CHAPTER 4

Study Configuration

General

Study Configuration (Config) contains the data describing the physical layout for the study area and plan definition for analysis. Data includes streams, damage reaches, plans and analysis years. Prior to using HEC-FDA, team members must define the physical layout of the study: i.e., study streams and damage reach locations. Next, plans and analysis years for the study area are defined. A study coordinated stream stationing convention is required and must be used by all disciplines.

Note: Hydrologic engineers, economists, and study managers must work together to develop the configuration and concur on the information used prior to analysis.

Study configuration consists of data items seldom changed during a study. Data changes at a later time, may affect other hydrologic engineering or economic data previously entered. For example, discharge-exceedance probability, stage-discharge and damage-stage functions are required at each damage reach index location for each plan and analysis year to perform the Monte Carlo computations. Adding and deleting study configuration data directly affects the functions previously entered or those that need entering.

To define the study configuration, all study team members should meet and agree on the required information. Decisions are made on the system of units and monetary units (defined in **New Study** window). Then using maps and other available information, team members should decide on the streams, initial damage reach delineations, stream station conventions, index locations, analysis years, plans, and naming conventions.

Contents

- Streams
- Damage Reaches
- Plans
- Analysis Years

Streams

Streams include various water bodies such as rivers, streams, creeks, ditches, canals, bayous, lakes, ponds, etc. Streams are defined for the study and are therefore common for all plans and analyses. A study may include one or more streams. A stream station convention must be adopted for the study. It is used to define damage reach boundaries, damage reach index locations, water surface profiles, cross-sectional locations, and structure locations. Figure 4.1 depicts a stream network for a study area. Stream names and descriptions are entered as shown in Figure 4-2.

