THE IWR PLANNING SUITE II
UNCERTAINTY MODULE

PCoP Webinar Series

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23 JUL 2020
How familiar are you with the IWR Planning Suite? Please place a check/mark in one of the boxes below.

Novice  Experienced  Expert

Click on the Annotation option \( \checkmark \) on the left side of your screen and then use the Pencil Tool or checkmark to mark your response.
Webinar topics

• The IWR Planning Suite II Basics
  • What is new about the IWR Planning Suite II
  • Quick Walkthrough of It’s Basic Mechanics

• The Uncertainty Module
  • Components, Features, and Options
  • Quick Walkthrough of It’s Basic Mechanics
  • Charts, Tables, and Reports
  • Interpretation of Uncertainty-Informed Cost Effectiveness and Incremental Cost Analyses (CEICA)

• Where can I get the software?

• Training resources & help
IWR Planning Suite II: The Basics

- Provide for consideration of monetized and non-monetized costs and benefits
- Automate computations associated with CEICA
- Facilitate documentation, visualization, reporting, and communication of CEICA
- Enable consideration of multiple variables, and support assessment of uncertainty on CEICA results
- Support risk-informed decision making
USACE-Certified Versions

IWR Planning Suite Version 1.0.11.1
- Plan Generator and CE/ICA
- Derived Value Calculator/Module

IWR Planning Suite Version 2.0.6.1
- Plan Generator and CE/ICA
- Derived Value Calculator/Module
- Added the Annualizer Module

Version 2.0.9 aka IWR Planning Suite II
- Updated Interface
- Plan Generator and CE/ICA
- Derived Value Calculator/Module
- Annualizer Module
- Added MCDA Module
- Added Uncertainty Module
- Added Watershed Module
- Added Report Generator
IWR Planning Suite II: Status

- **CERTIFIED**
- **31-MAY-2018 CECW-P Memorandum**
  - All review plans approved after 31-MAY-2018 must show use of the latest version of the IWRPS II.
  - Migration to IWRPS II also required for ongoing studies that had not scheduled a TSP meeting as of 31-MAY-2018.
  - Exemptions might be granted or ongoing studies (case by case).
  - Studies engaging in multiple criteria decision analysis should engage the ECO-PCX to develop a strategy for appropriate and policy compliant use.
- **ER 1105-2-100 (Planning Guidance Notebook)**
  - Provides instruction for NED and NER methods
  - Provides instruction on use of CE/ICA during selection of NER plan and for all recommended mitigation plans
- **IWR Planning Suite Users’ Guide**
  https://publibrary.planusace.us/document/5641c105-449e-4b7f-c52f-af91a15a99e2
Prepare you working directory…
Set up your project file…
Describe your costs...
Describe your outputs...
Describe any other captured effects...
IWRPS II – Defining the Variables

**Define any derived variables…**
IWRPS II – Building the plans

You can use the plan generator or directly input the name, descriptions and values for variables associated with each plan.
Annualize your costs and outputs...
Enter the values for each variable, for each of the planning alternatives.

★ Values of derived variables will be calculated automatically...
(A feature that will be of increased importance in the coming slides)
Perform the CEICA on your data to analyze costs against any of the outputs.

View Graphs and Reports.
IWRPS II – Generating your report

Generate or prepare report to document analyses.
Based on CEICAs that you are familiar with, please identify potential sources or consequences of uncertainty in the space below.

Click on the Annotation option on the left side of your screen and then use the Tool to type your response.
Potential Sources of Uncertainty

- Costs
- Precipitation
- Disturbances
- Introduced Species
- Climate Change
- Management Decisions
- Policy
- Models
- Understanding of Systems

All of the above, and more…

(Davis et al. 2005)
The General Concept...

• Informing of Decisions
• Management of Trade-Offs
• Communication of Risk
Initiating an Uncertainty Set...

We will now be working within the Uncertainty Sets Menu
Your **Uncertainty Planning Set** will be constructed from a **Planning Set** that you have already created, or a subset of those plans.
Selecting Plans for Analysis...

