

St. Croix Crossing: Sprawl, Ecosprawl, or Transit Hydrotopia?
 Therapy for 'Genetic Code' of Sprawl

tools to transform the baseline: subregional strategy for transit service

Regional/Subregional:

- expand joint Met Council/Wisconsin modeling & review of comprehensive plans to insure the 7 d.u./acre is provided in transit commutersheds by mode on key transit corridors. (e.g. 12 – 15 minutes to station, 1/3 mi. walk)
- expand MnDOT/WisDOT flexibility to aid construction of innovative minor arterials and grade-separations to facilitate intermodal connectivity
- greater attention to specifics of and relationships between geographic information in planning and design for growth

Local:

- subdivision design to support connective open space, protection of vegetation, soils, hydrology as well as intermodal design - mixed use, density, walkability, new street types/networks at collector and local/residential scale
- inclusive zoning that emphasizes access and destination creation – e.g. employment and housing relationships

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the baseline

The pattern of dispersed growth that occurs inside the MUSA, approved via Met Council review of comprehensive plans is less than the 7 d.u./acre that constitutes the lowest threshold for regular Metro transit service while altering ecologies, fragmenting drainage corridors and reducing infiltration.

Planning, Design, Science

St. Croix Crossing: Sprawl, Ecosprawl, or Transit Hydrotopia?
 Outcomes: What it Might Look Like

Enhanced Executive: 2030 Met Council Transportation Policy Plan
Multimodal, Decentralized Planning, Line Haul/Spoke Configuration, Multiple Providers

Bus routes primarily serving residence to work routes – central cities focused (dual radial spoke system)

Hiawatha LRT line completed

Bus Rapid Transit (BRT)/dedicated transitways on first tier routes - Northstar, Northwest, Cedar, I-35W S, Central Corridor

'Mixed Use Centers' - stops/nodes/ridership management thinking, transit adjacent development (TAD)

Regional Transit System: Intermodal System - Regional & Local Planning
Spoke/Hub/Loop Configuration, Multiple Providers

Bus/rail hub system - modes linked at hubs/destinations

- LRT system with University Avenue line
- BRT overlay on sub- and exurban freeway destinations

Red Rock Corridor implemented - Northstar linked to St. Paul

Transit-Oriented Development (TOD)- destinations/place/ integrative policy and management thinking

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New System: New Development Patterns

- New Employment-Rich Destinations Configurations, Urban Densities
- Patterns of Retail and other Commerce
- Recreational Connections
- Ecological Connections/Green Infrastructure

2040 Regional System Hub-Linked Service

Transitways on Dedicated ROW

Typ. 1
Northstar
Northwest
Cedar Avenue
I-394
Central

Typ. 2
Southwest
Red Line
Red Rock

Transitways on Dedicated ROW
Express Commuter Bus System

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Research Abstract **Transportation and the Environment**
Transportation and Regional Growth Study

Study Objective

The objective of the study: to investigate through *design* subdivision-scaled "Smart Growth" and hydrologically-sensitive design approaches as alternatives to suburban, automobile-dependent dispersed growth.

Central Transportation Issue

Can the trend of increased Vehicle Miles Traveled (VMT) be stabilized, reversed or altered by:

- mixing land uses ?
- greater density ?
- more connective patterns of street networks ?
- hydrologically-sensitive, connected public open lands ?

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Mixed Use Centers as Hubs
New Loop Service

- UM/Central Corridor
- Northstar
- I-394
- Southwest Corridor
- I-35 W South
- Red Rock
- Wakota Bridge
- Cottage Grove
- 694 West
- 694 South

St. Croix Crossing: Sprawl, Ecosprawl, or Transit Hydrotopia?

Cluster/Conservation

- Preserved critical habitats & natural features
- Limited forest fragmentation
- Conserved/replanted native plant cover
- Preserved critical soils
- .3 - 7 dwelling units/acre

Traditional Neighborhood Design (T.N.D.)

