THE IWR PLANNING SUITE II UNCERTAINTY MODULE

PCoP Webinar Series

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23 JUL 2020

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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 on the left side of your screen and then use the Pencil Tool or checkmark to mark your response.

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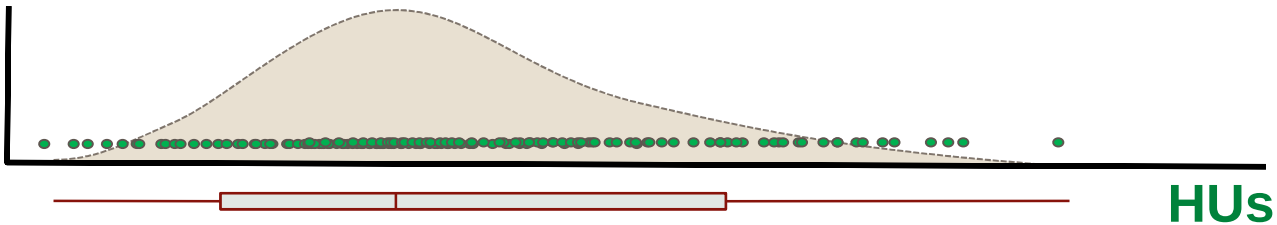
Webinar topics

- 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



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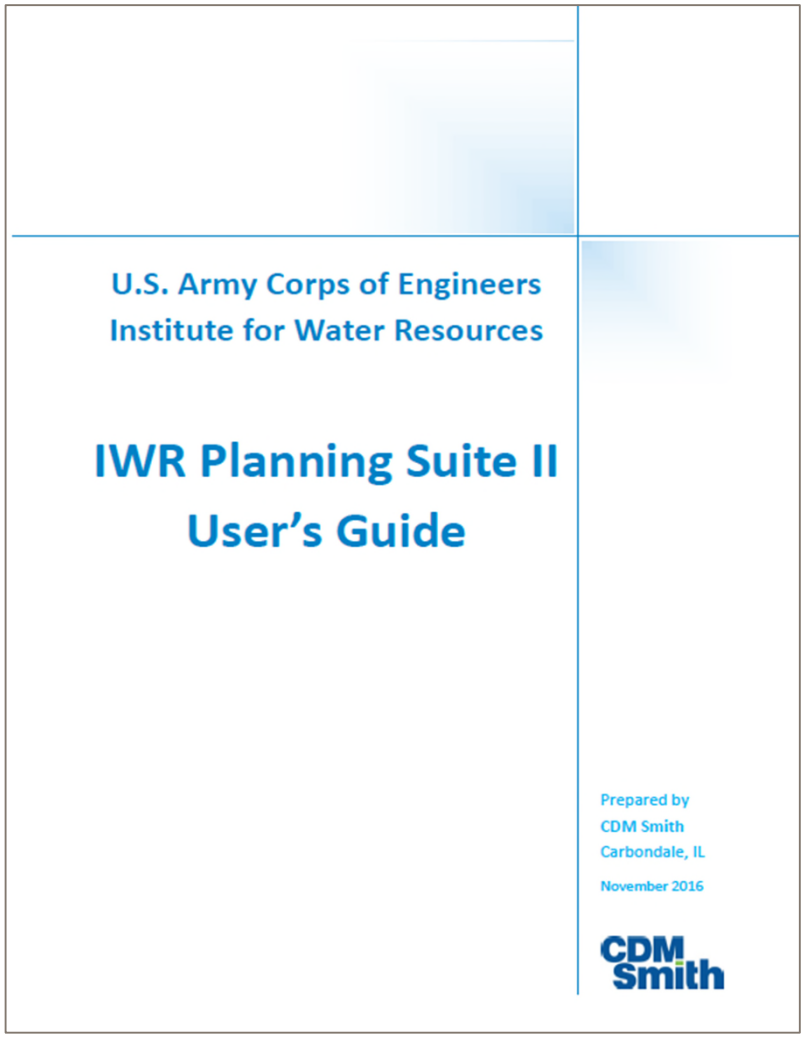
IWR Planning Suite II: The Basics



