VENTURA COUNTY RESOURCE CONSERVATION DISTRICT

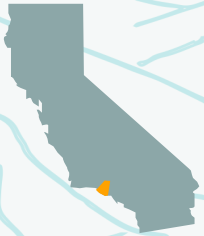
WATERSHED PROGRESSIVE

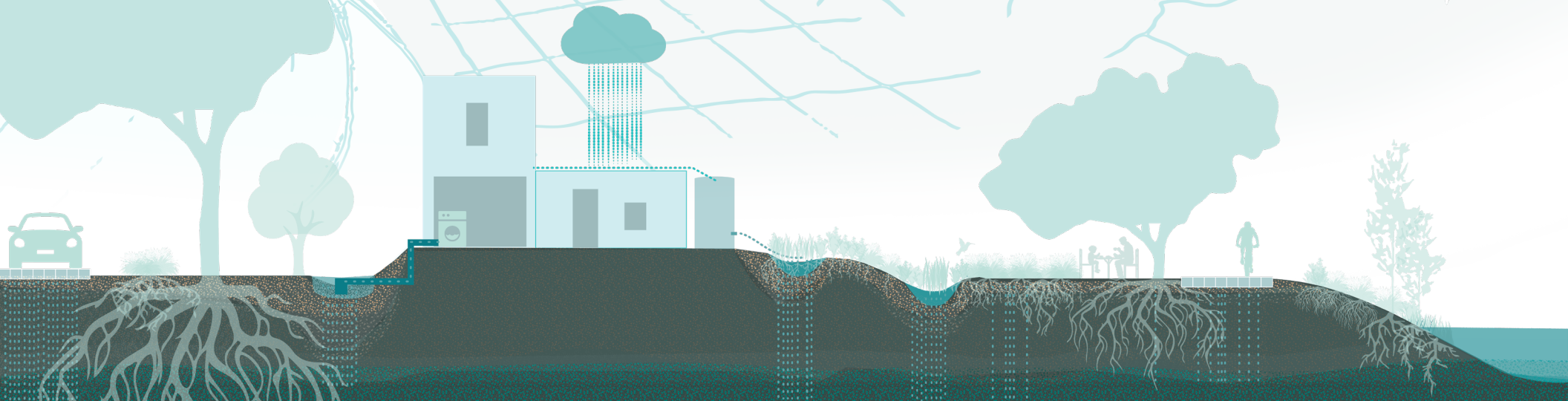
LAND RESILIENCE PARTNERSHIP

BIOSWALES

how to **reduce flood risk, filter stormwater & runoff,** and **increase drought resilience**

for Inland Valleys in Ventura County





B BIOSWALES

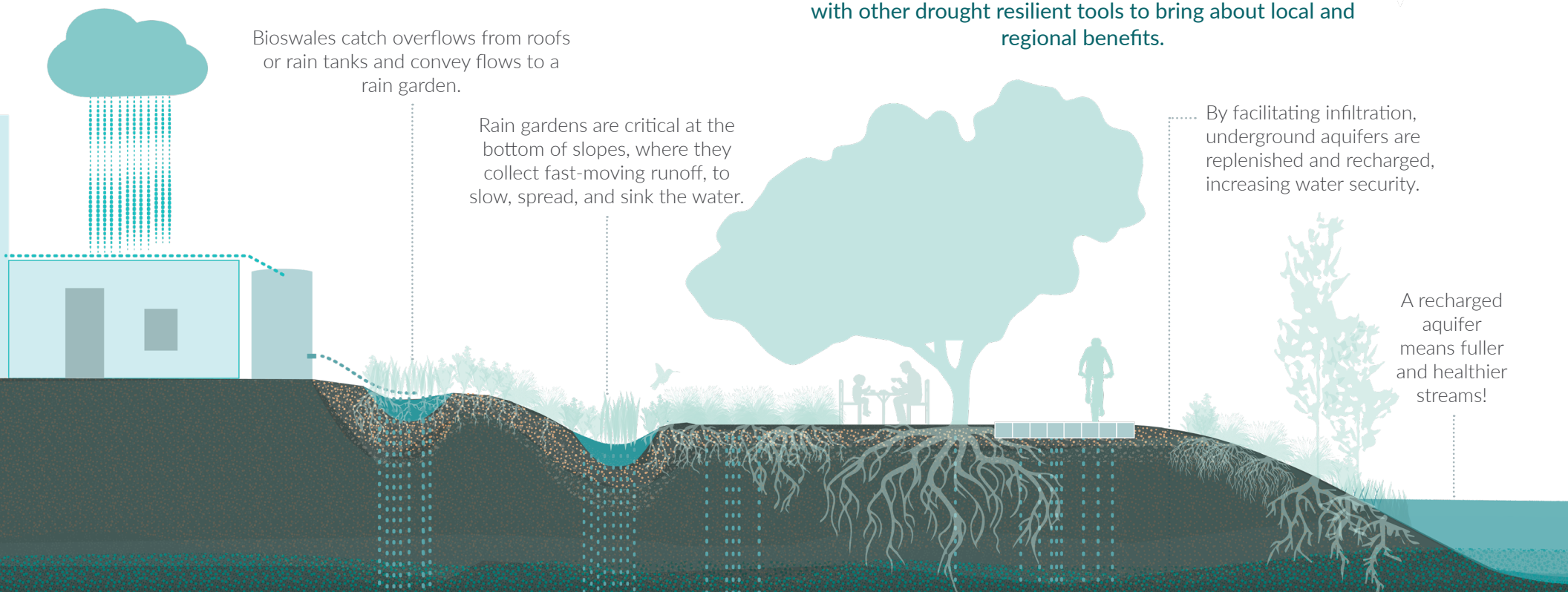
What is a Bioswale?
What makes it a critical drought-resilient tool?

