At this point you have already gone through the first flow chart: BMP Selection

Draft: Rain Garden/Bioretention Cell

Step 1
Identify project participants and determine available project time

Step 2
Outline project goals and objectives & Estimate amount you intend to spend

•Residential rain gardens average about $3 to $4 per square foot, depending on soil conditions and the density and types of plants used.
•Commercial, industrial and institutional site costs can range between $10 to $40 per square foot, based on the need for control structures, curbing, storm drains and underdrains .
•In any rain garden/bioretention cell design, the cost of plants varies substantially and can account for a significant portion of the expenditures.

Step 3
Gather Information and Add to Generic Site Design
(*this will be used later in a detailed schematic*)
Create a schematic drawing. Show where the water source comes into the rain garden (bioswale, rain barrel hose, or where water sheets off of sidewalk or parking lot).

•Obtain a schematic of the site including wetlands, power lines, fire lanes, future building plans, etc.
•Walk around and survey the grounds to identify potential areas for project implementation (i.e. areas where water ponds during/after storms, areas where there is a lot of erosion, landscaping doesn't get enough water)
•Identify gutters/downspouts
•Request assistance from an extension agent, landscape architect, ecologist
•Investigate permit requirements
•Make list of problem areas
•Take pictures of problem areas

Step 4
Locate and Size

•Now that you've evaluated the site, gathered all of the maps and materials you need, and listed the problem areas or potential areas for your rain garden, here are things to consider when locating and sizing your rain garden.
•Make sure you do not plan your rain garden in a riparian buffer, or too close to the foundation. Also, be sure to design a manageable rain garden.

**NOTE: Now is an excellent time to call your local Cooperative Extension Office to have them test the soil. They will do this free of charge. A good soil mix for a rain garden is 50% sand, 20% topsoil, and 30% compost. If the soil onsite contains less than 10% clay, then it can be used in place of imported topsoil in the mix. It is possible you may be able to use the existing soil, but if it is not in good condition, you may have to spend some money on new soil and/or amendments such as lime, gypsum and specific nutrients.

Step 5
Design

Now that you have determined the location and approximate size of your rain garden you can begin to design it:
•Create a schematic drawing of the rain garden on a copy of the site (topo map, aerial, etc.).
•Show where the water source comes into the rain garden (bioswale, rain barrel hose, or where water sheets off of sidewalk or parking lot)
•Determine the exact size of the rain garden (in square feet)

Step 6
Selecting Plants

Designing with Plants:
•Use a circle template (or ruler) to place plants in your rain garden
•Select several 4-6' shrubs, a lot of perennials (flowers that come back every year), and depending on the size of the rain garden a medium-sized tree or two [15-20' at full growth])

Consider these things when selecting plants:
•Choose native plants when possible
•Avoid planting non-native invasive plants
•Choose fragrant or edible plants when possible
•Avoid toxic/poisonous plants
•Avoid plants that produce excessive pollen

Step 7
Construction

1/2 day - Install sediment control devices. (These are for larger projects. Check with your local building permit office. It's a good idea to surround the down gradient part of the site with straw bales or silt fence. It's readily available and inexpensive.)
1 day - Grade site to elevations shown on plan. If applicable, construct curb openings and/or remove and replace existing concrete. Curb openings should be blocked or other measures taken to prohibit drainage from entering construction area. (Equipment such as a backhoe may be rented for this. Make sure any Miss Utility is notified before any digging. Safety fence should be used around any construction area or excavation.)
1/2 day - Stabilize grading within Limit of Disturbance except for the bioretention area, which will be planted. (Surrounding the cell with a biolog, straw bales, or compost berm to keep sediment out of the bioretention cell.)
1/2 day - Excavate bioretention area to proposed invert depth and scarify the existing soil surfaces, taking care not to compact the in-situ materials. (A contractor may be hired to dig the hole. Make sure that there are no open areas or pits open at the end of the day and no excavation over local jurisdiction or OSHA limits. Generally bioretention cells are less than 3 feet deep.)
1/2 day - Install underdrain system and observation wells, if specified. (Use perforated 4" HDPE pipe and surround the pipe with about 2" of gravel)
1/4 day - Backfill bioretention area with planting soil. (Fill the cell with 8" lifts of soil. Saturate each lift and let it drain and then place the next lift. Be careful not to compact the soil with equipment and saturate it.)
1/4 day - Plant vegetation.
1/4 day - Mulch and install erosion protection at entrance points. Remove sediment control practices or entrance blocks with inspector authorization if this project requires a permit. (It is recommended to leave perimeter biodegradable controls to reduce sediment loads to cell)
Total Estimated Construction Time: 5.5 Days

Step 7 (cont.)
Construction Materials List

(This is a general list of materials. Amounts will vary and depend on the size of the rain garden.)

- Topsoil
- Mulch
- Plants
- Screwdrivers
- Hammers
- Shovels
- Rakes
- Garden Hose
- String and Stakes
- Wheelbarrows
- Gardening Gloves

Step 8
Maintenance

A routine maintenance schedule can be followed. An example is presented here, as adapted from the Prince George's County Bioretention Manual. Experience has shown that the economic incentive of maintaining property values ensures that most homeowners will maintain their LID landscape.

Maintenance Schedule

Soil
? Visually inspect and repair erosion monthly. Use small stones to stabilize erosion along drainage paths.
? Check the pH once or twice a year. Apply an alkaline product, such as limestone, if needed.

Mulch
? Re-mulch any void areas by hand as needed.
? Every 6 months, in the spring and fall, add a fresh mulch layer.
? Once every 2 to 3 years, in the spring, remove old mulch layer before applying new one.

Plants
? Immediately after the completion of cell construction, water plant material for 14 consecutive days unless there is sufficient natural rainfall.
? When trees have taken root, or at least by 6 months, remove stakes and wires.
? Once a month (more frequently in the summer), visually inspect vegetation for disease or pest problems.
? If treatment is warranted, use the least toxic approach.
? Twice a year, from March 15th to April 30th and October 1st to November 30th, remove and replace all dead and diseased vegetation considered beyond treatment.
? During times of extended drought, look for physical features of stress (unrevived wilting, yellow, spotted or brown leaves, loss of leaves, etc.). Water in the early morning as needed.
? Weed regularly, if needed.
? Prune excess growth annually or more often, if desired. Trimmed materials may be recycled back in with replenished mulch or land filled if there is a concern of heavy metals accumulation.

General
? After rainstorms, inspect the cell and make sure that drainage paths are clear and that ponding water dissipates over 4-6 hours. (Water may pond for longer times during the winter and early spring.)

**NOTE: Keep in mind, the rain garden is not a pond. It should not provide a breeding ground for mosquitoes. Mosquitoes need at least 4 days of standing water to develop as larva.