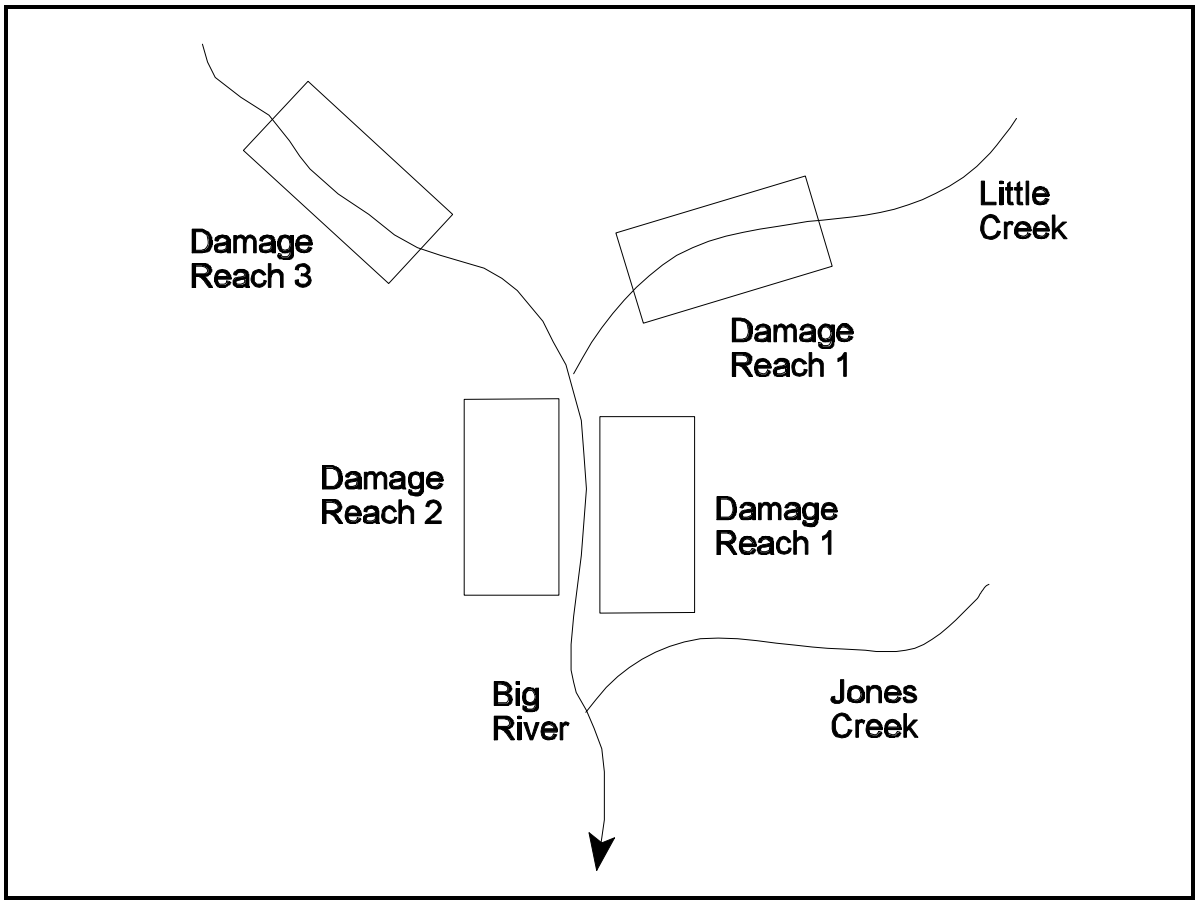

Figure 4.1 Stream and Damage Reach Concepts

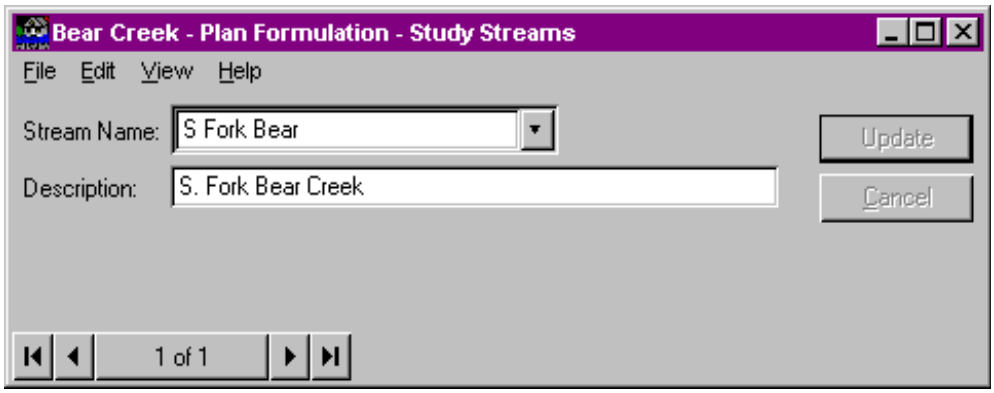

Figure 4.2 Study Streams Data Entry Screen

Data Entry for Study Streams

Note:

You must enter a name for the stream (required).

Enter a stream description (optional but recommended).

Add/Update Buttons - see description on page 3-12.

Menu Items for Study Stream

Please refer to the Menu Items Section in Chapter 3.