Photo: Typical bioswale in a parking lot. (Image source: greenportal.wca.ca.gov)

Bioswales convey stormwater runoff through linear, vegetated channels that slow water to collect, slow, and sink it into the earth. In turn, this can save you money, irrigate your landscape, and recharge your local aquifer! Bioswales are planted, linear depressions in the landscape that can take on many forms. This template covers three types of Bioswales:

Bioswale on Low Slope: On a site with a low slope, bioswales can be created to convey water or as a modification of an existing drainage channel to stabilize and prevent erosion.
Bioswale on Steep Slope: When on a steeper slope, bioswales may use boulder check dams, rock piles, and weirs to slow water and prevent erosion.
Contour Swale: Contour swales run parallel to the slope to slow stormwater runoff and increase infiltration.

Bioswales are critical features in a drought resilient landscape. The diagram below shows how they function and interact with other drought resilient tools to bring about local and regional benefits.



B BIOSWALES

Bioswale on Low Slope

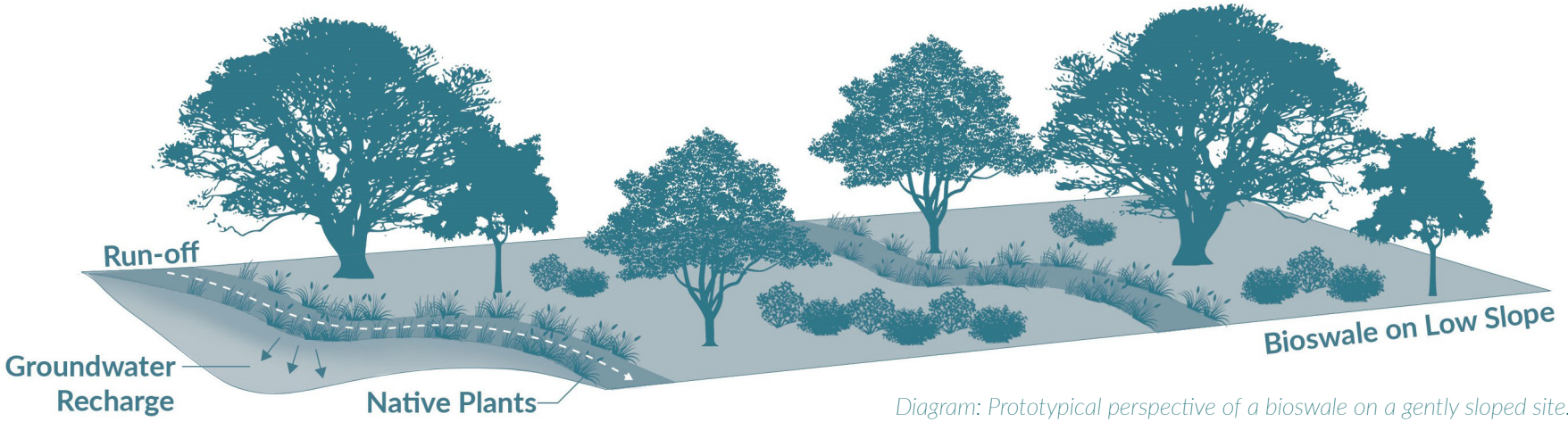


Diagram: Prototypical perspective of a bioswale on a gently sloped site.

Stormwater is rainwater that falls onto impervious surfaces like rooftops, roads, and driveways. When unmanaged, stormwater runoff can flood properties and pollute waterways.

Bioswales receive and slow runoff, allowing it to infiltrate into the ground while filtering and removing pollutants that would otherwise be carried downstream. Bioswales help prevent erosion from stormwater drainage through a site by guiding a flow path from a roof drain or hard surface through a channel lined with gravel and/or mulch and planted with species that help clean stormwater.

Photos: A rain tank collects rainwater and overflows to a bioswale.

Photos: The bioswale captures the overflow stormwater, slows it, spreads it, then infiltrates it, replenishing groundwater supplies.