- 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

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USACE-Certified Versions

IWR Planning Suite Version 1.0.11.1

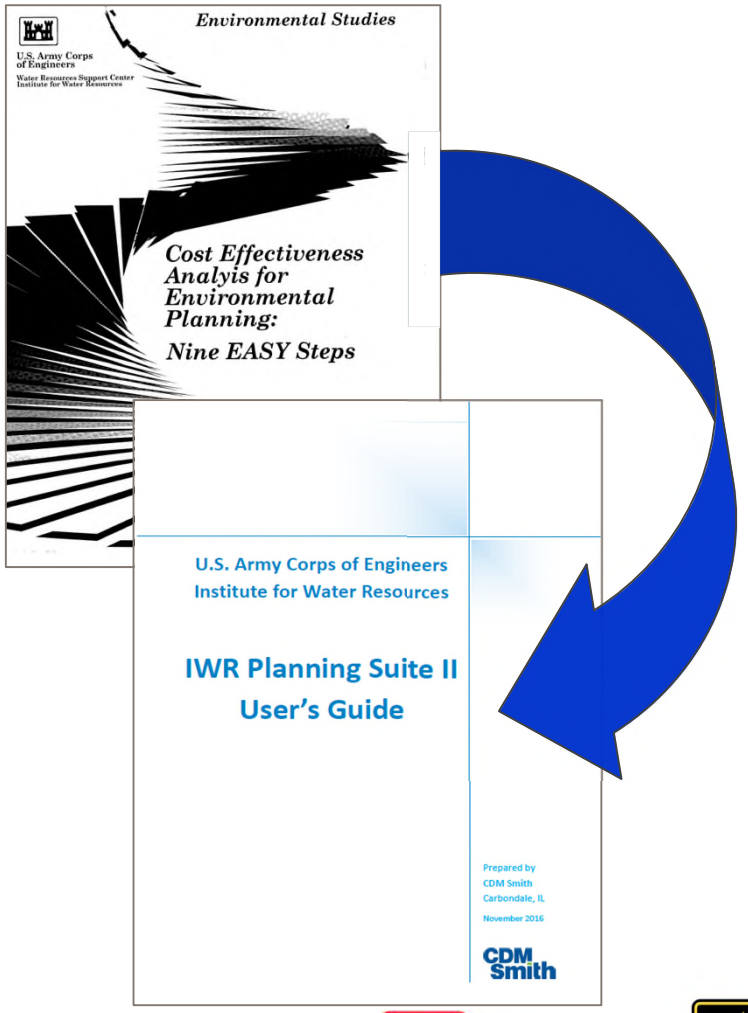
- Plan Generator and CE/ICA
- Derived Value Calculator/Module

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**



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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

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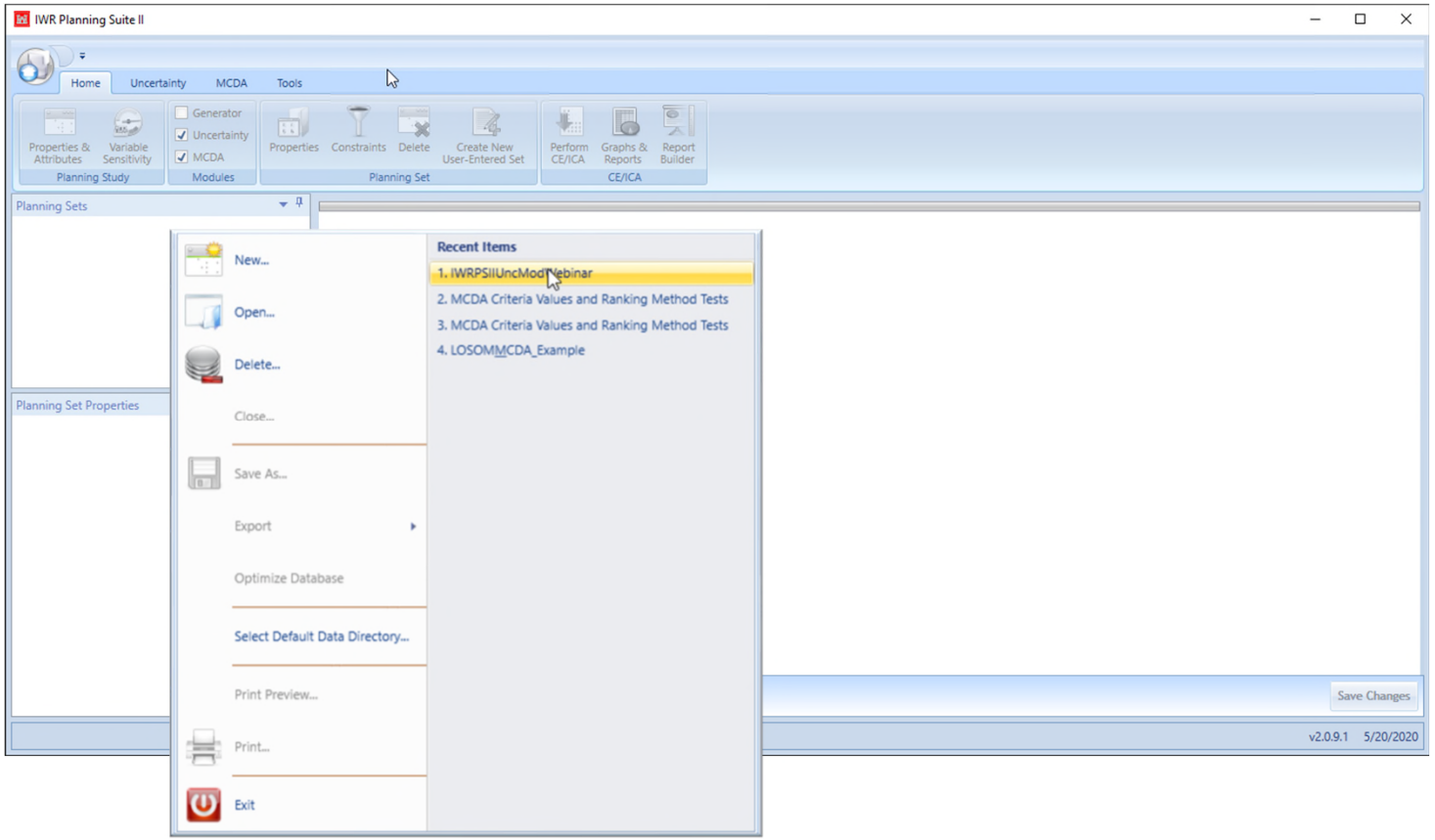
IWRPS II - Getting Started (The Basics)