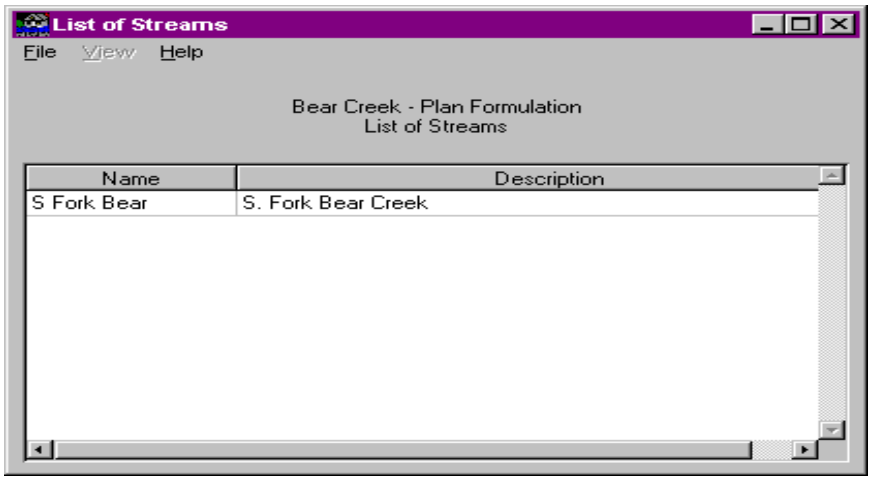

Figure 4.3 List of Streams Screen

Damage Reaches

Damage reaches are spatial floodplain areas. They are used to define consistent data for plan evaluations and to aggregate structure and other potential flood inundation damage information by stage of flooding. A damage reach is delineated by the beginning and ending stations (river mile, kilometer, etc.) along the stream and extend into the floodplain to include the largest flood deemed reasonably possible. Damage reaches are unique to a stream. They are integral to both the hydrologic engineering and economic analyses. A damage reach can be specified for the right or left bank (as looking downstream) or both banks. Delineation of the damage reach must be consistent with flood damage reduction measures. For example, a channel may be analyzed with a damage reach covering both banks, but a levee is analyzed for a damage reach only along one bank (See EM 1110-2-1619).

When delineating damage reaches, consider consistent discharge- or stage-exceedance probability functions throughout the damage reach, location of flood damage reduction measures, and jurisdiction boundaries for reporting purposes. Normally, damage reach delineations evolve through the analysis of the without-project (base year) condition and become fixed thereafter when the location and magnitude of damage is known and types of flood damage reduction measures to be studied are defined. The same damage reaches are used throughout for all the analyses of without- and with-project conditions. Figure 4.1 shows the delineation of damage reaches.

The index location station for a damage reach is specified to aggregate structure stage-damage functions with uncertainty for flood damage analysis calculations. The index location station may be located for any stream station in the damage reach. Figure 4.4 shows the data entry for damage reaches.

Data Entry for Damage Reaches

You must first select a **Study Stream** name where the damage reach is located. The damage reach is assigned to that stream.

HINT: To review the assignment criteria previously defined for damage reaches information, click the **View Menu** and select **List of Damage Reaches**. An example is shown in Table 4.5.

You must enter the name for the damage reach.

Enter damage reach description (optional but recommended).

