Central California Coast
Technical Assistance Memo (TAM)

LID Plant Guidance for Bioretention

Low Impact Development

This Technical Assistance Memo (TAM) provides plant guidance for bioretention stormwater control measures. Bioretention systems are low impact development (LID) features that use a combination of soil, plants, and other design elements to slow, treat, retain, and infiltrate stormwater runoff to mimic the natural, pre-development hydrology of a site.

While bioretention systems may look like regular landscaped areas, they are designed (engineered) to manage stormwater runoff volumes and pollutants created by urbanization. Specifying the appropriate plants and soil for a bioretention system is critical to its performance and community acceptance.

Which Bioretention Facility Type?

There are two basic bioretention design types: planter and slope-sided. The flat-bottom planter type has a level soil surface, which allows stormwater to pond across the entire area. All plants in the planter type of bioretention must be able to tolerate stormwater inundation (Figure 1, Zone A). In comparison, the slope-sided type has two landscape conditions: the area that functions for stormwater management (Figure 2, Zone A) and the area above the ponding level. Similar to the planter type, plants in Zone A of a slope-sided bioretention type must be able to survive periodic ponding conditions. Plants in Zone B, however, are not located in the stormwater management area and the plants/trees can be selected from conventional plant palettes. For each project, it is important that the landscape designer understand where the delineation between Zone A and Zone Be occurs in order to develop a proper plant design.

Source: Kevin Robert Perry

Slope-sided: This facility type has a lower area that ponds and conventional landscape on the side-slopes. Only plants in the functional, ponding area (Zone A) must be tolerant of periodic inundation.

Source: Cannon

Flat-bottom Planter: This design type has a flat surface with consistent depth of ponding across the structure. The entire area functions for stormwater management and all plants in this facility must be tolerant of periodic inundation (Zone A).

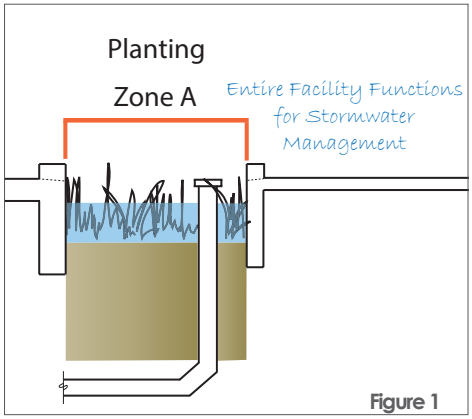


Figure 1

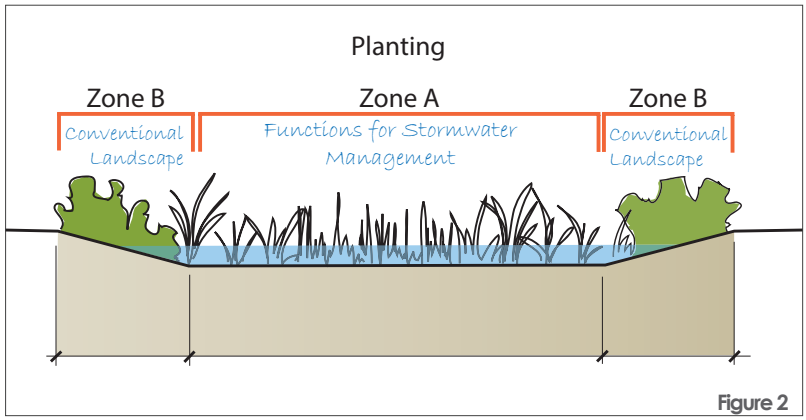


Figure 2

Choosing the Plants

With the bioretention facility type known and ponding areas identified, the plants can be selected. A list of plants appropriate for Zone A conditions (periodic ponding) is available on the Central Coast Low Impact Development Initiative (LIDI) website.

The LIDI Bioretention plant list was developed using the following criteria:

- Tolerant of varied moisture conditions (wet and dry)
- Tolerant of varied soil types and growing conditions
- Low maintenance requirements
- Not invasive weeds
- Do not have aggressive/invasive root systems
- Exhibit an attractive appearance.

centralcoastlidi.org/plants

The bioretention plants provided on the LIDI website represent a basic bioretention plant palette. When selecting plants, the landscape designer should determine whether a plant species is appropriate for the site considering proximity to cars, pedestrians, height limits, and anticipated levels of maintenance. Drought tolerant native plants are strongly encouraged to support water conservation, provide wildlife habitat, and for their ability to survive in local climate conditions.

