

# Context Document: Installing or Retrofitting Baffle Boxes for Stormwater Ecosystem Service Logic Model

Project: GEMS  
<http://bit.ly/NI-GEMS>

Ecosystem Service Logic Models (ESLMs) are conceptual models that summarize the effects of an intervention, such as a habitat restoration project, on the ecological and social systems. Each model links changes in biophysical systems caused by an intervention to measurable socioeconomic, human well-being, and ecological outcomes. ESLMs assume that the restoration is successful and include all potentially significant outcomes for the intervention; not all outcomes will be relevant to each individual project, depending on location and environmental conditions.

The direction of an outcome (whether the restoration will have a positive or negative influence) often depends on the specific situation or is unclear due to multiple links (arrows) leading into an outcome that may have opposite effects. Thus, language like “increased” or “decreased” is not included in the models. These models are often used to consider management with or without an intervention or to compare different interventions.

This context document includes additional information about the restoration approach and details about some of the relationships in the living shoreline ESLM. It also includes a list of the references used to develop the ESLM and names of experts with whom we spoke to refine the model.

## Baffle Boxes Description and Use in the Gulf of Mexico

Baffle boxes are infrastructure components typically found near the end of the stormwater management system, positioned at outfalls or in types of stormwater management infrastructure. Baffle boxes attach to stormwater outfalls and contain a series of sediment settling chambers separated by baffles (Suntree Technologies 2018). Stormwater runoff enters through the boxes which capture sediment and pollutants in the storage zones. When the first chamber is full, flow is directed to the second chamber, and so on. Larger particles, including marine debris, tend to settle in the first chamber and smaller particles associated with sediment accumulate in the other chambers.

There are two main types of baffle boxes, Type 1 and Type 2 (EPA 2001). Type 1 baffle boxes have swinging vertical screens that are known to allow sediment to pass through. Type 2 baffle boxes have horizontal sieve screens that allow for increased filtration by the system to remove sediments.

Baffle boxes are widely used in BMPs in Florida, including Tampa Bay, India River Lagoon, and Sarasota (Bateman et al. n.d., GPI Southeast 2010, Tsegay 2018, EPA 2012). There is some evidence that they are used in Texas, but limited indication of widespread use across the entire Gulf.

## External Factors That Influence Restoration Success

If baffle boxes are not maintained (e.g., cleaned out monthly or bimonthly), the sediment and pollutants stored in the chambers can re-suspend in subsequent storms and therefore reduce or negate the potential impact that baffle boxes have on the system (EPA 2001).

Stormwater speed and volume. A number of factors impact the rate of stormwater flow into baffle boxes, including population density, permeable pavement, canopy structure, and more. These factors impact whether or not baffle boxes can retain enough sediment before they are cleaned out or if they become overwhelmed by the system (EPA 2001).

## Model Notes and Clarifications

**Nutrients:** Most baffle boxes are not designed to remove nutrients. However, nutrients are captured in solids that settle in the baffle boxes (i.e., leaf litter, nutrients attached to sediments). This can reduce, or delay, the flow of nutrients into bodies of water (EPA 2012). However, students have not demonstrated significant removal of nutrients through baffle boxes and officials do not recommend that baffle boxes are used as BMPs in areas where nutrients are of high concern (Tsegay 2018). Some baffle boxes are able to separate nutrients, though it is unclear how regularly used they are. In one project in Sarasota, nutrient-separating baffle boxes resulted in reduction in total nitrogen released into the water (GPI Southeast 2010).

**Heavy Metals:** While some documents indicate that heavy metals can be accumulated in baffle boxes, only one shows reduction in heavy metal concentration following the installation of baffle boxes (GPI Southeast 2010).

**Recreation:** Changes to water quality and clarity are proven to impact recreation in the Gulf of Mexico, but it does remain unclear if the scale of changes per baffle box–related project is significant enough to impact recreation.

**Nutrition for Communities:** This as an expected socioeconomic outcome of restoration projects can come from two sources: changes in fish and shellfish harvesting, and changes in land-based hunting on restoration areas. For this model, the source of nutrition is mainly from changes in fish and shellfish harvesting.

## Experts Consulted

Eban Bean, University of Florida

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## References

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