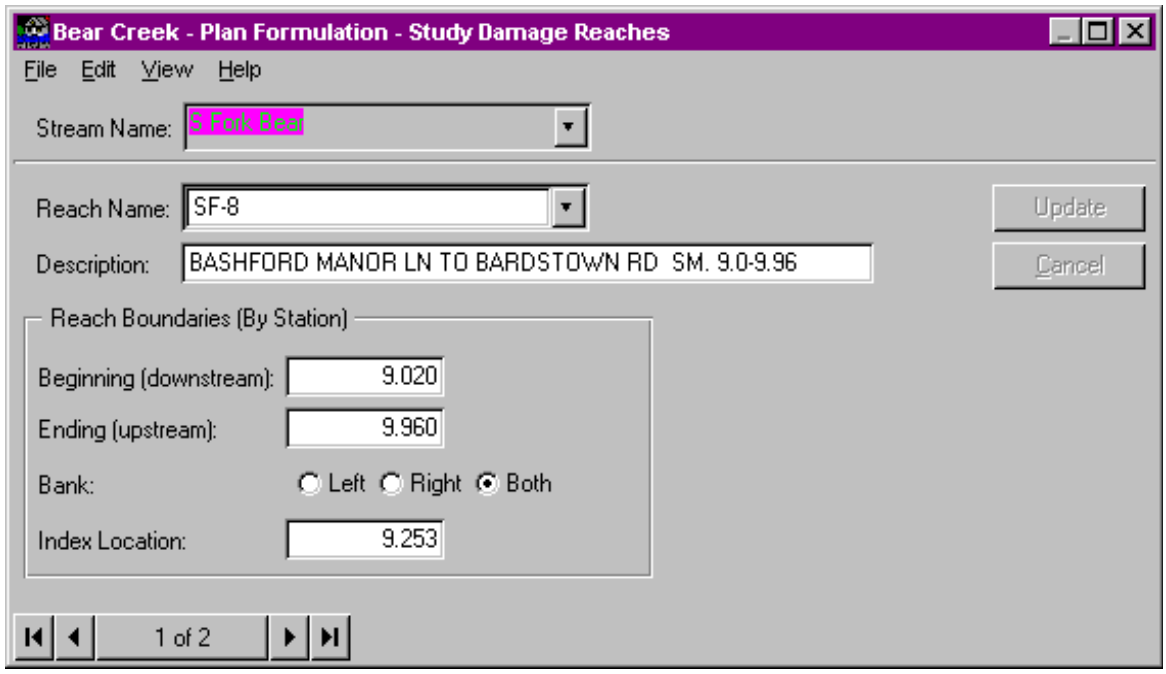

Figure 4.4 Study Damage Reach Entry Screen

- Enter beginning and ending damage reach boundary stations, reach bank, and index location station.

- **Add/Update Buttons** - Used to save or update damage reach data.

Menu Items for Damage Reaches

Please refer to the Menu Items section in Chapter 3.

Data Entry Variables for Damage Reaches

Stream Name: Select a previously defined stream name where the damage reach is located.

Damage Reach Name: Name of the damage reach, which is used in subsequent data entry pick lists, reports, and plots. A new damage reach name can be added to the database. An existing damage reach name can be selected, updated, or deleted. The maximum length is 16 characters.

Damage Reach Description: Alphanumeric description of the defined damage reach. The maximum length is 64 characters.