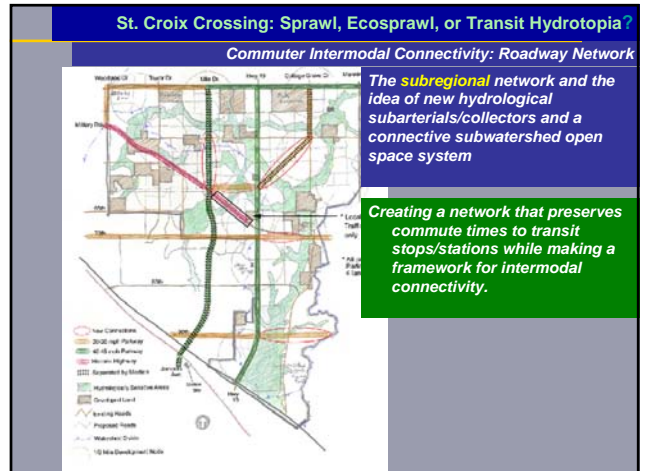
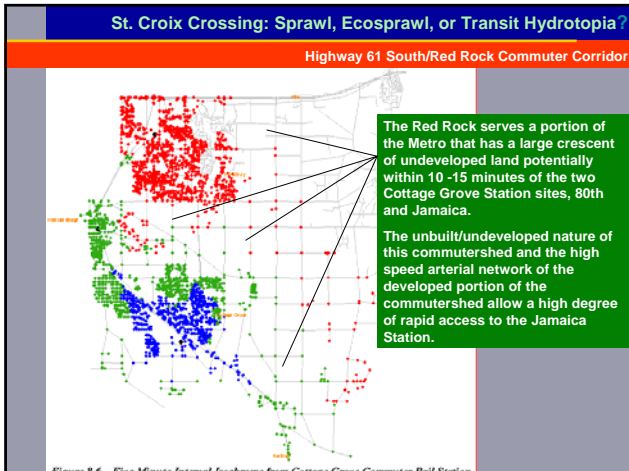
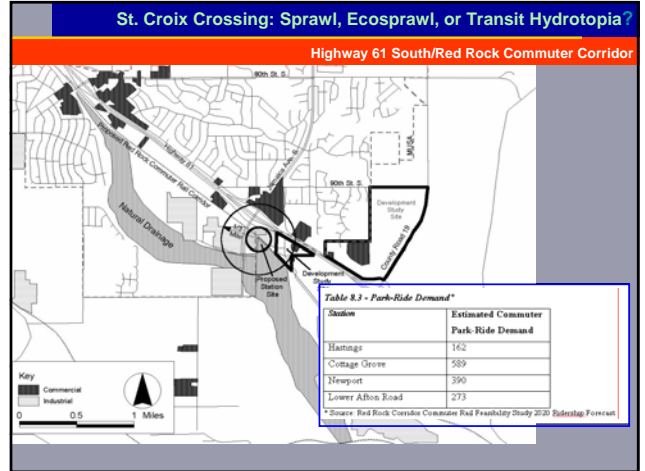
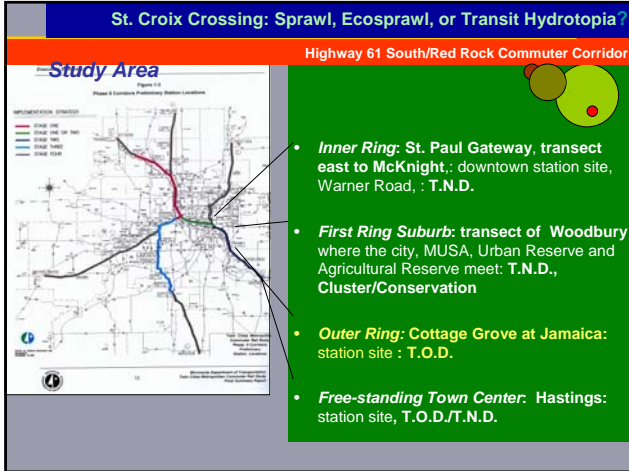
- Pedestrian-friendly, traditional streets
- Traditional architectural space
- Multi-modal circulation system - fine grain
- Mixed uses - no industry
- Neighborhood parks, open space corridors
- 7 + dwelling units/acre

Transit-Oriented Design (T.O.D.)

- Pedestrian-friendly streets
- Small, permeable blocks
- Circulation oriented to transit riders
- Mixed uses, including jobs generators, industry
- Neighborhood parks and open space corridors
- 15-20 dwelling units/acre

Water-Sensitive Design
Hydrology Overlay on all Approaches

- Preserved critical hydrology
- No build in receiving basins
- Preserved drainage corridors
- Public Open space follows drainage



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Highway 61 South/Red Rock Commuter Corridor

The corridor is characterized by steep, wooded ravines that lead from blufftop fields and urbanized areas to the floodplain above the Mississippi River.

The watershed became the boundary of the study area to reflect our interest in design at both the site and watershed scales.

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Regional Water Surface and Ground Water Interaction: Roadway Network

Design at the Watershed Scale: Watershed Districts
Hypothetical watershed structure of land use in Minnesota and northwestern Wisconsin:

Upper third - non-urbanized
Middle third - suburban and exurban - mixed infrastructure
Lower third - urbanized, piped infrastructure

Strategic Approach: Hydrology

Design at Subdivision Scale

- Subdivision design occurs at the local jurisdictional, not regional level of review and legal control.
- The subdivision is manifested as urbanization in the form of the street network that bundles public infrastructure related to water.

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Regional Water **Surface and Ground Water Interaction**

Suburban cities and towns on municipal wells

Central cities on Mississippi River and reservoir system

- Twin Cities drinking water is river water - large quantity
- quality dependent on the cleanliness of upstream sources - runoff from urbanization?
- Suburban water is locally controlled
- Suburban water is ground water
- Suburbs have highly different quantities of ground water and access
- Red Rock communities have ample supplies in Prairie du Chien Jordan aquifer?
- Fate of streams? Other communities?