B BIOSWALES

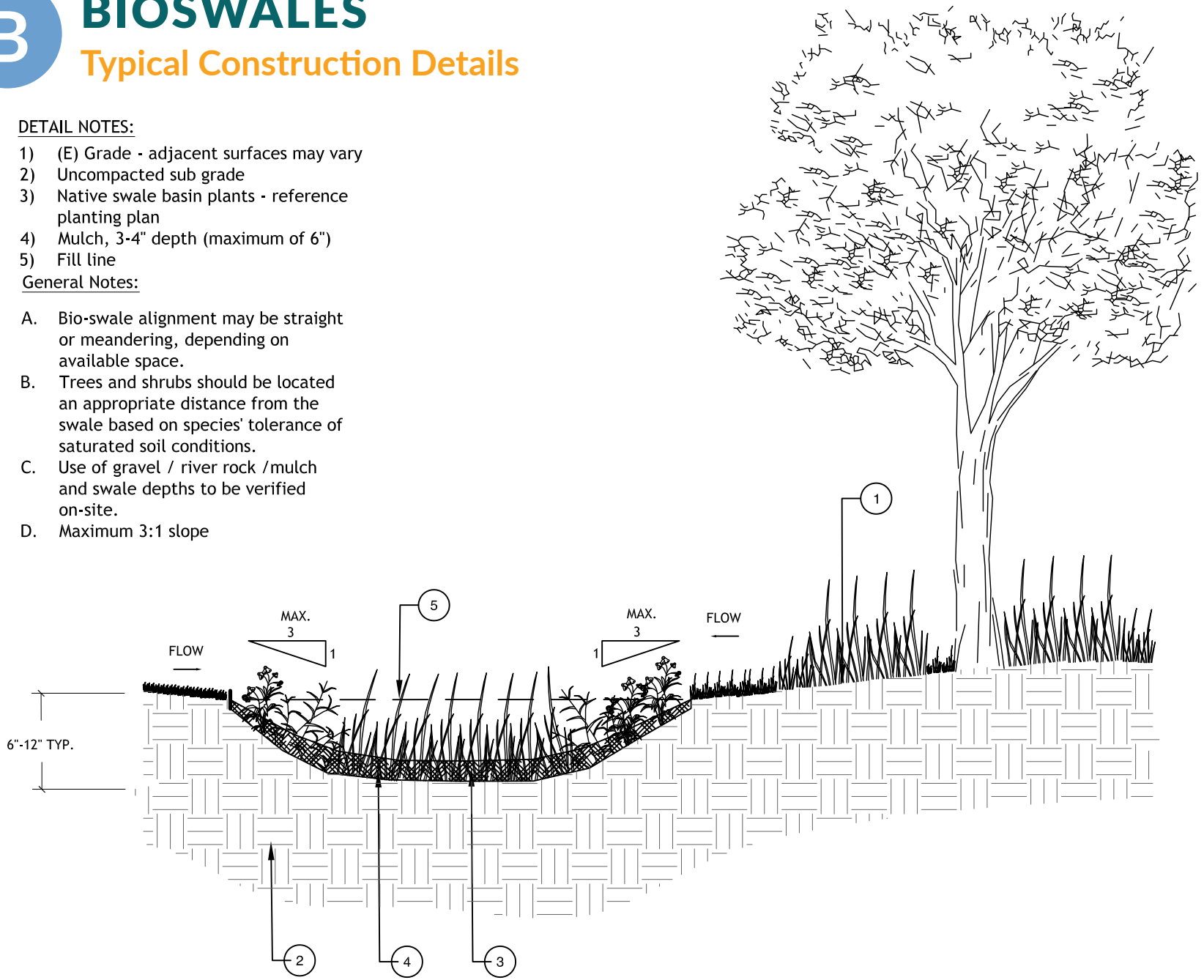
Typical Construction Details

DETAIL NOTES:

1) (E) Grade - adjacent surfaces may vary
2) Uncompacted sub grade
3) Native swale basin plants - reference planting plan
4) Mulch, 3-4" depth (maximum of 6")
5) Fill line

General Notes:

A. Bio-swale alignment may be straight or meandering, depending on available space.
B. Trees and shrubs should be located an appropriate distance from the swale based on species' tolerance of saturated soil conditions.
C. Use of gravel / river rock /mulch and swale depths to be verified on-site.
D. Maximum 3:1 slope



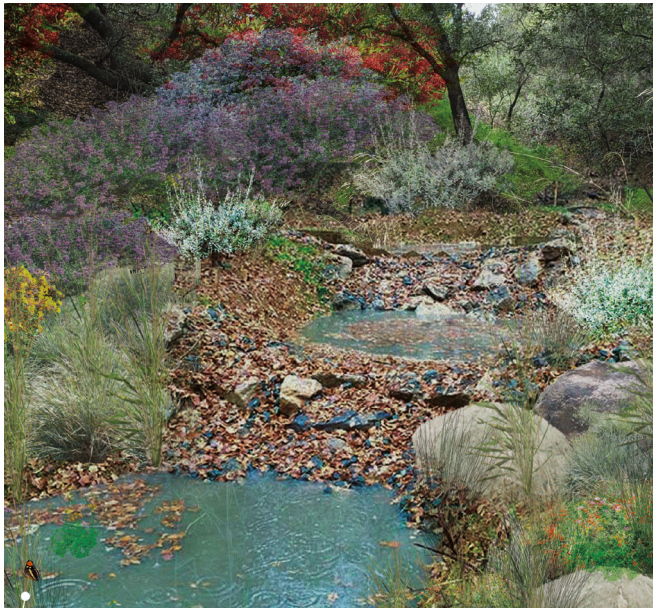
1 **BIO-SWALE (TYP.)**

(N.T.S)

B BIOSWALES

Bioswale on Steep Slope

Conveyance Bioswales collect, convey, filter, and infiltrate stormwater. On slopes, conveyance swales include a series of shallow rain garden "steps" that slow fast-moving water, reducing erosion. Swales on steeper slopes may need boulder check dams and gravel centers to help slow and sink water.