While plant selection for Zone B areas is at the discretion of the landscape designer, selection should take into account the sandy, free draining bioretention soil mix and the potentially erosive conditions where stormwater enters the facility.

Source: Las Pilitas Nursery

Plant Selection and Maintenance: Anticipating the level of maintenance a facility will receive informs plant selection and may improve long-term system function. Where irrigation levels and maintenance are expected to be low, select a tough plant palette using species with similar requirements. For example, on a road-side bioretention swale that will receive little or no irrigation and minimal maintenance after establishment, a planting of *Juncus patens*, *Achillea millefolium* and *Muhlenbergia rigens* could survive on rainfall once established. These tough plants, which look best when given supplemental water and cut back annually, will also tolerate mowing.

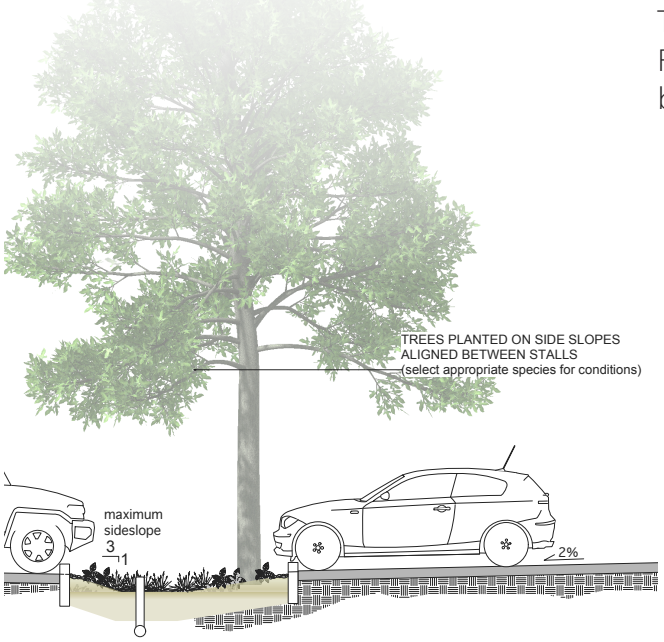
About Plant Substitutions

Selection of different plant species may be appropriate based on the specific project objectives. However, the designer must ensure that plants selected for the Zone A location of a bioretention facility can tolerate periodic stormwater inundation. During construction, designers and/or construction managers should carefully review substitution requests. In the case of substitutions sought due to supplier availability, the contractor may need to broaden their search to locate a different supplier.

Source: William Cullina

Bioretention Workhorse: *Juncus* is a genus of plants, commonly known as rushes. They are found across the globe and frequently on bioretention plant lists because of their tolerance for inundation. Some *Juncus* perform better than others in arid environments. *Juncus patens* is an easy to grow California native rush. It tolerates poor drainage, flooding, drought, and shade. A strong bioretention performer, it is more drought tolerant than the commonly available *Juncus effusus*. Additional *Juncus* cultivars and varieties may also be available at nurseries. Ask growers which *Juncus* will perform well with both seasonal inundation and drought.

Trees in Bioretention Areas



Trees provide additional aesthetic and performance benefits. Following these guidelines will maximize their success in bioretention areas:

- Provide sufficient facility width (a rule of thumb is 8' min.)
- Trees should be located at least five feet from facility inlets to avoid erosion of soils around the root ball
- Select trees that will tolerate seasonally wet soils and potential ponding
- Typically, locate trees on side-slopes; not at the bottom of Zone A
- Some trees may tolerate periodic shallow ponding, especially if native soils are highly infiltrative
- Do not specify trees with invasive roots
- Securely stake trees planted in bioretention areas

Soils for Bioretention

Specifying the correct soils for bioretention areas is critical in order to achieve stormwater objectives and plant health. Soils must balance three primary design objectives:

- High enough infiltration rates to meet surface water draw down requirements
- Infiltration rates that are not so high that they preclude pollutant removal function of soils
- Soil composition that supports plant establishment and long-term health

Bioretention Soil Mix: Construction documents for any LID project should include a bioretention soil specification that defines the ratio of materials in the mix (approximately 35% aged compost to 65% concrete sand), and the gradation, quality analysis, and other requirements for the materials. Specifications should also include guidelines for blending and placement of the bioretention soil mix.