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Regional Water Surface and Ground Water Interaction: Roadway Network

City A


City B

Piped Storm Water Systems cross municipal boundaries & watersheds

Drainage is conducted via impervious surfaces to outfall at bottom of watershed with little infiltration

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Regional Water Surface and Ground Water Interaction: Roadway Network



The **subregional** network and the idea of new hydrological subarterials/collectors and a connective subwatershed open space system


- no build over 15% slopes/drainage corridors
- woodland patches and buffers
- new parkway-like multi-/intermodal arterials and minor arterials

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Water and Park and Parkway Systems

Apply the vision of 19th c. landscape architects to make:



- connective, hydrologically-based, publicly accessible open space systems
- street systems that combine subregional connectivity with ecological, hydrological and recreational objectives; and
- local accessibility/safety: short blocks, relatively contained network



Regional Park
Highway 61/Red Rock Corridor

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Precedents:
Highland Park, Illinois
Cleveland and French, 1869-74

19th century suburban commuter rail design

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Biomimicking Storm Water Management Design Approaches for Higher Density Sites

- Lots, Parcels & R.O.W.
- Storm Water Inlets
- 'Leaky' Storm Sewers
- Connective Open Space System
- Surge Areas

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Lots, Parcels & R.O.W.

As far as possible, design these so that water flows first from impervious surfaces to absorptive vegetated surfaces.

5 year old prairie shown to infiltrate 7.5 in./hour

Root Systems of Prairie Plants

alley 120-foot house lot 100-110-foot right of way 120-foot house lot alley

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'Leaky' Storm Sewers

Figure 2-1. TYPICAL STREET-SECTIONAL SYSTEM (Storm Sewer)

In new high density developments, storm sewers are invariably required. In these cases, a "leaky sewer" was used. The idea of a "leaky" sewer was gleaned from *Modern Sewer Design* (A.I.S.I., 1971, p. 182). Porous pavement could also be used for this situation.

alley 120-foot house lot 48-56-foot right of way 120-foot house lot alley

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Storm Water Inlets

In every case, inlets used available technology to filter and remove larger particles of sediment from runoff flow before it enters the larger system.

The future of stormwater systems is here today.

FluGuard-PLUS™

In some cases the inlets could be a small bioretention pond, depending on available space (Claytor, 1996, chapters 5 and 6)

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Connective Open Space System.

Connective open space systems were designed to both hold and convey storm water. The conveyance type principally used was the biofilter or enhanced swale.

120-foot house lot 90-122-foot right of way 120-foot house lot

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Surge Areas

This technique was used just before every outlet from the site. Surge areas are typically dry basins, that, with major storms, temporarily fill with water to delay flow downstream, mimicking floodplains and wetlands (Leopold, 1974).



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CROD-Lo
3.5 d.u./ac. gross density



CROD-Med/Hi
7.0 d.u./ac. gross density



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Cottage Grove Site

Baseline Plan



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Cottage Grove Site

Table 1: Water Quality Volume Storm Runoff Volumes @ Cottage Grove Site

| Design Scheme | Runoff Volume (cu. ft.) | Runoff per Acre (c.f./ac.) | Diff. from Baseline, Runoff per Acre | % Change from Baseline | Dwelling Units (equiv.) in Scheme | Runoff per Dwelling Unit (c.f.) | Diff. from Baseline, Runoff (cu. ft./d.u.) | % Change from Baseline |
|---------------|-------------------------|----------------------------|--------------------------------------|------------------------|-----------------------------------|---------------------------------|--|------------------------|
| Baseline | 528,818 | 2,103 | 0 | 0 | 477 | 1,109 | 0 | 0 |
| CROD-LO | 0 | 0 | -2,103 | -100% | 748 | 0 | -1,109 | -100% |
| CROD-Hi/Med | 0 | 0 | -2,103 | -100% | 1616 | 0 | -1,109 | -100% |

WQV Storm

Table 2: 10 Year 24 Hour Storm Runoff Volumes @ Cottage Grove Site

| Design Scheme | Runoff Volume (cu. ft.) | Runoff per Acre (c.f./ac.) | Diff. from Baseline, Runoff per Acre | % Change from Baseline | Dwelling Units (equiv.) in Scheme | Runoff per Dwelling Unit (c.f.) | Diff. from Baseline, Runoff (cu. ft./d.u.) | % Change from Baseline |
|---------------|-------------------------|----------------------------|--------------------------------------|------------------------|-----------------------------------|---------------------------------|--|------------------------|
| Baseline | 1,592,554 | 6,335 | 0 | 0 | 477 | 3,339 | 0 | 0 |
| CROD-LO | 1,021,918 | 4,065 | -2,270 | -35.8% | 748 | 1,366 | -1,972 | -59.1% |
| CROD-Hi/Med | 916,938 | 3,647 | -2,687 | -42.4% | 1616 | 567 | -2,772 | -83.0% |

10 yr. 24 hr. Storm