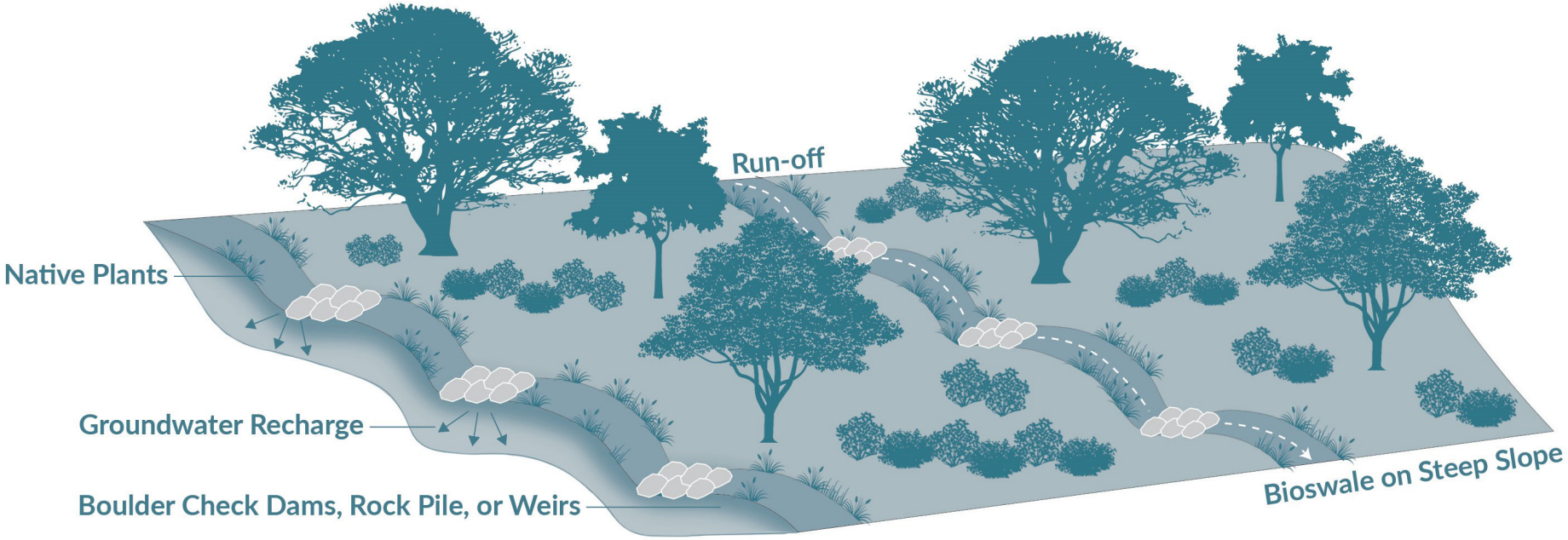
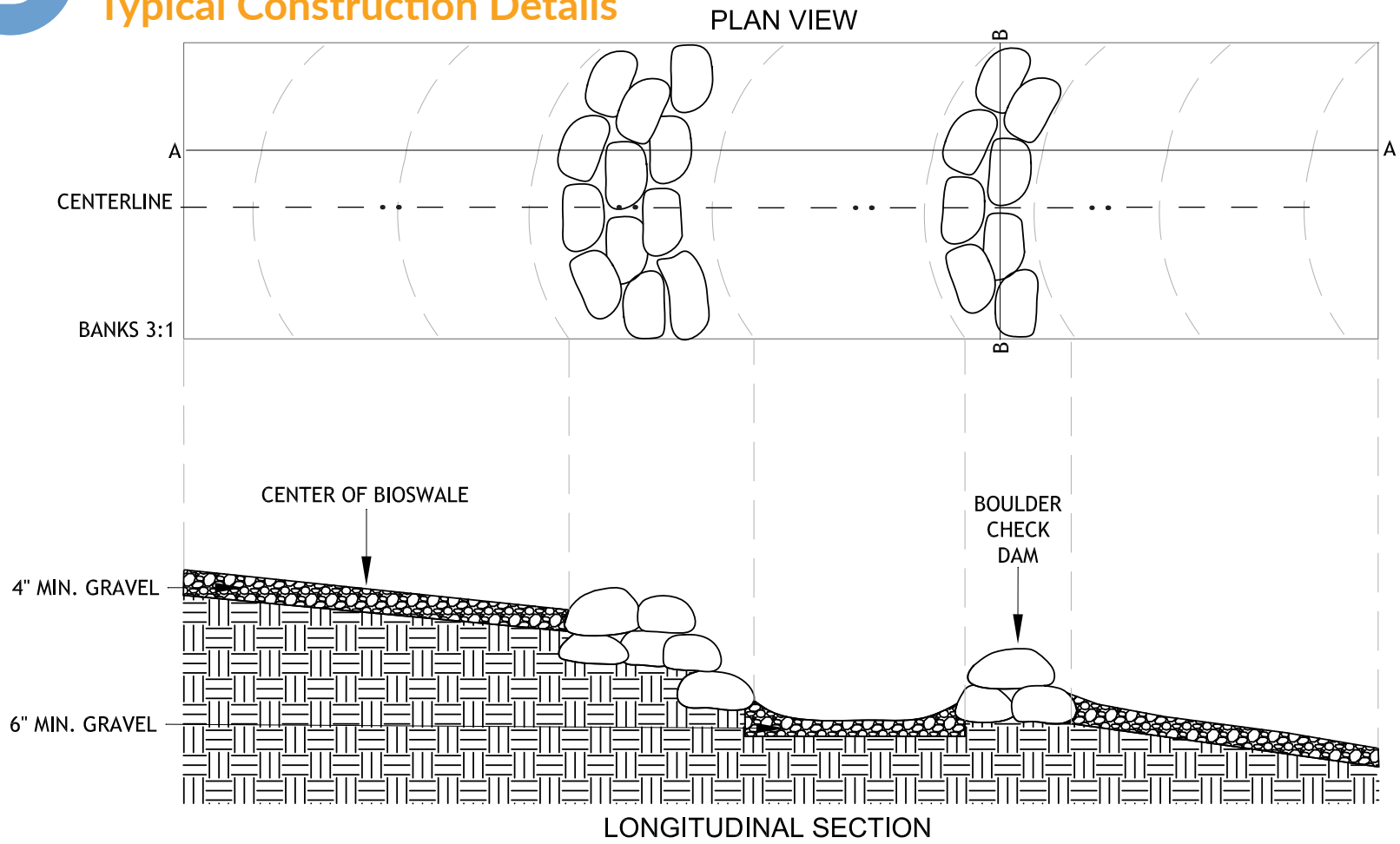


