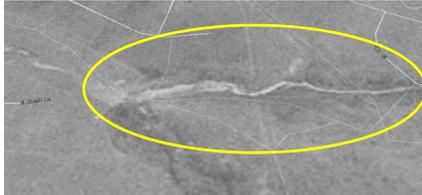


- Channel Section from North / South



## Channel Section- East to West

Channel in 1993



Channel in 1999



Channel in 2002

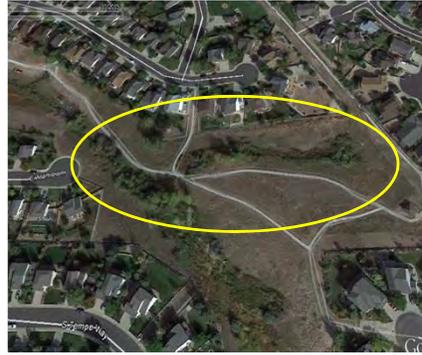
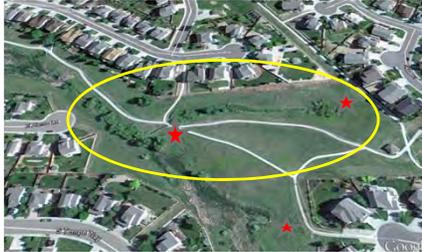


Channel in 2006



## Channel Section- East to West

Channel in 2010- trees and wetlands expanding, outfalls becoming blocked



Channel in 2015- trees continue to grow, cattails grow/die and add to biomass in channel- outfalls blocked

## Summary of Progression

- Start of development  
2002

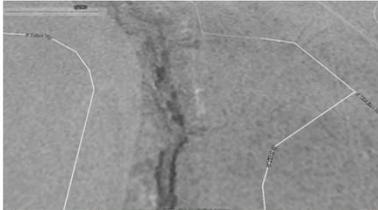


- Post  
development  
2015



## Channel Section- North / South

Channel in 1993



Channel in 2002



Channel in 2006- Cattails adding to bio-mass in channel, outfalls becoming blocked

## Channel- North / South



Channel in 2010- new cattails growing through last year's batch, trees becoming established

Channel in 2015- outfalls blocked, trees established, cattails expanding, capacity being compromised



## Channel Section- North / South



Access to outfalls to perform maintenance does not exist- needs to be constructed

Outfalls blocked, trees and vegetation continue to expand

## West Tollgate- outfall and channel photos



## West Tollgate- outfalls and channel photos



## West Tollgate outfalls and channel photos



## Willamette Detention Pond



Pond outlet structure

Trees adding to dense vegetation- but not yet blocking 54" outfall into pond



## Willamette Detention Pond- outfall



Outfall located here- railing and Russian Olive tree



## Riviera Detention Pond- Google Earth History



2006- wetlands die off in winter, trees beginning to grow upstream

2010- growth of new cattails during the month of June, bio-mass cycle in action- new growth comes up through previous year's "crop"



## Riviera Detention Pond- Google Earth History

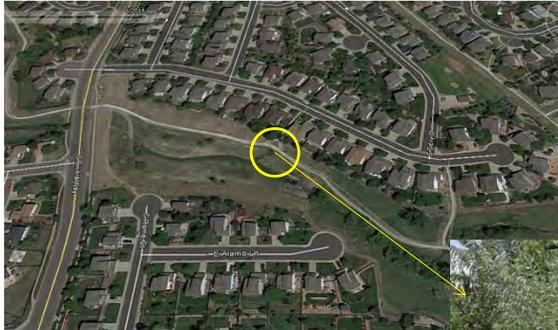


2011- SEMSWA crews remove sediment and cattails from channel- can once again see the main channel

2012- Channel is visible, but new cattails growing along banks- vegetation management- mowing and debris removal is becoming necessary



### Riviera Detention Pond- Google Earth History



2014- Continued growth of cattails in pond, outfall becoming blocked



### Riviera Detention Pond- Google Earth History



2014- One outfall is still visible, has an existing maintenance point with access, and functions as designed



## Riviera Detention Pond- outfall to West Toll Gate

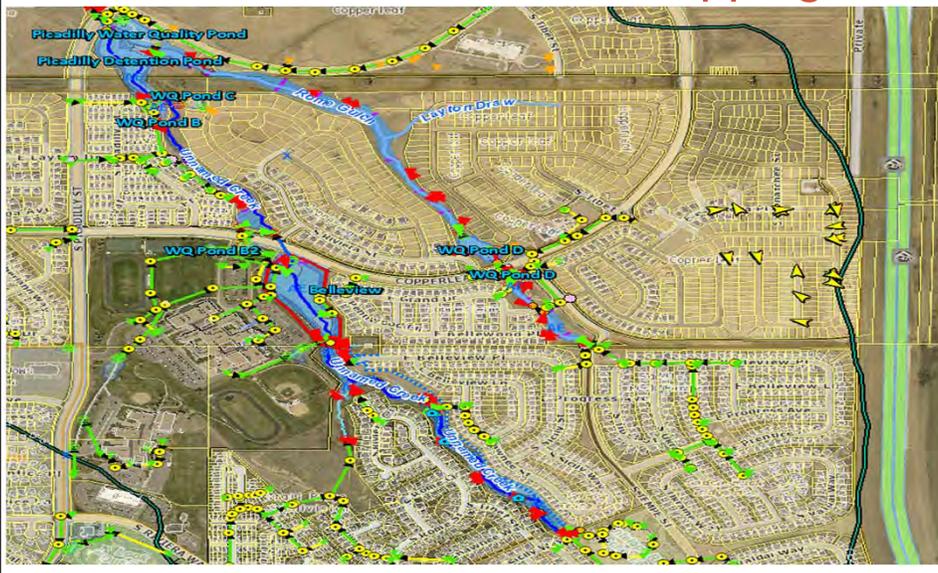


Outfall draining into West Toll Gate- dense cattails with potential capacity issues

Pond outlet structure- needs some work- access is available, Nationwide Permitting under NWP 43



## Unnamed Creek- GIS Mapping



## Unnamed Creek- Google Earth History



Unnamed Creek 1993

Unnamed Creek- 2002, channel is open, no trees, very little wetlands



## Unnamed Creek- Google Earth History



2007- Wetlands growing and expanding across channel bottom

Trees expanding, wetlands expanding, can no longer see creek due to vegetation growth, outfalls becoming blocked



## Unnamed Creek- Google Earth History



2014- dense vegetation, well established trees in channel and out, wetlands located from top of basin to bottom

## Unnamed Creek- outfall and channel photos



## Unnamed Creek- outfall and channel photos



Dense vegetation in channel bottom, causing a debris catch at numerous locations

## Unnamed Creek- outfall and channel photos



24" outfall completely grown over and cannot be located- or can it?



24" outfall located after knocking down vegetation. Channel invert is higher than top of pipe- 30" of sediment and vegetation to be removed

## Outfall and Channel Restoration

- Questions?