1. Uncertainty Planning Set Distributions
   - Name:
   - New
   - Delete
   - Clone Distribution Set
   - Correlation Matrix

2. Distribution Types
   - Fixed
   - Normal
   - Uniform

3. Select Plan Alternatives
   - Load Plans from Existing Set
   - Use Custom Plans

   - Plan Description:
   - Red Plan: Structural Approach, Active Management
   - Orange Plan: Extensive Construction, Passive Management
   - Yellow Plan: Nature-Based, Active Management
   - Green Plan: Nature-Based, Passive Management
   - Blue Plan: Incremental Adaptive Construction and Management

... to select a subset.
Naming the Uncertainty Set...
The Uncertainty Set Window

- Distribution Tab
- Variable Profile Tab
- Tolerance Rules Tab
- Correlation Matrix Tab

Options:

- Distribution
- Variable Profile
- Tolerance Rules
- Correlation Matrix

Tabs:

- Plans
- Variables
- Distribution
- Distribution Parameters
Distribution Options

**Supported distributions:**

- **Fixed** – Unchanging constant value
- **Normal** – Statistical bell-curve based on mean and standard deviation
- **Uniform** – All values within the range are equally likely
- **Triangular** – Based on min, most-likely, and max values
- **Truncated Normal** – Normal with option for setting min and max values
- **User-Defined Cumulative Distribution Function** – Custom

Built-in Monte Carlo engine will generate values for each variable in accordance with the distributions and parameters selected by the user.
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as...

Fixed

Cost

Output
Distribution Options

Cost reflected as uniform (90-110)
Output reflected as...
Fixed
Uniform
Distribution Options

- **Cost reflected as uniform (90-110)**

- **Output reflected as…**
  - Fixed
  - Uniform
  - Triangular
Cost reflected as uniform (90-110)

Output reflected as...

- Fixed
- Uniform
- Triangular
- Normal
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as...

Fixed

Uniform

Triangular

Normal

Truncated Normal
Distribution Options

Cost reflected as uniform (90-110)
Output reflected as...
Fixed

Uniform

Triangular

Normal

Truncated Normal

Custom (CDF)
Distribution Options
Assigning Distributions: Variable Profiles Tab

Allows users to assign a distribution to a variable for use among all plans, as opposed to assigning plan-specific distributions.
Inputting Parameter Values

The previously-used single value is now represented as a triangular distribution...

Complete for all plans...

The previously-used single value is now represented as a triangular distribution...
Generate Uncertainty Set

NOTE: 100 iterations might be insufficient...
Viewing Monte Carlo Results

Tables

Charts
Viewing Monte Carlo Results

Charts
## Viewing Monte Carlo Results

### Tables

<table>
<thead>
<tr>
<th>Plan</th>
<th>Variable</th>
<th>Avg</th>
<th>SD</th>
<th>Min</th>
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<th>25^{th} %</th>
<th>50^{th} %</th>
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8/10/2020 12:14:31PM  Fixed Distribution (No Uncertainty)  IWR Planning Suite  Page 1 of 2

US Army Corps of Engineers.
Something to remember…

Recall that we defined one variable as a formula.

Using the distributions and parameters entered by the user, the Recreation Outputs were computed for each iteration as a sum of the Early Season and Late Season Recreation outputs.

One reason to consider running more iterations…
A CEICA will be performed on each of the possibilities generated by the Monte Carlo engine to identify cost-effective and “best buy” plans for each iteration.
Viewing Your CEICA Results

You will see that several chart options are now available…

Which plans were cost effective and/or best-buys most often?
Viewing Your CEICA Results

**Table**

<table>
<thead>
<tr>
<th>Plan Name</th>
<th>Cost Effective</th>
<th>Best Buy</th>
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<tr>
<td>Yellow Plan</td>
<td>16 / 20</td>
<td>16 / 20</td>
</tr>
<tr>
<td>Green Plan</td>
<td>16 / 20</td>
<td>11 / 20</td>
</tr>
<tr>
<td>Blue Plan</td>
<td>18 / 20</td>
<td>15 / 20</td>
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</tbody>
</table>

**Charts**
A Few Endnotes…

- **Tolerance Rules Tab** – In an effort to manage the volume of data generated by the Monte Carlo engine, tolerances for “acceptability” can be assigned by users. The planning suite will track and report how frequently the value for a variable was outside of the user-specified range.
- **Correlation Matrix** – An option exists for users to assign correlation coefficients between variables that are not independent of one another.
TRAINING RESOURCES & HELP

• Links to the software, certification memo, and other related resources can be found at http://www.iwr.usace.army.mil/Missions/Economics/IWR-Planning-Suite/.

• Training materials that highlight IWR Planning Suite’s capabilities, improvements and case study applications are available online at the IWR Planning Assistance Library.

• Customized or study-specific training/assistance is also available upon request. For Support, Please contact:
  • IWR Planning Suite Development Team at: DLL-CEIWR_IWR-PLAN; or
  • ECO-PCX
Discussion?

Type questions in the chat box. We will answer as many as time allows.

This webinar will be posted to the Planning Community Toolbox: http://www.corpsplanning.us