

Proactive Watershed Planning.



How watershed assessment, management, and stabilization prior to development can create a resilient and functioning system.

10-7-2015

Agenda

1 Introduction

2 Background – Consequences of Urban Development

3 Traditional Approach to Stream Management

4 Proactive Planning

5 Pilot Study – Oak Gulch

1 Introduction

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2 Background

- Denver Metro Area is one of the fastest growing cities in the country.
- Growing demand for residential and commercial development especially in rural, undeveloped areas
- Impact on Hydrograph
 - Increase in impervious area by **35%**
 - Increase in Q by over **200%**
 - Flashy run-off

2014



Google earth
Image Douglas County
Image NASA



Background - Continued

- Denver Area Geology
 - Dawson Formation
 - Characterized by sandstone and sand that were once beaches and sandbars along the edge of the retreating Cretaceous Sea.
- Watersheds are very sensitive to change in hydrology
 - Highly erosive
 - Easily transported



Piney Creek

3 Traditional Approaches



Traditional Approaches - continued

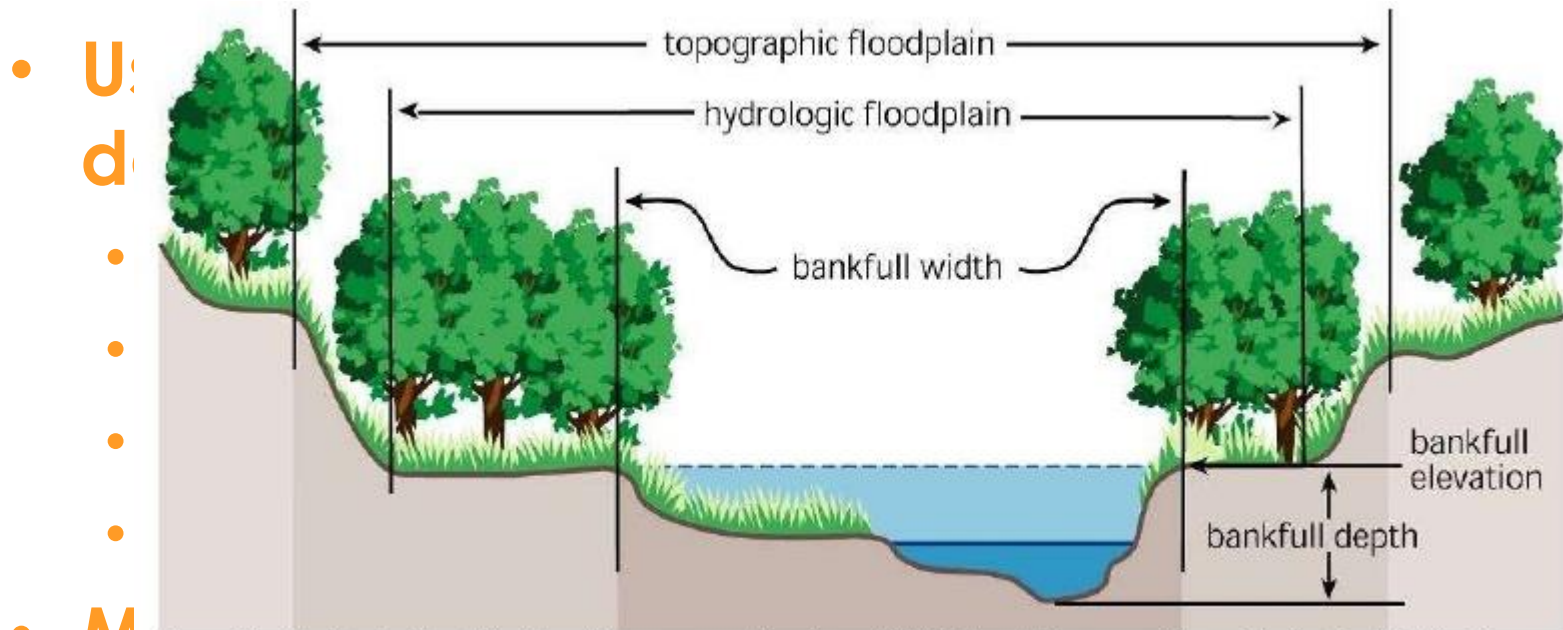
- Streams and Rivers have been treated as Flood Conveyance Systems.
 - Oversized trapezoidal channel.
 - Heavily engineered and expensive structures
 - Assumes regular channel maintenance
 - No resiliency
- The natural functions are largely ignored.
- Only addresses problems on a reach based scale

4 Proactive Planning

- **Pre-development watershed assessment**
 - Hydrologic change
 - Stability assessment
 - Upstream and downstream
 - Sediment transport
 - Stream type
 - Sensitivity to change
- **Search for reference reaches**

Proactive Planning - continued

- Stream evolution prediction
- Stormwater detention



- M *Stream Corridor Restoration: Principles, Processes, and Practices. 1998. Federal Interagency Stream Restoration Working Group.*

5 Pilot study Oak Gulch



user community

Oak Gulch Reach 8

Pilot study Oak Gulch

- **Undeveloped Ranch**
 - Long history of poor grazing practices
 - Property encompasses headwaters of several first order streams
- **Intermittent channels**
- **Massive gully formation**
 - 20-30ft deep sand canyons
 - Areas of massive aggradation
- **Geological anomaly**
- **Proposed residential development**
 - Consequences?