Prepare you working directory…

Set up your project file…

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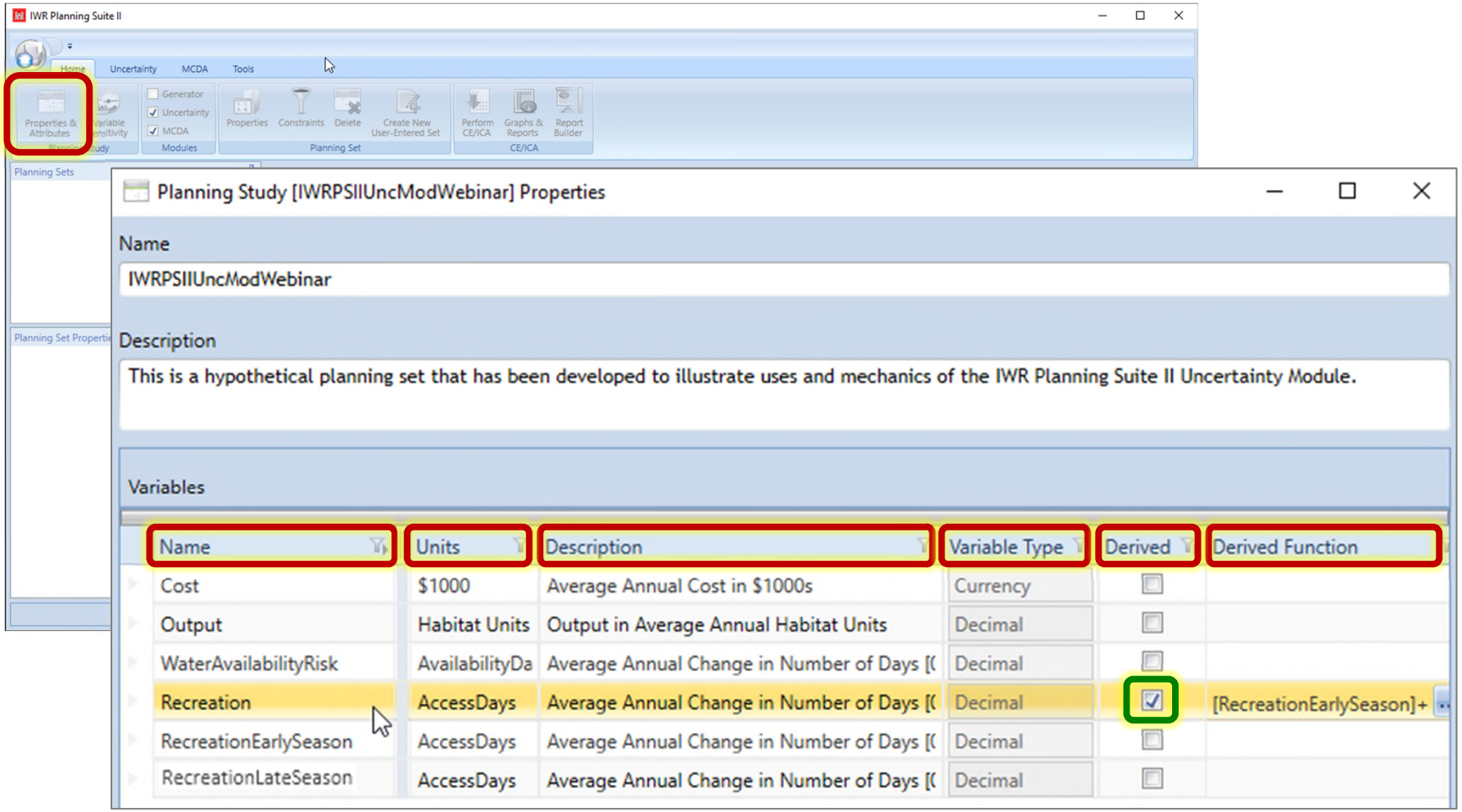
IWRPS II – Properties and Attributes