Diagram: Conveyance bioswale on a steep slope, with boulder check dams.

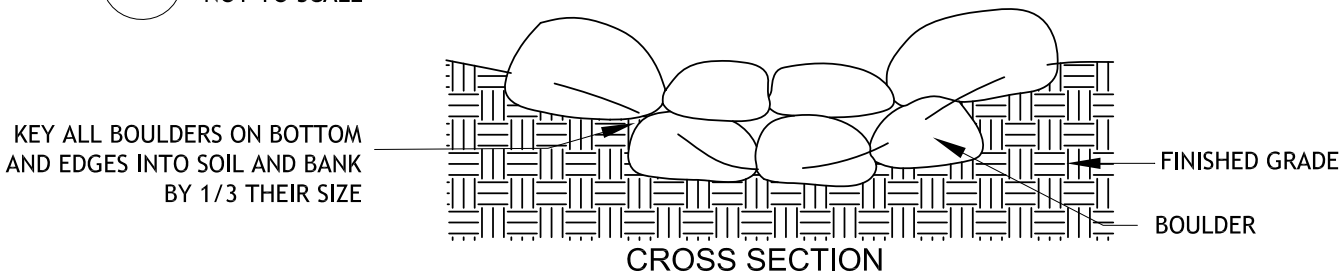
B BIOSWALES

Typical Construction Details



1 BIOSWALE WITH CHECK DAM - SECTION A

NOT TO SCALE



2 CHECK DAM CROSS SECTION - SECTION B

NOT TO SCALE

B BIOSWALES

Contour Swale

Contour Bioswales capture stormwater running downhill, holding it onsite until it infiltrates into the ground. Building swales “on contour” follow a level surface perpendicular to a steep slope. This keeps the swale level, allowing it to catch water flowing down a hill and spread the water horizontally and evenly to prevent erosion.

The soil removed to create a swale can be used to form a berm on the downhill side of the swale. The berm can be planted with vegetation to help reduce erosion and stabilize the slope.

Contour swales are great tools for passively irrigating large planted areas, such as orchards.

