New Braunfels Stormwater Management Strategy

New Braunfels, Texas

Phase II Report Appendix

Draft - March 2012

DESIGNWORKSHOP

A

STRATEGY CARDS

open space conservation

sets aside land to preserve open space that has high infiltration rates, which contributes to peak flow levels and increased infiltration into underground aquifers

policy | design & construction | operations, maintenance and monitoring | site | community | **regional**

impervious coverage reductions or limits

increased densities, decreased road sections, reduced parking requirements; City can establish limits to impervious cover in city limits or ETJ

policy | **design & construction** | operations, maintenance and monitoring | **site** | **community** | regional

benefits

This strategy may:

- **preserve the character** of the New Braunfels Hill Country
- **maintain (or reduce) pervious** cover existing in watersheds contributing to New Braunfels
- contribute to TCEQ permit approval

limitations

This strategy may:

- not increase infiltration, only maintain existing status
- require funding for potential purchase of land or easements

This strategy may help accomplish the following goals:

environment

- **encourage** development **patterns** that improve stormwater management opportunities
- **protect** water **quality** of receiving waters, particularly the streams of Landa Lake

community

- utilize parks and **open space** for stormwater storage and infiltration

economics

- ensure that the public investment in infrastructure proves to have a **positive return on investment** for the community

aesthetics

- stormwater infrastructure should be **visually pleasing**

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benefits

This strategy may:

- be applied at multiple scales with various mechanisms
- decrease the peak flow stormwater runoff

limitations

This strategy may:

- require changes in City regulation and standards
- require coordination among land owners when implementing at a community scale

This strategy may help accomplish the following goals:

environment

- **minimize impervious** surfaces
- **prevent flooding** and erosion caused by stormwater runoff

community

- ensure **stakeholder buy-in** on stormwater strategies

economics

- develop **stronger** stormwater strategies without stifling **growth** and **development**

aesthetics

- stormwater infrastructure should be **visually pleasing**
- ensure **craftsmanship** of stormwater infrastructure will result in **permanence**

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floodway building prohibitions

further limit or restrict new construction in the 100-year floodplain and floodway beyond existing ordinance

policy | design & construction | operations, maintenance and monitoring | site | community | regional

stream bank setbacks

establish setbacks from streams for buildings, parking lots and other structures

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:
- reduce flood damage and insurance claims
- increase park and open space area

limitations

This strategy may:
- reduce landowners' area of usable land

This strategy may help accomplish the following goals:

environment
- **encourage** development **patterns** that improve stormwater management opportunities
- ensure **construction** does not create environmental degradation, even on a temporary basis

community
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economics
- develop **stronger** stormwater strategies without stifling **growth** and **development**

aesthetics
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benefits

This strategy may:
- protect waterways from point source pollution
- reduce flood damage and insurance claims
- prevent or minimize erosion and gully formation

limitations

This strategy may:
- reduce direct access to water

This strategy may help accomplish the following goals:

environment
- **encourage** development **patterns** that improve stormwater management opportunities
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community
- make sure **responsibility** for operations and management of stormwater infrastructure is **clear**
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building materials

limit the use of materials in construction that contribute to water pollution

policy | design & construction | operations, maintenance and monitoring | site | community | regional

construction control measures

enhanced seeding, mulching, sediment traps, silt fencing, erosion control plan beyond existing requirements

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- improve downstream water quality
- improve wildlife habitat
- improve drinking water quality
- increase cost savings over time
- increase energy efficiency

limitations

This strategy may:

- be more costly and not as readily available as other strategies

This strategy may help accomplish the following goals:

environment

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economics

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benefits

This strategy may:

- be less costly to contractors during construction if implemented from the beginning
- reduce sedimentation in waterways
- increase water quality

limitations

This strategy may:

- be costly for small projects

This strategy may help accomplish the following goals:

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stormwater facilities inventory

inventory all stormwater facilities in each watershed, including type, capacity, maintenance, responsibility and schedule

policy | design & construction | operations, maintenance and monitoring | site | community | regional

maintenance and monitoring

outlines responsibilities for ensuring maintenance and monitoring is not only completed and operating correctly, but also requires regular city maintenance practices to incorporate BMPs