Describe your costs…
Describe your outputs…
Describe any other captured effects…

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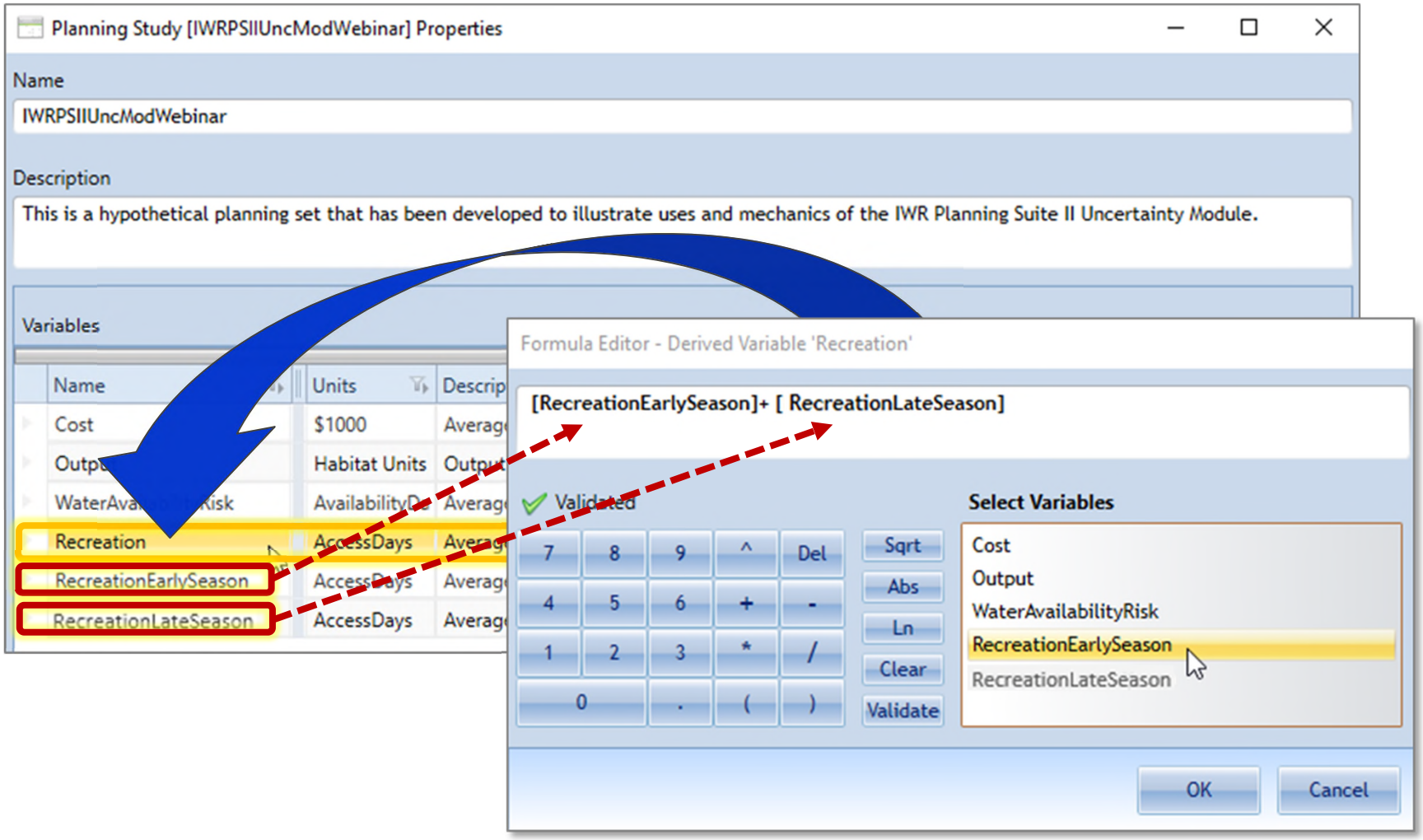
IWRPS II – Defining the Variables



