

**DRAFT Objectives for Adaptation Strategies**  
**Lower Santa Cruz Basin Study**  
**Environmental Sub-team**  
*Revised October 2018*

**Background** *(Adapted from the Plan of Study)*

There is concern in the Lower Santa Cruz River Basin (LSCRB) region as key areas in the Basin are experiencing groundwater declines due to a combination of groundwater pumping, drought conditions and a lack of access to renewable supplies. Impacts of water imbalances in the environment are experienced through subsidence and the loss of riparian habitat, which have already occurred.

The goal of the LSCRB Study is to identify where physical water resources are needed in order to mitigate supply-demand imbalances due to projected changes in climate and population growth in the LSCRB study area, which is identical to the Tucson Active Management Area. Following identification of areas of projected water imbalance, place-based adaptation strategies will be developed to improve water reliability for municipal, industrial, agricultural and environmental sectors in the Lower Santa Cruz River Basin.

The Basin Study will evaluate risks, under selected scenarios, to the environment, and other water users, by assessing:

- 1) the types and volumes of supplies used for environmental water in the study area,
- 2) the associated risks to their reliability,
- 3) how losses of renewable supplies and changes in future groundwater levels could affect environmental uses

**Environmental Sub-team**

As part of the Basin Study, an Environmental Sub-Team (herein “Sub-team”) was formed to identify and evaluate adaptation strategies used to address physical water imbalances that impact environmental resources. The Sub-team developed a general framework to evaluate adaptation options, used to guide trade-off analyses of adaptation strategies, as described below.

**Evaluation of Adaptation Strategies**

The overall objective of the Sub-Team is to support adaptation strategies that support the greater Tucson community efforts to protect and enhance environmental resources and maintain environmental quality of life.

The Sub-team has discussed the term “environment” as it is used in the goal of the Study and recommends that “environment” include:

- 1) Groundwater-dependent ecosystems,
- 2) Effluent-dependent reaches of rivers, washes and streams,
- 3) Perennial, intermittent and ephemeral flows,
- 4) Urban vegetation, and
- 5) Riparian and aquatic systems

Adaptation strategies will be assessed in a place-based manner. However, in order to allow for the comparison of adaptation strategies, it is helpful to define a common set of overarching priorities. The Sub-team acknowledges that the characteristics of adaptation strategies will vary in measurability, both qualitatively and quantitatively.

Priority considerations define by the Sub-team include:

**1. High value habitat**

This can include areas with mature trees, high aesthetic value, biodiversity, refugia, biological cores, rarity, and large landscape size.

**2. Landscape connectivity**

Considered within the context of wildlife species support, such as corridors for migration.

**3. Accessibility and recreational opportunities-**

Considered as areas that are accessible to visitors and/or provide recreational opportunities, including public lands.

**4. Areas with high vulnerability**

Areas that are highly sensitive to change, or are at a high risk of loss such as aquatic habitat.

**5. Strategies with low opportunity cost**

Strategies that avoid irreparable changes, changes that require significant investment to undo, or changes that involve lost future flexibility. Examples include strategies that highlight preservation and restoration of floodplain function and ecosystem services.

**6. Cultural value/Heritage**

Consideration is given to human connections to landscape of regional inhabitants, including tribal concerns and heritage values, and ecosystem services related to cultural or spiritual connection to landscape.

These priority considerations should be qualitatively assessed for projects, where applicable. This analysis should be used in conjunction with an evaluation of the indicators listed below to develop an overall, holistic assessment of how the adaptation strategy of interest will impact environmental resources from the lens of ecological, social, health & safety, and economic benefits<sup>1</sup>.

Indicators were defined by this Sub-team to characterize areas to identify high-priority locations for adaptation efforts ("location indicators") and to evaluate relative benefits of adaptation options ("adaptation measure indicators"). The Environmental Sub-team suggests that these two sets of indicators, through the lens of ecological, social, health and safety, and economic benefits, be used in concert to conduct the Tradeoff Analysis in the later part of the Study. The list of indicators is not meant to be exhaustive, but should serve as a guide for high-level assessment of relative benefits of adaptation options.

Location indicators are used to describe an area of interest for adaptation efforts, therefore effort should be made to describe an area as completely as possible (Location Suitability Indicators Sheet). However, the Sub-team acknowledges that this will not always be possible with the information available to characterize an area. Adaptation measure indicators are used to describe the impact, or change, a given adaptation strategy would have on an area of interest. These are intended to be evaluated from the standpoint of the impact of the adaptation strategy upon the specific location of interest. Effort should be given to evaluate the impact of individual adaptation strategies upon an area.

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<sup>1</sup> Economic benefit is considered by this Sub-team to include environmental benefits that are commonly monetized, as well as those not commonly monetized (ie biodiversity). For example, the economic value of watershed function includes avoided costs realized by maintaining existing environments, considered as the avoided costs of retrofitting an overly urbanized watershed. Social benefits include categories associated with environmental quality-of-life, with consideration given to both for tribal and non-tribal residents in the study area.