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- be extremely useful for city to have on record and when determining needs for new stormwater facilities

limitations

This strategy may:

- be difficult to keep up to date once in place
- require a time-consuming survey

This strategy may help accomplish the following goals:

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community

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benefits

This strategy may:

- reduce costs associated with poorly managed facilities and infrastructure
- reduce wasted natural resources

limitations

This strategy may:

- require on-going staff training
- require the creation or revision of a maintenance procedures manual

This strategy may help accomplish the following goals:

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density bonuses

incentives and bonuses for increased density in locations close to transit and services in order to preserve open space

policy | design & construction | operations, maintenance and monitoring | site | community | regional

stormwater utility fee

implement fee to fund maintenance of stormwater facilities

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- reduce the impacts such as increased flooding from impervious cover
- allow the City to incentivize increased density in desired areas
- require TCEQ permit approval

limitations

This strategy may:

- require additional study to determine which areas could become more dense

This strategy may help accomplish the following goals:

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benefits

This strategy may:

- help defray the costs of maintaining existing facilities as the city grows

limitations

This strategy may:

- inhibit new development if fee is perceived as too costly

This strategy may help accomplish the following goals:

environment

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community

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economics

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city incentives or fees

opportunities for variance from code for a fee for developments that achieve a higher standard than required. examples: buy into watersheds to pay in lieu of expedited permitting process

policy | design & construction | operations, maintenance and monitoring | site | community | regional

porous pavement

increase use of pervious paving materials by amending code to allow for the use of such materials in roadways and parking lots

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- increase revenue that can be used to finance infrastructure or capital projects

limitations

This strategy may:

- inhibit new development if fee is perceived as too costly
- cause development in undesirable areas that may not have an impact fee

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benefits

This strategy may:

- reduce volume of runoff
- reduce delivery of associated pollutants to warm water bodies
- reduce need for more involved stormwater drainage, conveyance and treatment systems
- contribute to TCEQ permit approval

limitations

This strategy may:

- be costlier than traditional materials
- is typically used for more lightly-trafficked (vehicular) sites
- require frequent maintenance
- offer different TCEQ benefits depending on concrete or asphalt
- not be applicable for curb and gutter roadway sections

This strategy may help accomplish the following goals:

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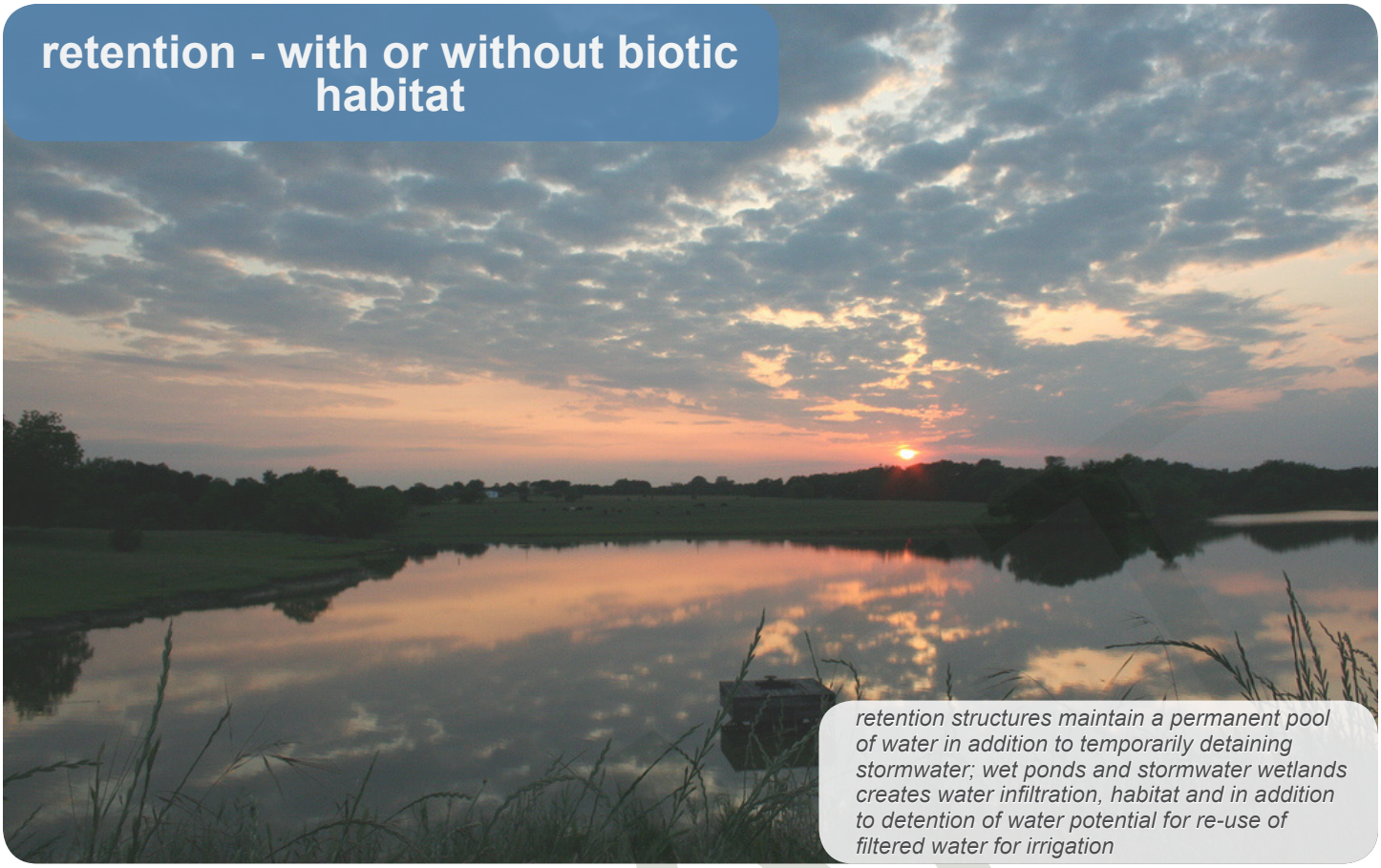
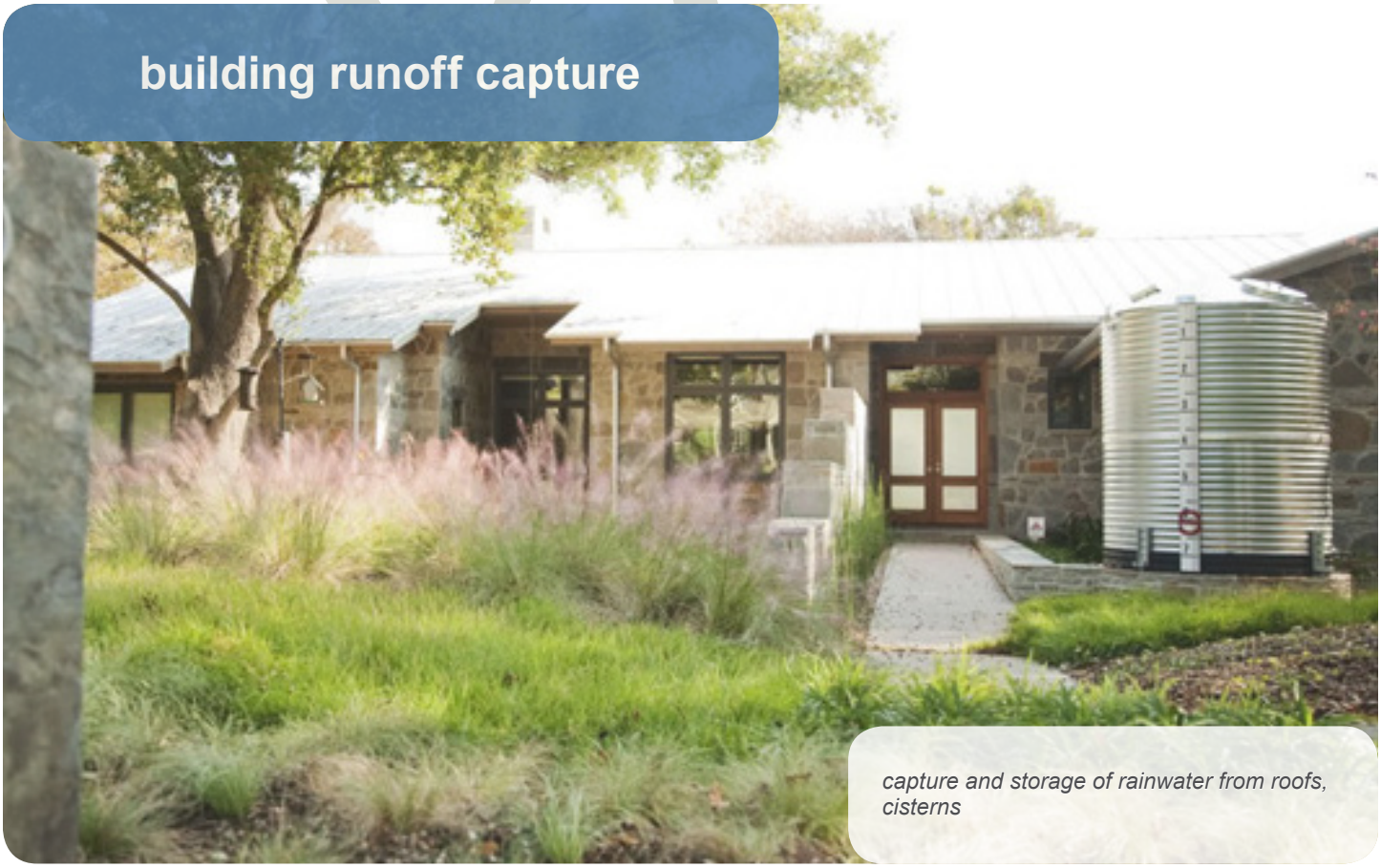
retention - with or without biotic habitat