Define any derived variables…

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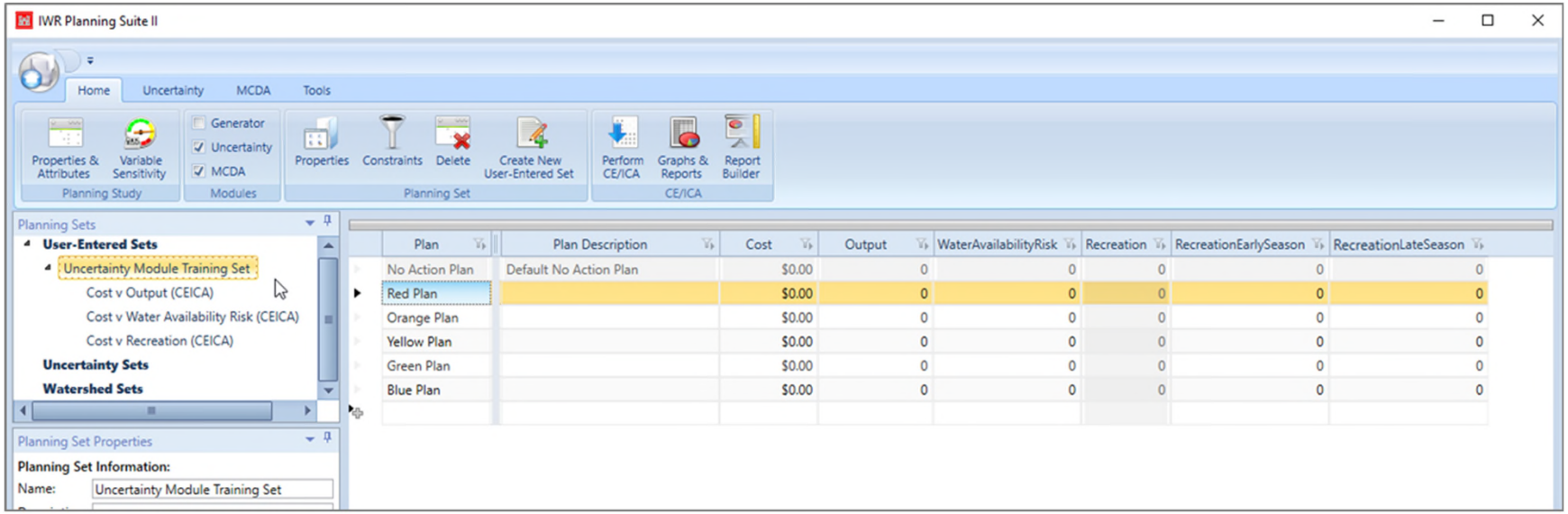
IWRPS II – Building the plans



You can use the plan generator
or
directly input the name, descriptions and values for variables associated with each plan.