Definition of a Gulch

- **Definition of a Gulch:**
 - A Gulch is a deep V-shaped valley formed by erosion. It may contain a small stream or **dry** creek bed.
 - Sees water infrequently
 - Formed by irregular, high discharge events
 - Generally very sensitive to change in watershed hydrology.

Double
Angel
Ball Park

Aggradation

Reference
Gully

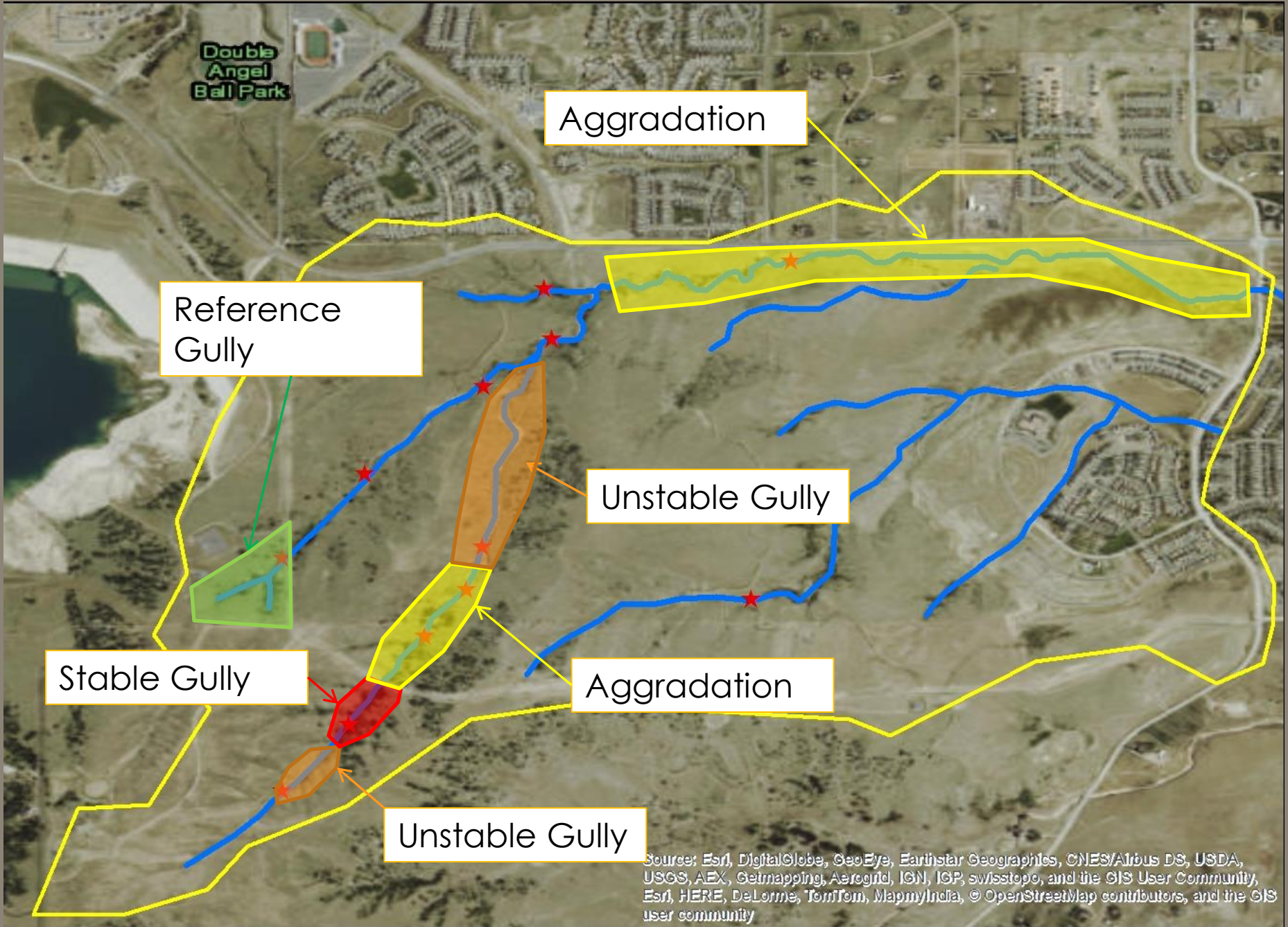
Unstable Gully

Stable Gully

Aggradation

Unstable Gully

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<https://www.youtube.com/watch?v=fb33xEjShOo>

Watershed Assessment Steps

- **Conduct a Assessment of the entire watershed**
 - **Split watershed into reaches**
 - Similar channel types
 - Channel and side slope stability
 - Aggradation/degradation
 - **Conducted historical stability assessment**
 - Historical aerials
 - Dendrochronological analyses
 - **Investigated surface and subsurface soil composition**
 - Soil borings throughout site