retention structures maintain a permanent pool of water in addition to temporarily detaining stormwater; wet ponds and stormwater wetlands creates water infiltration, habitat and in addition to detention of water potential for re-use of filtered water for irrigation

policy | **design & construction** | operations, maintenance and monitoring | site | community | regional

building runoff capture



capture and storage of rainwater from roofs, cisterns

policy | **design & construction** | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- be aesthetically pleasing by adding a water feature and plant material
- remove dissolved nutrients
- contribute to TCEQ permit approval

limitations

This strategy may:

- increase construction costs
- increase maintenance costs
- contribute to thermal pollution and cause downstream warming
- be a safety concern for children
- cause nuisances such as mosquitoes, odor, algae
- have the potential to dry up during drought, without external water source

This strategy may help accomplish the following goals:

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community

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- develop **stronger** stormwater strategies without stifling **growth** and **development**

aesthetics

- stormwater infrastructure should be **visually pleasing**

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benefits

This strategy may:

- mitigate or eliminate increased runoff volume
- reduce the required capacity for down-slope retention and sediment control BMPs
- contribute to TCEQ permit approval

limitations

This strategy may:

- increase building costs, for example: installing a green roof
- not claim flood control credit unless sized properly
- be hard to enforce

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infiltration basin

examples include swales, infiltration basins, rain gardens or shallow excavated trenches filled with gravel or crushed stone that is designed to infiltrate stormwater through permeable soils into the groundwater aquifer; often used to treat runoff from parking lots for sidewalks

policy | **design & construction** | operations, maintenance and monitoring | **site** | **community** | **regional**

biofilter

biofilters may consist of either biological or engineered characteristics that filter various contaminants and pollutants. the use of native plants in stormwater facilities increases habitat and evapotranspiration. examples include grassed channels, swales and filter strips

policy | **design & construction** | **operations, maintenance and monitoring** | **site** | **community** | **regional**

benefits

This strategy may:

- have relatively low costs of construction
- be aesthetically pleasing
- treat certain pollutants
- contribute to TCEQ permit approval

limitations

This strategy may:

- not be appropriate for sites where there is a possibility of groundwater contamination or where there is soil with a high clay content that could clog the trench
- require maintenance
- be subject to additional regulation by EAA

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benefits

This strategy may:

- improve infiltrated water quality
- contribute to TCEQ permit approval

limitations

This strategy may:

- require periodic maintenance

This strategy may help accomplish the following goals:

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- **prevent flooding** and erosion caused by stormwater runoff
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detention basin (including multi-use stormwater detention facilities)

basins that temporarily detain a portion of stormwater runoff for a specific length of time and can increase water quality. examples of multi-use detention facilities include parks, open space, bike paths and fields

policy | **design & construction** | operations, maintenance and monitoring | site | **community** | regional

wetland basin or channel

engineered systems intended to perform the water purification functions of natural wetlands. best when used in conjunction with other BMPs, such as minimization of initial runoff volumes and use of pervious pavement or swales. may also be restored wetlands

policy | **design & construction** | operations, maintenance and monitoring | **site** | **community** | **regional**

benefits

This strategy may:

- improve infiltrated water quality
- reduce flooding
- prevent downstream channel scouring
- increase park and open space area
- contribute to TCEQ permit approval

limitations

This strategy may:

- require maintenance which is both essential and costly

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benefits

This strategy may:

- be very effective in removing pollutants
- decrease irrigation needs
- provide groundwater recharge
- contribute to TCEQ permit approval

limitations

This strategy may:

- contribute to thermal pollution and cause downstream warming if shallow water is present
- be a safety concern for children
- require frequent and intensive maintenance
- cause nuisances such as mosquitoes, odor, algae
- limit nearby future development due to wetland regulations

This strategy may help accomplish the following goals:

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economics

- align the city's **tourism** industry practices with sensible **stormwater management**
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litter control

clean up or minimization of litter in rivers, stormdrain facilities and along streets to reduce the amount of debris in the rivers, creeks and detention basins

policy | design & construction | operations, maintenance and monitoring | site | community | regional

retrofit existing stormwater facilities

upgrade existing facilities in need of repair to current standards and low impact development techniques

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- be a cost effective strategy
- reduce maintenance of other stormwater structures
- reduce chances of localized flooding due to drainage blocks

limitations

This strategy may:

- require on-going efforts in the community
- limit the use of disposable materials in key locations

This strategy may help accomplish the following goals:

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benefits

This strategy may:

- reduce future maintenance costs post-retrofitting
- improve functionality of unmaintained facilities

limitations

This strategy may:

- require costly upgrades

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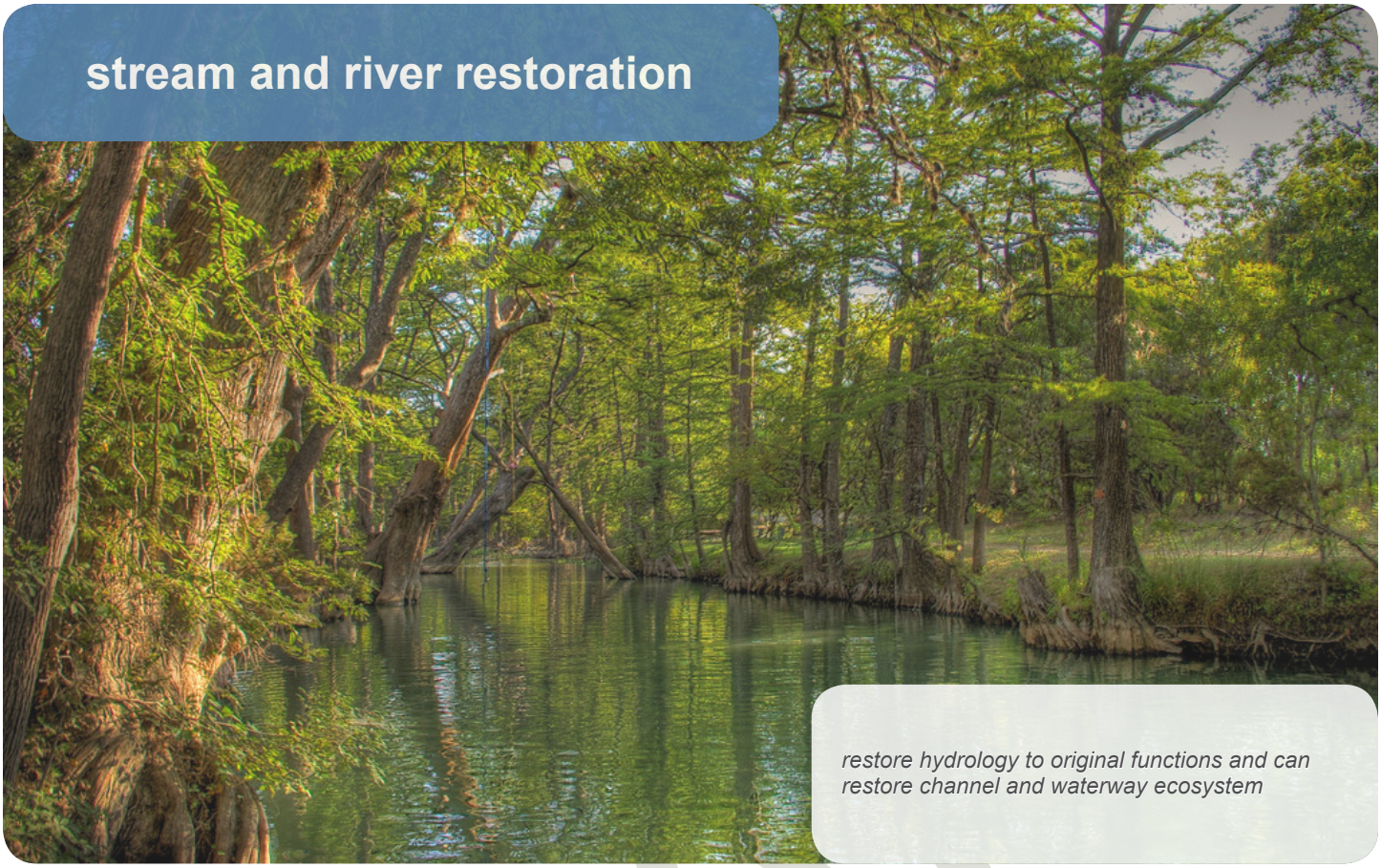
stream and river restoration



restore hydrology to original functions and can restore channel and waterway ecosystem

policy | design & construction | operations, maintenance and monitoring | site | community | regional

clustering

groups houses on smaller lots in concentrated areas, while maintaining the same amount of houses on the site as a traditionally allowed. large areas of open space are preserved where structures may never be built

policy | design & construction | operations, maintenance and monitoring | site | community | regional

benefits

This strategy may:

- alleviate issues of increased sediment accumulation and nutrient loading
- restore wildlife habitat
- contribute to TCEQ permit approval

limitations

This strategy may:

- be a very costly process
- require land use changes

This strategy may help accomplish the following goals:

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benefits

This strategy may:

- increase open space by focusing development
- manage stormwater more effectively than in conventional developments
- contribute to TCEQ permit approval

limitations

This strategy may:

- inhibit development through restrictions

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flood hazard mitigation

prepare to minimize, expedite communication during and swiftly recover after a flood hazard event

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benefits

This strategy may:

- put a plan in place for recovery post hazard events
- minimize risk of property and life in flood prone areas
- be prepared for flood events

limitations

This strategy may:

- limit development in high risk areas
- require a network of communication with additional infrastructure

This strategy may help accomplish the following goals:

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community

- ensure **stakeholder buy-in** on stormwater strategies

economics

- **stormwater management**

B

ONLINE POLLING RESULTS
STRATEGY PRIORITIZATION

Attach PDFs