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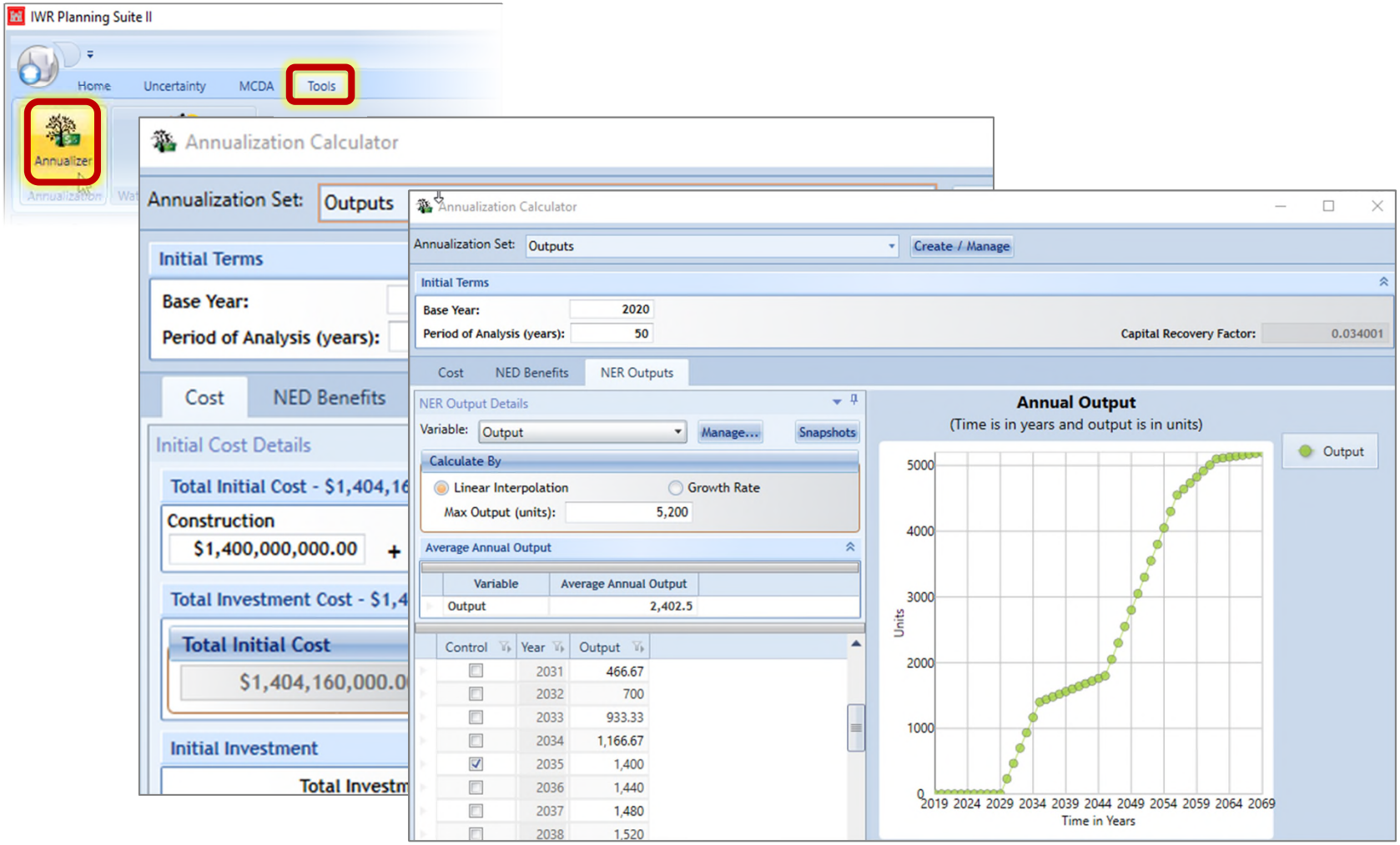
IWRPS II – Estimating your inputs



Annualize your costs and outputs…

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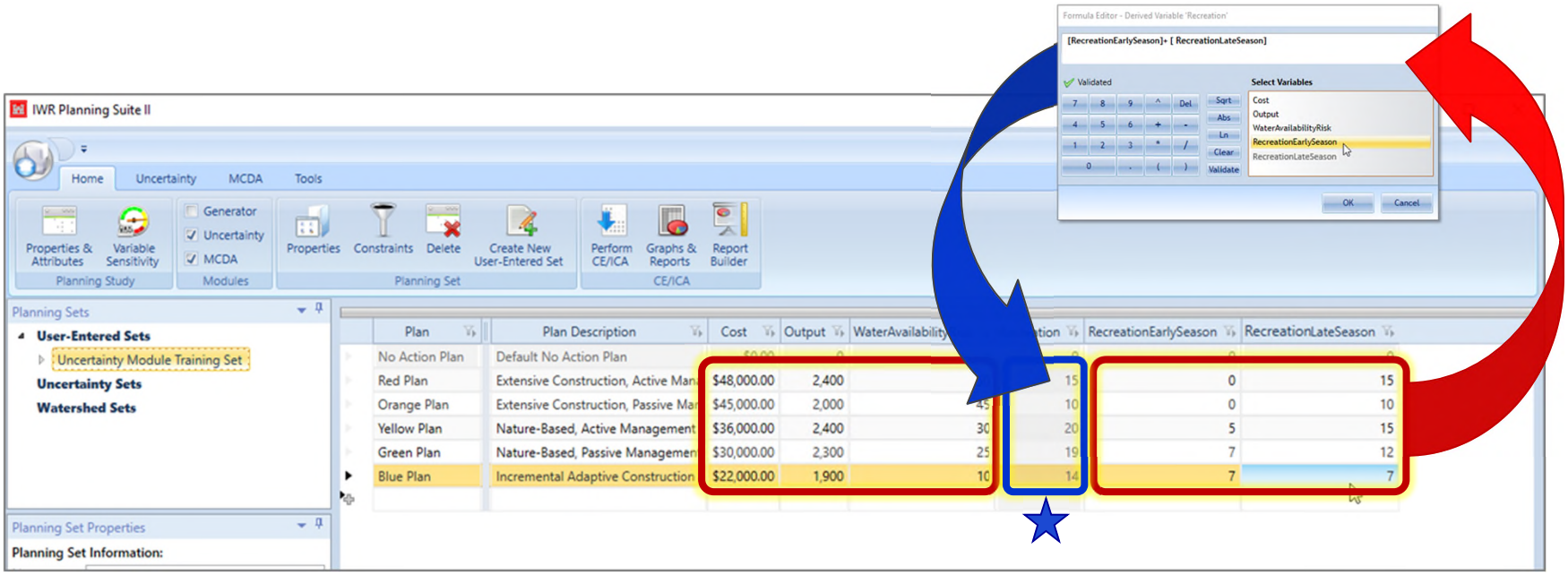
IWRPS II – Entering your inputs