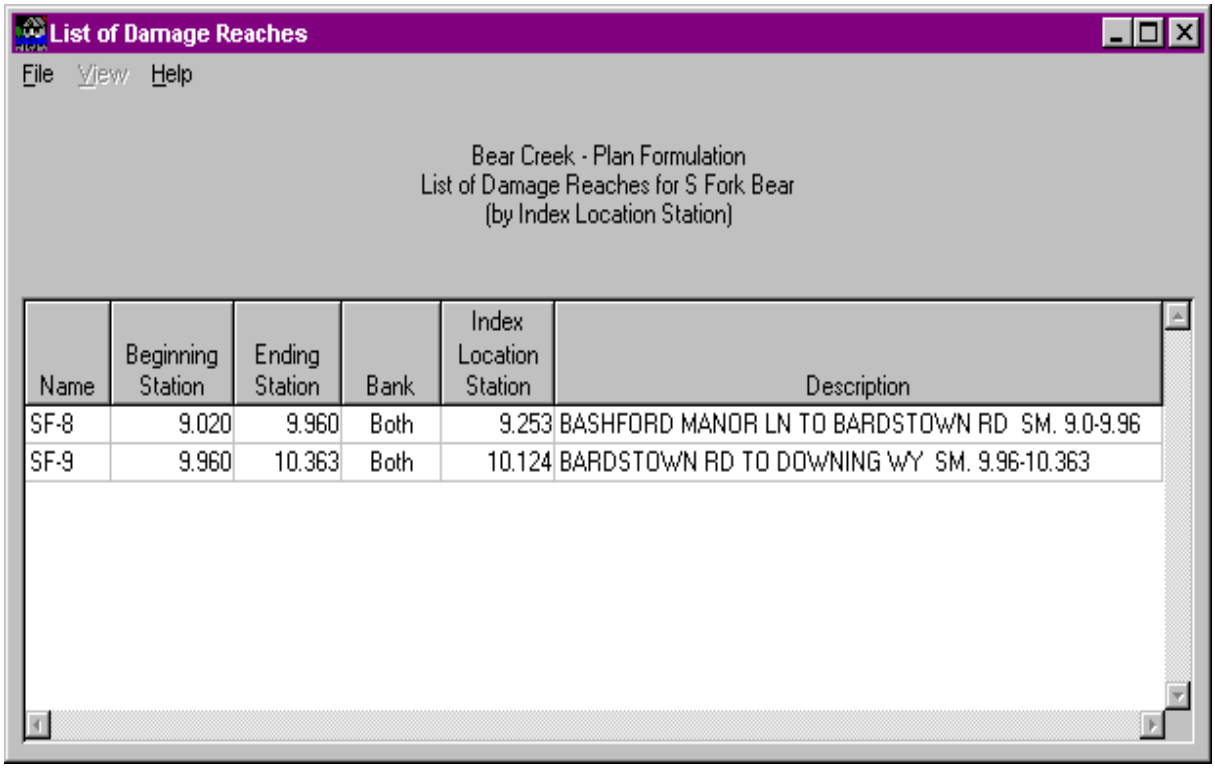

Figure 4.5 List of Damage Reaches Screen

Ending Station: Ending station number for upstream end of damage reach. The range of allowable values is from 0.00 to 999,999.99. The value must be greater than the beginning station.

Bank: Stream bank (looking downstream) where the damage reach is located. The delineation of the bank should consider potential local flood damage reduction measures and jurisdictional boundaries. Some measures are typically implemented on only one bank, these include levees and walls, and various nonstructural actions. Channels and upstream storage projects reduce flooding for both banks. There are three hardwired choices (Left, Right, Both), with Both being the default.

Left Bank: Indicates that the damage reach is only along the left bank of the stream. The left bank is defined looking downstream or with the current of the stream.

Right Bank: Indicator that the damage reach is only along the right bank of the stream. The right bank is defined looking downstream or with the current of the stream.

Both Banks: Indicator that the damage reach is delineated spatially over both

banks of the stream. The stream cuts through the damage reach. Normally used for ponding or storage area reaches.

Index Location Station: A stream station location within a damage reach is used to specify discharge-probability, stage-discharge, and stage-damage functions with uncertainty data for plan evaluations for that damage reach. Also, the index location station (corresponding stream station) is used for aggregation of stage-damage functions with uncertainty by damage category. The index location station is defined between the beginning and ending station values and where data is normally deemed most reliable, such as a streamgage location. The range of allowable values is from 0.00 to 999,999.99. The value must be greater than the Beginning Station and less than or equal to the Ending Station. The index location does not have to be at a water surface profile cross section location.

Plans

A plan may represent the with- or without project conditions. The with-project condition plan consists of one or more flood damage reduction measures and actions. It includes all streams and damage reaches within the specified study limits. A plan exists and is evaluated over an analysis period (project life), normally fifty years. It starts with the base year of implementation or operation. Static hydrologic engineering and economic conditions associated with a specified future analysis year are included to evaluate the equivalent economic and engineering performance of the plan over its project life. See Table 4.1 and ER 1105-2-100, ER 1105-2-101, and EM 1110-2-1619. Figure 4.6 shows the data entry screen for plans.

Table 4.1
Study Plans and Analysis Years

Plan Name	Analysis Year	
	Base Year	Most Likely Future Year
Without Project Conditions	2000	2025
Plan 1 Levees	2000	2025
Plan 2 Channels	2000	2025
Plan 3 Nonstructural	2000	2025
Plan 4 Mixed Measures	2000	2025

The without-project condition is a hardwired plan. It is always listed first and cannot be deleted. The without-project condition is the plan which all subsequent plans are compared against.