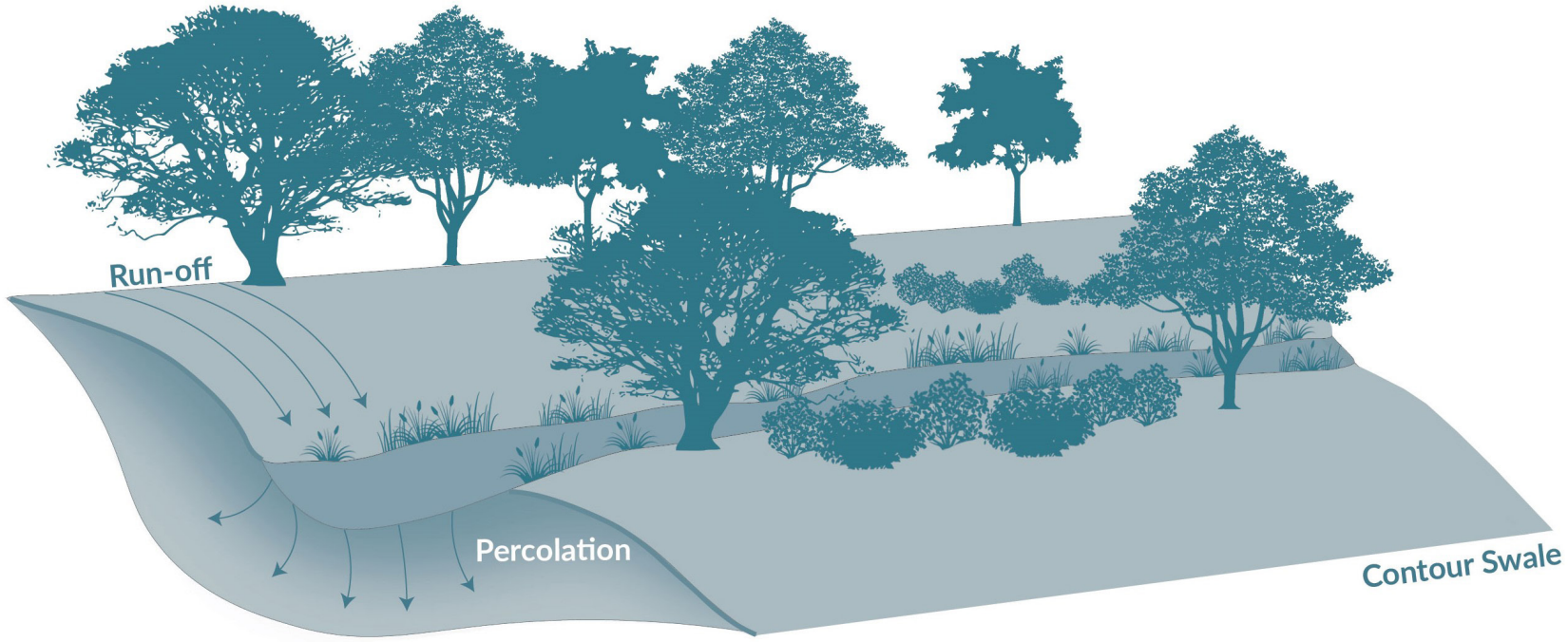
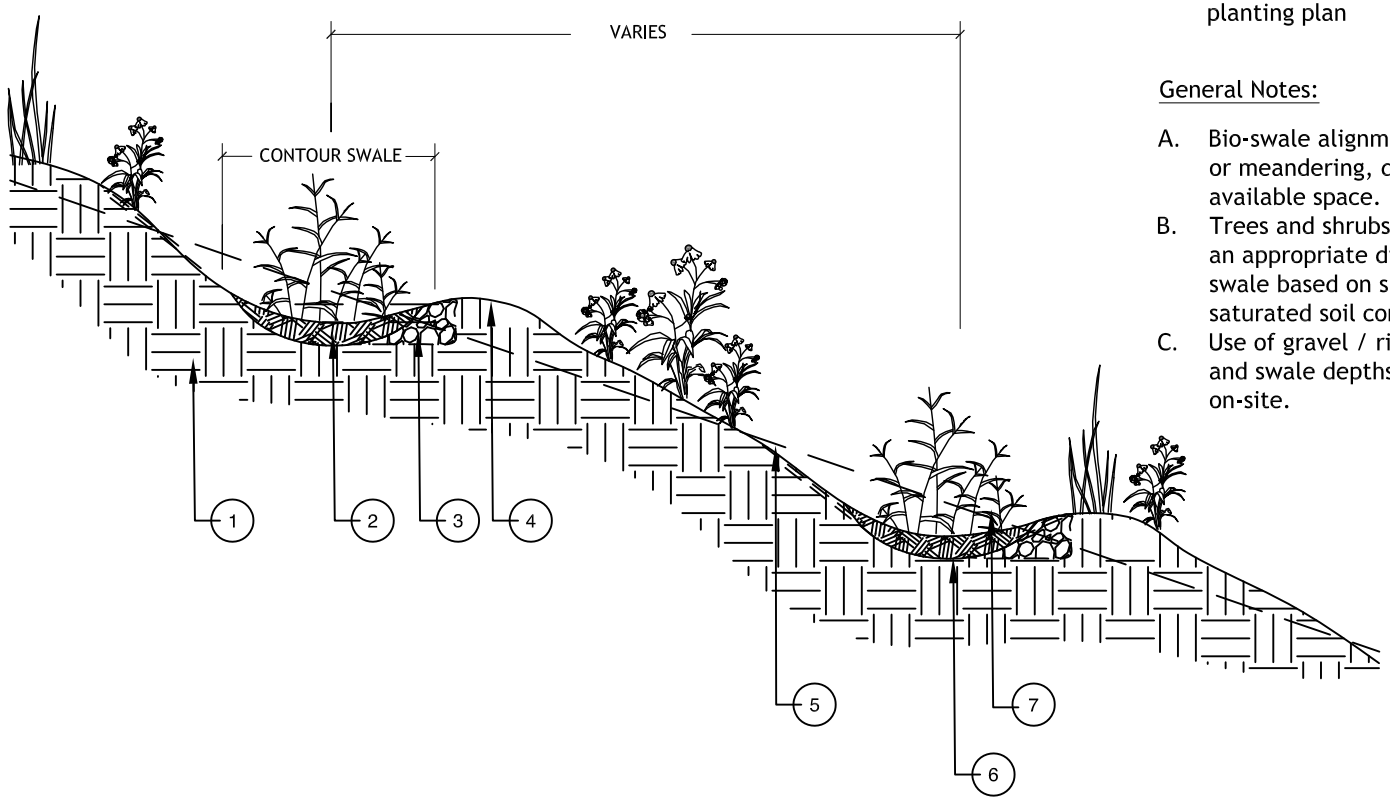


Diagram: A swale, laid out on contour so that water doesn’t flow along it but instead percolates into the soil, forming an underground storage reservoir. Swales can be 1 to 3 feet deep and 1 to 4 feet or more across, with a berm downslope roughly the same size, made from the soil from the swale.