Enter the values for each variable, for each of the planning alternatives.

★***Values of <u>derived</u> variables will be calculated automatically...***
(A feature that will be of increased importance in the coming slides)

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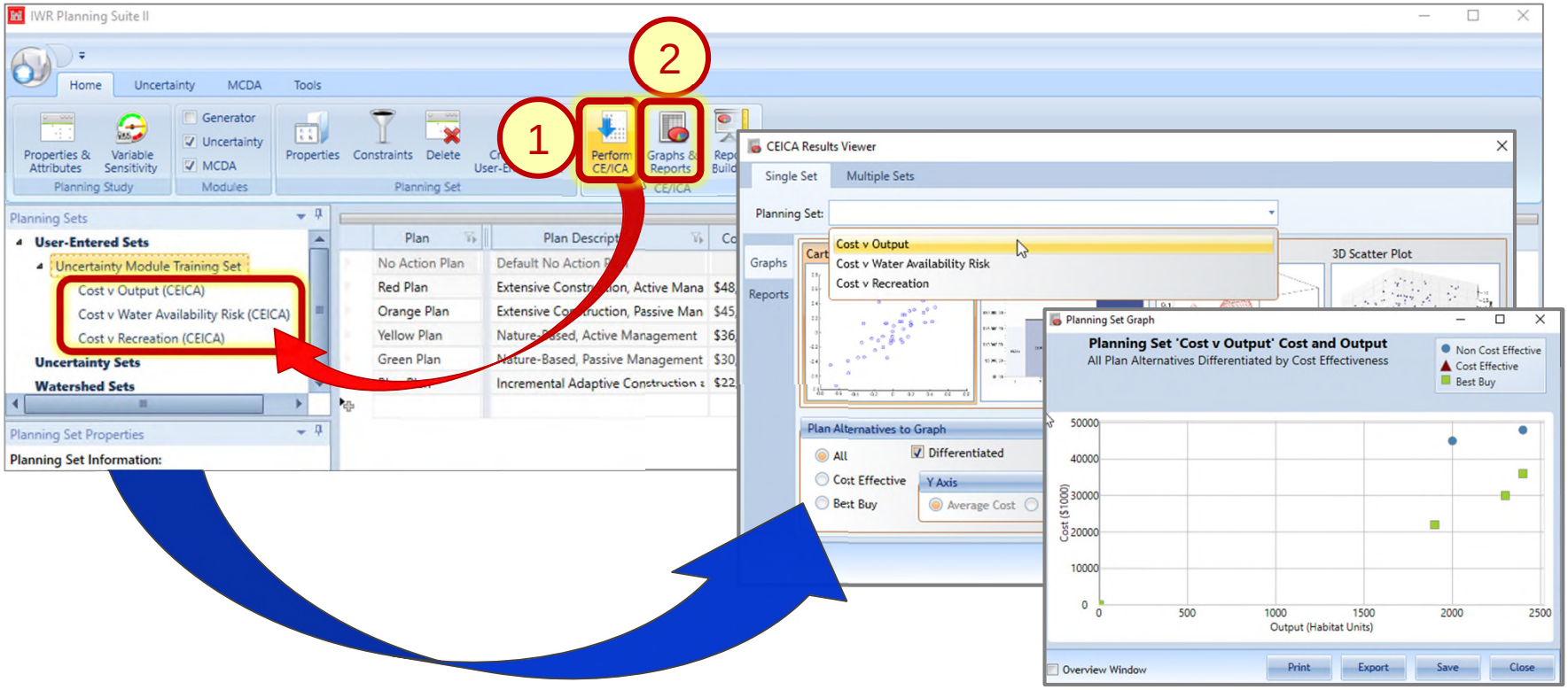
IWRPS II – Generating your analyses



Perform the CEICA on your data to analyze costs against any of the outputs.