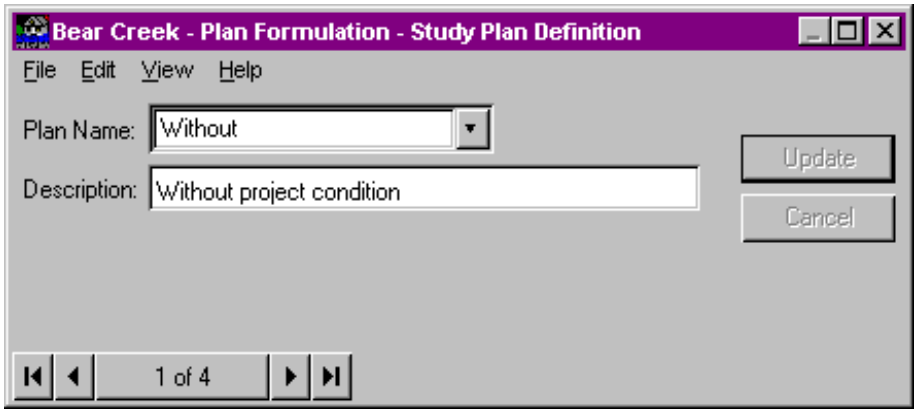

Figure 4.6 Plan Definition Screen

Data Entry for Plans

- You must enter (required) a name for the plan.
- Enter a plan description (optional but recommended).
- Add/Update, and Cancel Buttons - used to save or update Plan information.

Hint: You may review the list of previously entered plans under **View Menu List of Plans.**

Menu Items for Plans

Please refer to the HEC-FDA Menu Items section in Chapter 3.

Data Entry Variables for Plans

Plan Name: Name for the defined plan, which is used for subsequent data entry pick lists, reports, and plots. A new plan name can be added to the database. An existing plan can be selected, or deleted. The maximum length is 16 characters.

Plan Description: Description of the defined plan. The maximum length is 64 characters.

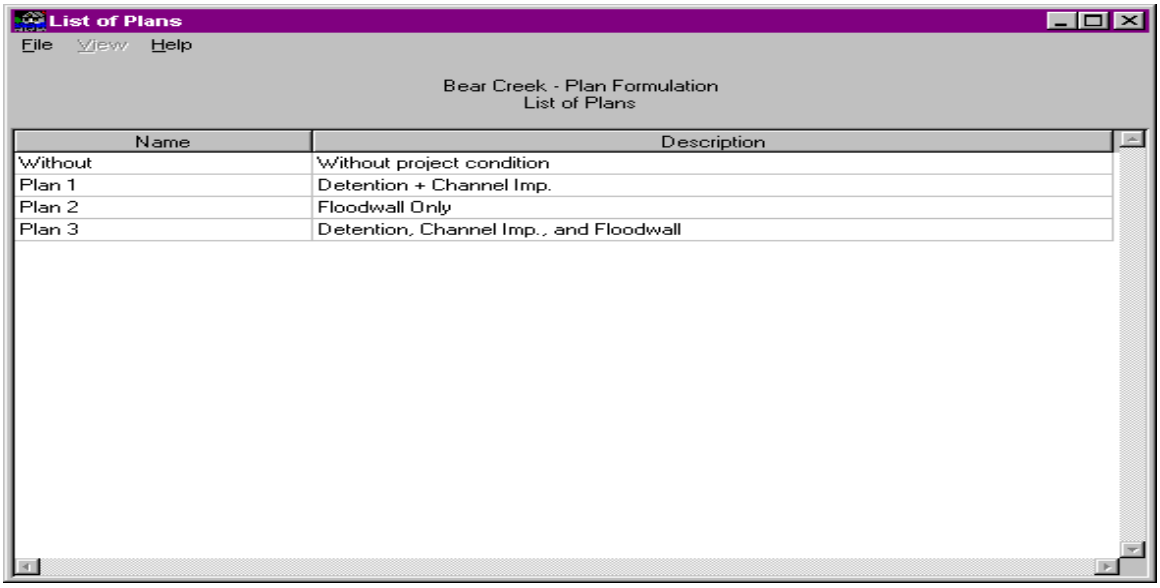

Figure 4.7 List of Plans

Analysis Years

Analysis years define damage and project performance information for specific time periods during the project life, such as the base year or most likely future year. The analysis year results are used to compute equivalent annual damage computations for a plan. The same analysis years are used for all study evaluations. An analysis year represents a static time period or year that the hydrologic engineering and economic data must be developed for analyses. Base year is the first year of the plan operation. The most likely future year is normally a development projection for a specific future year, say twenty years out from the base year. The expected annual damage is assumed constant beyond the most likely future condition (future analysis year). The analysis concepts are depicted in Figure 4.8. The expected annual damage for each year in the analysis period is computed, discounted back to present value and annualized to get the equivalent value over the analysis period (project life). (See ER 1105-2-100, ER 1105-2-101, and EM 1110-2-1619.) Figure 4.9 shows the analysis years data entry screen.