B BIOSWALES

Typical Construction Details



1 BIO-SWALE ON CONTOUR (TYP.)

(N.T.S)

Detail Notes:

1) Uncompacted sub grade
2) Mulch, 3-4" depth (maximum of 6")
3) Check dam for erosion protection and to reduce flow velocities.
4) Constructed berm w/ material cut from terracing
5) Original grade line
6) Low point of swale - 6-12" below top of berm
7) Native swale basin plants - reference planting plan

General Notes:

A. Bio-swale alignment may be straight or meandering, depending on available space.
B. Trees and shrubs should be located an appropriate distance from the swale based on species' tolerance of saturated soil conditions.
C. Use of gravel / river rock / mulch and swale depths to be verified on-site.

BIOSWALES

Constructing a Bioswale

1. Feasibility

- **Identify stormwater runoff sources:**
  a. Rooftop downspouts
  b. Hard/paved surfaces
  c. Uphill landscapes and slopes
- **Identify a purpose and type for the Bioswale:**
  a. Conveyance Bioswale w/ mild slope
  b. Conveyance Bioswale w/ steep slope and check dams
  c. Contour Bioswale w/ flat slope
- **Understand your site's soils:**
  a. Determine your site's soil types and characteristics using: https://websoilsurvey.sc.egov.usda.gov
  b. Well draining (not clay) soils will allow some infiltration.

2. Design

- **Determine the size and shape of your bioswale on your site:**
  a. Minimum depth of 6" and maximum of 12".
  b. Minimum width 3'.
- **Plan where bioswales will convey water to and how stormwater overflows:**
  a. Conveyance to a Rain Garden
  b. Conveyance to an existing drain or waterway
  c. Spreading into a landscape area
  d. Move water to more than 10' away from buildings and do not overflow or infiltrate uphill from structures.

3. Planting

- **Use climate appropriate plants** that don't need irrigation after establishment. Species that grow natively in dry creeks are well-suited to bioswales.
- **Place plants that prefer more moisture closer to the bottom of the bioswale:** Plant species with a lower water demand but that can tolerate occasional saturation along edges of bioswale slopes. Group plants according to their size/space and sun/shade requirements.
- **Minimize soil compaction from walking:** Consider pathway locations you will use to weed and maintain the bioswale.
- **Use mostly evergreen plant materials:** Make sure that the majority of your plants are active all year rather than deciduous/dormant.
- **Arrange to cover at least 80% of the bioswale slopes in the first year of growth:** This will help stabilize soil during storm flows.
- **Use mostly evergreen plant materials:** Make sure that the majority of your plants are active all year rather than deciduous/dormant.
- **Arrange to cover at least 80% of the bioswale slopes in the first year of growth:** This will help stabilize soil during storm flows.

4. Build It!

- **Call 811:** Always call first to identify underground utilities before you dig. Avoid existing tanks, pipes, and other utilities during construction.
- **Dig bioswales:** Start from downspout or other water source, maintaining a minimum 2% slope away from all buildings. Designed depth (6-18" at lowest point), accounting for a minimum of 3" of mulch on top of soil as finished grade.
- **Use gravel and rocks:** Use gravel to increase infiltration in the low flow channel of the bioswale. Use larger rocks and boulders to slow water, form check dams on steep slopes, and create a natural creek aesthetic.
- **For lower slope bioswales, layer the bioswale with 4-6" of coarse, woody mulch:** This prevents standing water and mosquitos, as well as encourages healthy soil and reduced weeds. River rock or gravel may also be used to cover the base of the bioswale but has less soil and plant benefits.
- **Include a compacted, raised berm:** This "wall" may be constructed around the low side of the rain garden to prevent uncontrolled overflow on a sloped site.

Photo 1: 'Before' conditions.

Photo 2: Trench dug.

Photo 3: Gravel layers placed.

Photo 4: Plants installed.

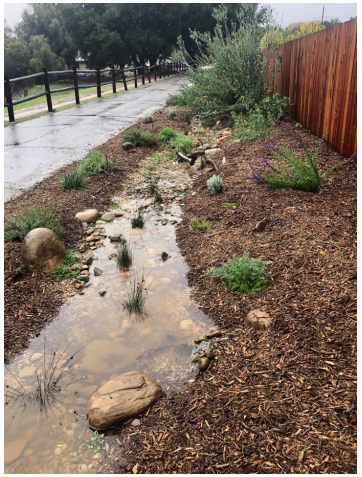


Photo 5: Success!

B BIOSWALES

Bioswale Zones

Bioswales vs. Rain Gardens: What's the Difference?
Both Bioswales and Rain Gardens are practices that help manage rainwater and stormwater runoff through nature-based designs. Bioswales slow and convey stormwater through long channels, filtering pollutants before infiltrating the water back into the soil. Rain Gardens are depressed areas in a landscape designed to capture, store, and infiltrate rainwater. Often, Bioswales and Rain Gardens are designed for use together in a landscape, with the Bioswale directing stormwater towards a Rain Garden.

Additional Information:
For more information, visit our Rain Gardens Design Template.