Plant Installation

Landscape installation for bioretention areas is similar to that of traditional landscapes with a few added considerations:

- Conditions differ greatly between the ponding area (Zone A) and side-slopes (Zone B); plant installation must accurately follow landscape plans. After planting, an inspection should ensure correct placement.
- Plants should not block stormwater flows at inlets. The mature, full-size of plants should be estimated to determine proper setback from inlets, with adjustments made after installation, if plants are too close.
- A two-inch layer of compost may be applied to retain moisture, prevent erosion, and suppress weed growth. Use the same compost from the bioretention soil mix specification and avoid bark mulches that can float during storm events.
- Landscape installers should be aware to avoid compaction of the soil with machinery, or never working wet soils.

Plant Establishment and Care

Like traditional landscapes, bioretention planting areas require care and ongoing maintenance for optimal health. Due to their functional nature as stormwater management facilities the following guidelines should be followed:

Irrigation is typically needed for two to three years following installation. After that period, native plants will need little to no supplemental irrigation to survive, however they may enter a dormant stage and appear dried up until rejuvenated by rains or supplemental irrigation. Because bioretention soils are formulated to infiltrate, irrigation application rates must be properly designed to avoid overwatering, and for systems with an underdrain prevent potential discharges through the underdrain.

Compost Mulch (1" - 2") may be reapplied to bioretention areas annually, or as the mulch layer breaks down. Use compost mulch (the same compost used in the bioretention soil mix) and avoid bark mulches that can float during storm events. Do not apply mulch just prior to the rainy season.

Fertilizer should not be used in bioretention areas. Instead, a compost top dressing or application of compost tea can be used to introduce nutrients and beneficial microorganisms to the soil.

Synthetic herbicides and pesticides should **not be used** in bioretention areas because of their potential toxicity risk to aquatic organisms. There are a variety of natural methods and products that can be used to control weeds and pests.

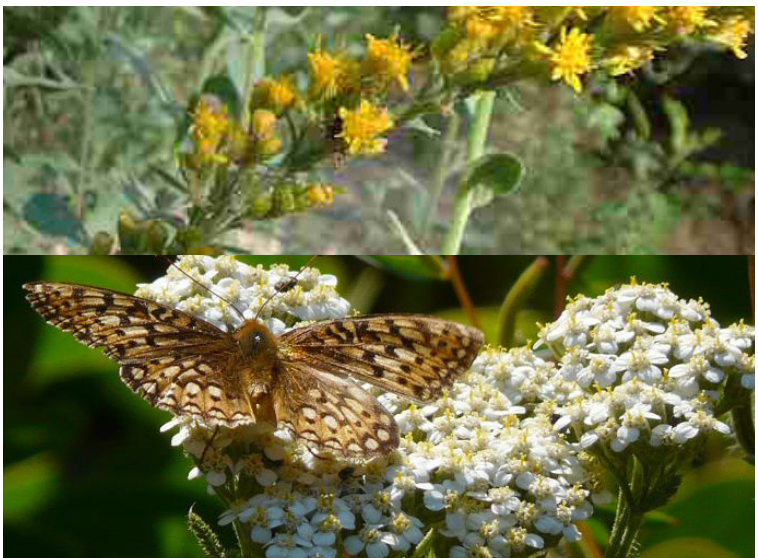
Weeds compete with plants for nutrients, water, and sunlight. They should be regularly removed, with their roots, by hand pulling or with manual pincer-type weeding tools. Care should be given to avoid unnecessary compaction of soils while weeding.

Replace plants that die due to unsuitable plant conditions, disease, underwatering, or other unforeseen issues. Dead and dying plants must be removed and replaced to avoid spreading disease, establishment of weeds in bare areas, and reduced LID function. Before replacing with the same species, determine if another species may be better suited to the conditions.

Check tree staking, especially in high wind areas. Trees in bioretention areas may be more easily impacted by storms because of side-slope and saturated soil conditions. They should be inspected once or twice a year and following storm events to ensure they maintain a vertical, upright position during establishment. Stakes should be removed once they are no longer needed to encourage self supporting root systems (between one and two years).

Plant Nurseries

Check with your local nursery for availability of plants on the LIDI Bioretention plant list. Additionally, LIDI's Bioretention Vendor List, while it may not be inclusive of all suppliers, provides contact information for Central Coast nurseries that stock plants from the Bioretention plant list.



Source: Las Pilitas Nursery

For additional technical resources:
www.centralcoastlidi.org
For questions or to contact the
Central Coast Low Impact Development Initiative:
info@centralcoastlidi.org

Central Coast Water Board

central coast LIDI

UC Davis LID Initiative