Context Document: Restoring Hydrologic Connectivity ESLM

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. The relevance of each outcome to individual projects depends 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 restoring hydrologic connectivity 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.

Restoring Hydrologic Connectivity Description and Use in the Gulf of Mexico

As defined by the RESTORE Council, restoring hydrologic connectivity means "restoring or mimicking natural connections that have been broken or disrupted by infrastructure such as roads and levees." This often involves removing barriers to flow (e.g., old flood control structures) or installing structures like culverts to enable water to flow under or around an existing barrier.

River diversions, such as those used for land-building in Louisiana, are not included in the restoring hydrologic connectivity ESLM because that approach is limited to certain parts of the Gulf (particularly Louisiana) and is politically sensitive. RESTORE lists controlled river diversions as a separate technique from restoring hydrologic connectivity, as does Restore the Mississippi River Delta, so separating river diversions from restoring hydrologic connectivity shouldn't cause confusion among practitioners and experts in the region.

An initiative submitted to RESTORE proposed to implement 11 hydrology restoration projects across the Gulf. As part of the proposal, NOAA and Gulf Sea Grant identified dozens of potential projects. Sea Grant's website also contains information about four projects that have been implemented to restore hydrologic connectivity. Most of these proposed and completed projects aim to restore natural salinity and/or inundation levels by restoring freshwater flow or tidal exchange, with the ultimate goal of benefiting marsh (or occasionally seagrass) habitats that are declining due to altered salinity or inundation. Some projects also mention allowing fish passage and creating habitat for salinity-sensitive organisms like amphibians and fish.

Model Notes and Clarifications

Adjacent Habitat: Because many of the outcomes of projects to restore hydrologic connectivity occur through effects on other habitat types, one of the main outcomes of the restoring hydrologic connectivity ESLM is effects on adjacent habitat types. There are individual ESLMs representing the effects of restoring each of these other habitat types. If improving the condition of one of these habitat types is an important objectives of a restoring hydrologic connectivity project, consulting the relevant habitat restoration ESLM will help to identify key outcomes resulting from that habitat improvement.

Salinity: Many of the other effects shown in the ESLM occur through the project's influence on salinity. Restoring hydrologic connectivity can reduce salinity by reintroducing freshwater inflows to an area or increase salinity by restoring tidal flows. The specific effect depends on the project context and type of restriction being removed.

Inundation Regime: Restoring hydrologic connectivity often changes the depth, extent, and frequency of inundation. This has implications for water quality, suitability for other habitat types such as marsh, and erosion or accretion of sediment along the shoreline.

Fish Passage: In some cases, flow barriers prevent fish from moving upstream, which is required for certain species' reproduction. Removing barriers and allowing fish passage benefits populations of these species.

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.

Disruption from Construction: Construction activities related to the project can cause social and economic disruption by changing traffic patterns. Many hydrologic reconnection projects involve the installation of culverts or other alterations to infrastructure, which require road closures or reduced traffic flows. This can cause access issues for local businesses and increase stress and anxiety among drivers who are affected by the road closures. The model links leading from the construction disruption node represent these effects, which are temporary and do not persist after construction is complete.

Experts Consulted

Participants at the March 2020 regional GEMS workshop.

References

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