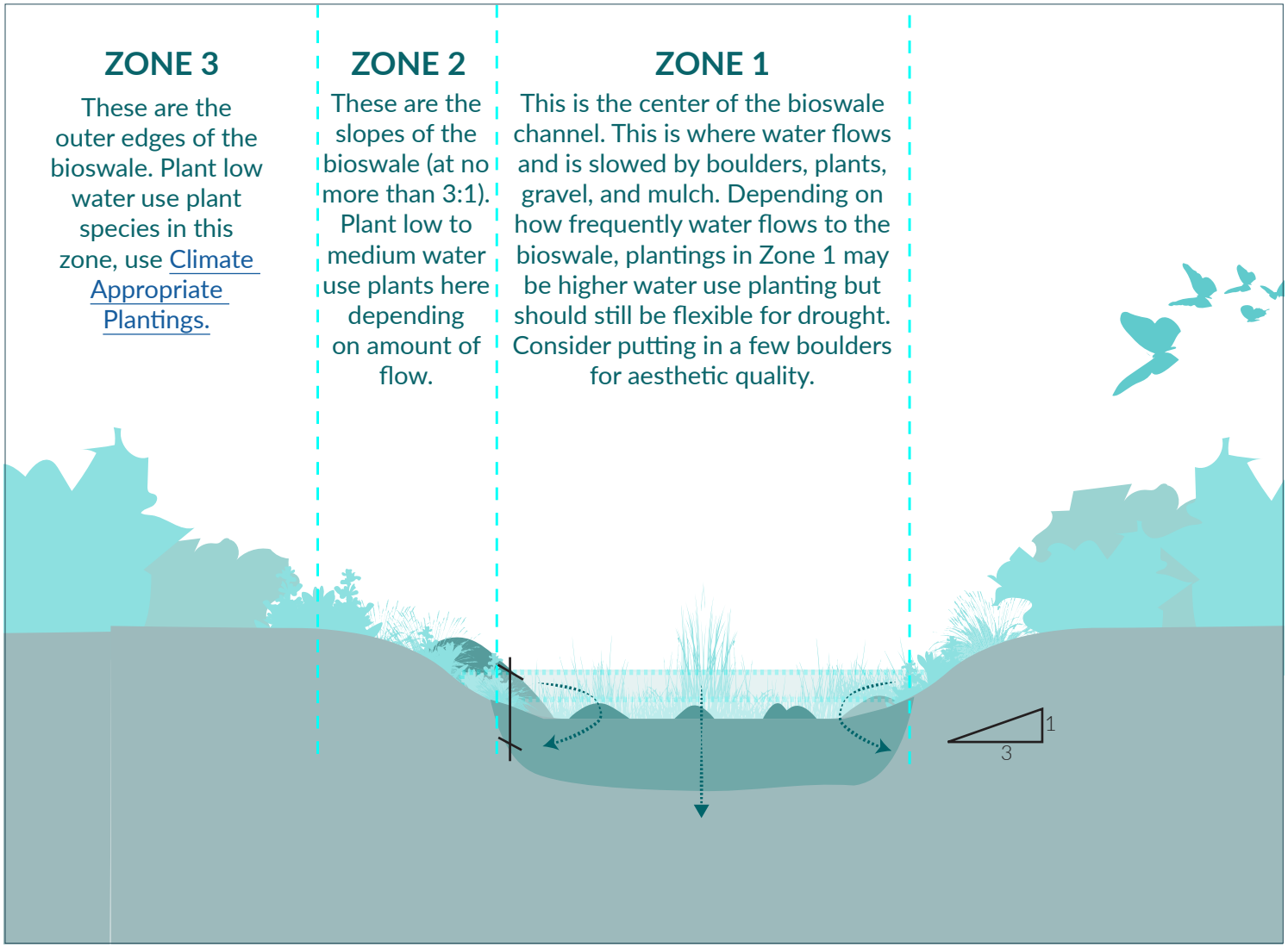


Diagram: Typical bioswale section showing planting zones. Visit the Plant Palette in this template for more information on region-specific plants.

BIOSWALE DO's

- ✓ DO slope sides at a 3:1 slope.
- ✓ DO make swale 6" to 18" deep.

BIOSWALE DON'Ts

- ✗ DO NOT direct water toward buildings or place bioswales within 10' of foundation.
- ✗ DO NOT grade a bioswale within drip line of existing trees.
- ✗ DO NOT make bioswale too deep.
- ✗ DO NOT put bioswales over septic or other utilities.

B BIOSWALES

Plant Palette

LARGE TREES

Juglans californica
California Black Walnut

Platanus racemosa
Sycamore

Quercus agrifolia
Coast Live Oak

SMALL TREES/ LARGE SHRUBS

Ceanothus spp.
California Lilac

Cercis occidentalis
Western Redbud

Heteromeles arbutifolia
Toyon

SHRUBS

Diplacus/Mimulus longiflorus
Sticky Monkeyflower

Epilobium canum
California Fuchsia

Trichostema lanatum
Wooly Blue Curls

PERENNIALS

Achillea millefolium
Yarrow

Eriogonum umbellatum
Sulphur Buckwheat

Romneya coulteri
Matilija Poppy

WILDFLOWERS, GRASSES, RUSHES

Eschscholzia californica
California Poppy

Leymus condensatus
Canyon Prince Wild Rye

Juncus patens
California Gray Rush

SOIL DRAINAGE

- *fast*
- *slow*
- *adaptable*

SUN/SHADE

- *full sun*
- *partial sun / shade*
- *full shade*

OTHER CONSIDERATIONS

- *erosion control*
- *pollinator*