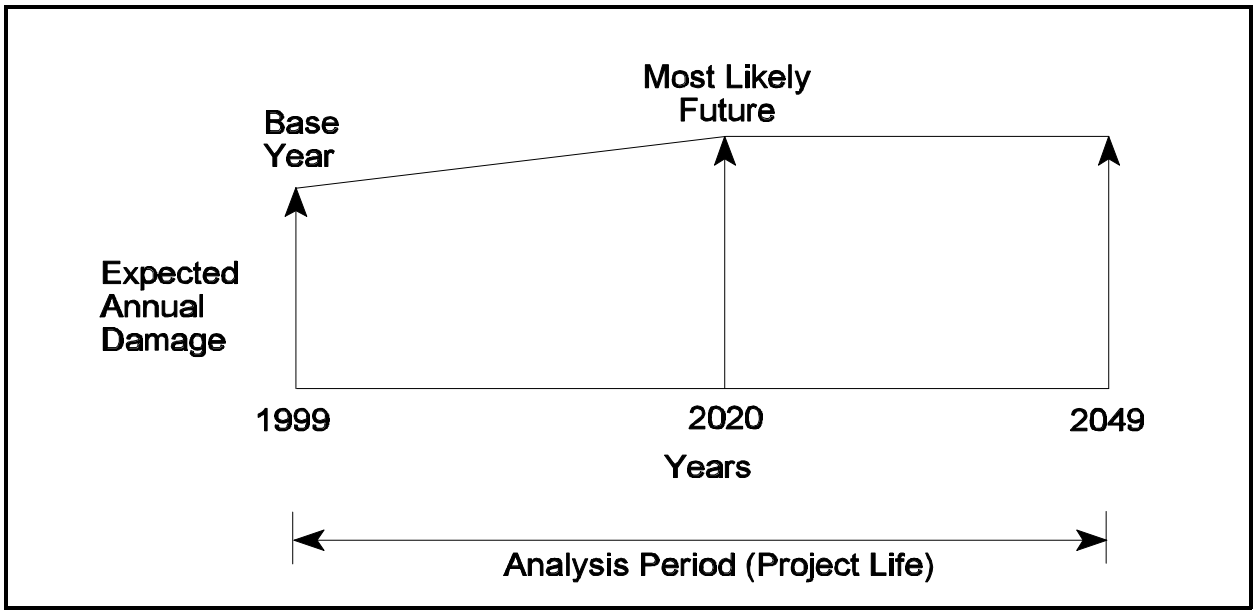

Figure 4.8 Analysis Year

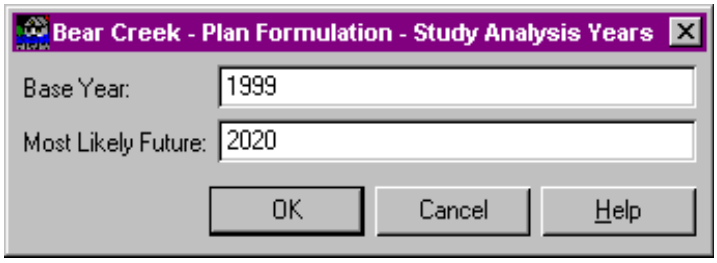

Figure 4.9 Analysis Years Screen

Data Entry Variables for Study Analysis Years

Base Year: First year a plan is implemented and operational.

Most Likely Future: The most likely future condition development projection for a specific future year. Used to compute the equivalent annual damage over the analysis period (project life). Normally, the most likely future conditions is projected twenty to thirty years out from Base Year, and it must be greater than Base Year.