Reference Conditions Analysis

- **Reference areas existed on-site**
 - Photo documentation
 - Survey
 - Stable side slopes
 - Stable channel profiles
 - Valley width
 - Recorded vegetation composition and density
- **Searched for reference Gulches in surrounding watersheds**

Preliminary Recommendations

- **Prioritize critical stabilization areas**
 - Break stabilization efforts up into phases
 - Based on development plans
- **Stabilize reaches prior to development**
 - Allow upper portion of watershed to heal
 - Cut off sediment supply
 - Sediment detention basins
 - Regrade banks
 - Reestablish riparian vegetation
- **Stormwater Management in the upper watershed**
 - Need to manage hydrology as build-out occurs

Example Alternatives

- **Phase the stabilization efforts**
 - Synchronize channel and bank stabilization with downstream sediment detention basins
- **Develop stabilization methods per typical reach**
- **Build multi-stage channels**
- **Vigorous revegetation efforts**
- **Paired Watershed study.**
 - Traditional vs. alternative stabilization methods

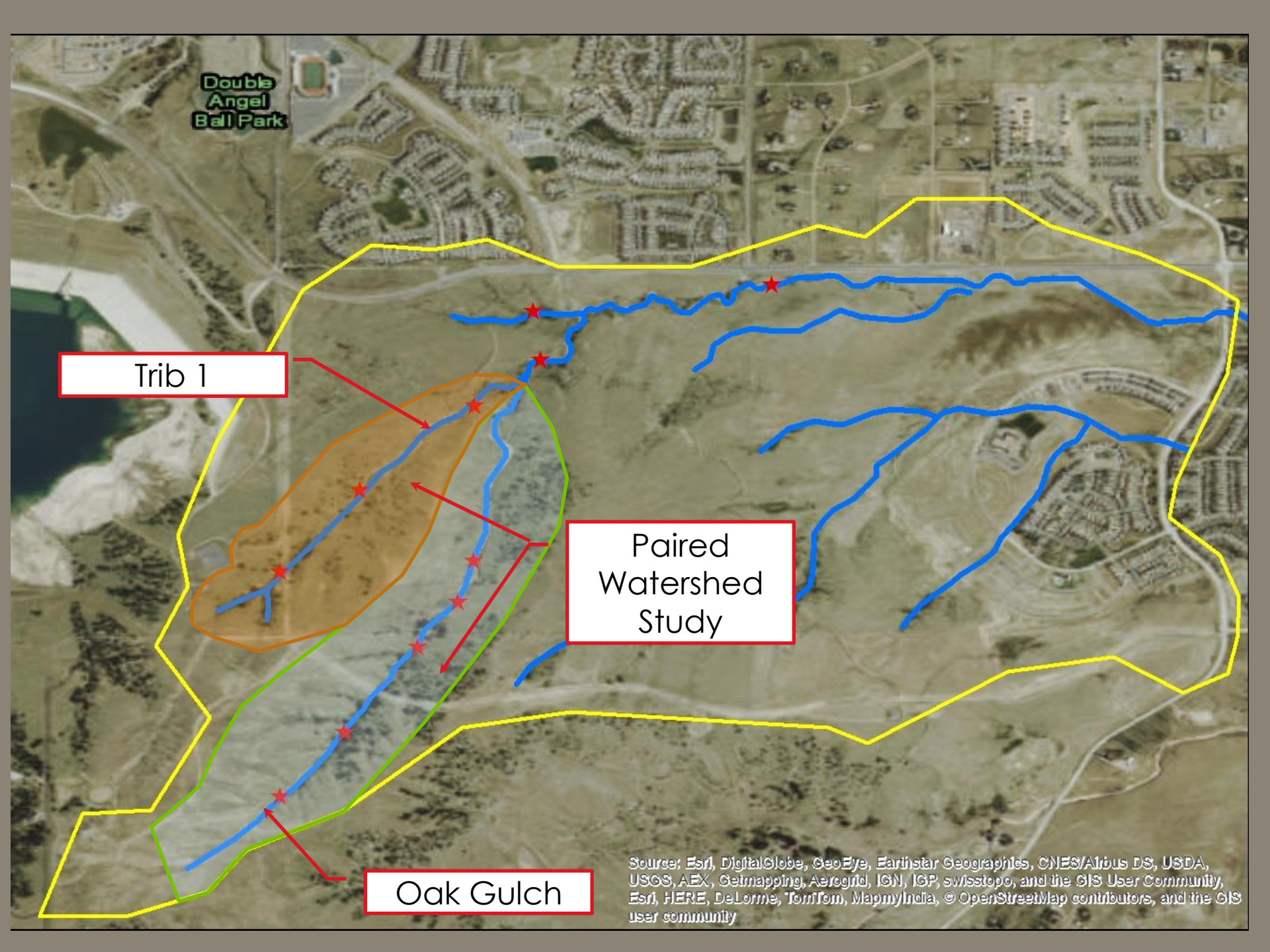
Double
Angel
Ball Park

Trib 1

Paired
Watershed
Study

Oak Gulch

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Questions?