View Graphs and Reports.

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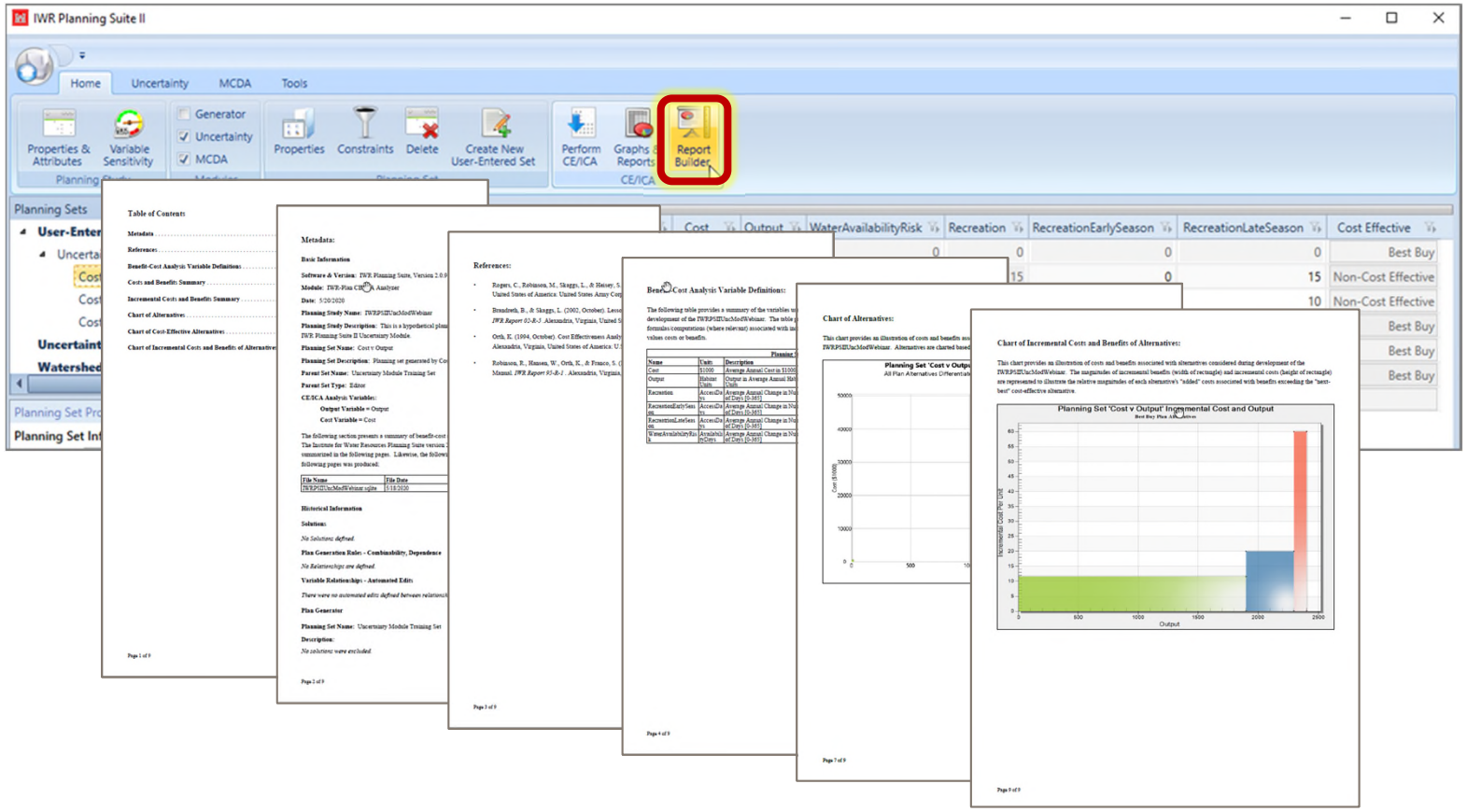
IWRPS II – Generating your report



Generate or prepare report to document analyses.

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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 T Tool to type your response.

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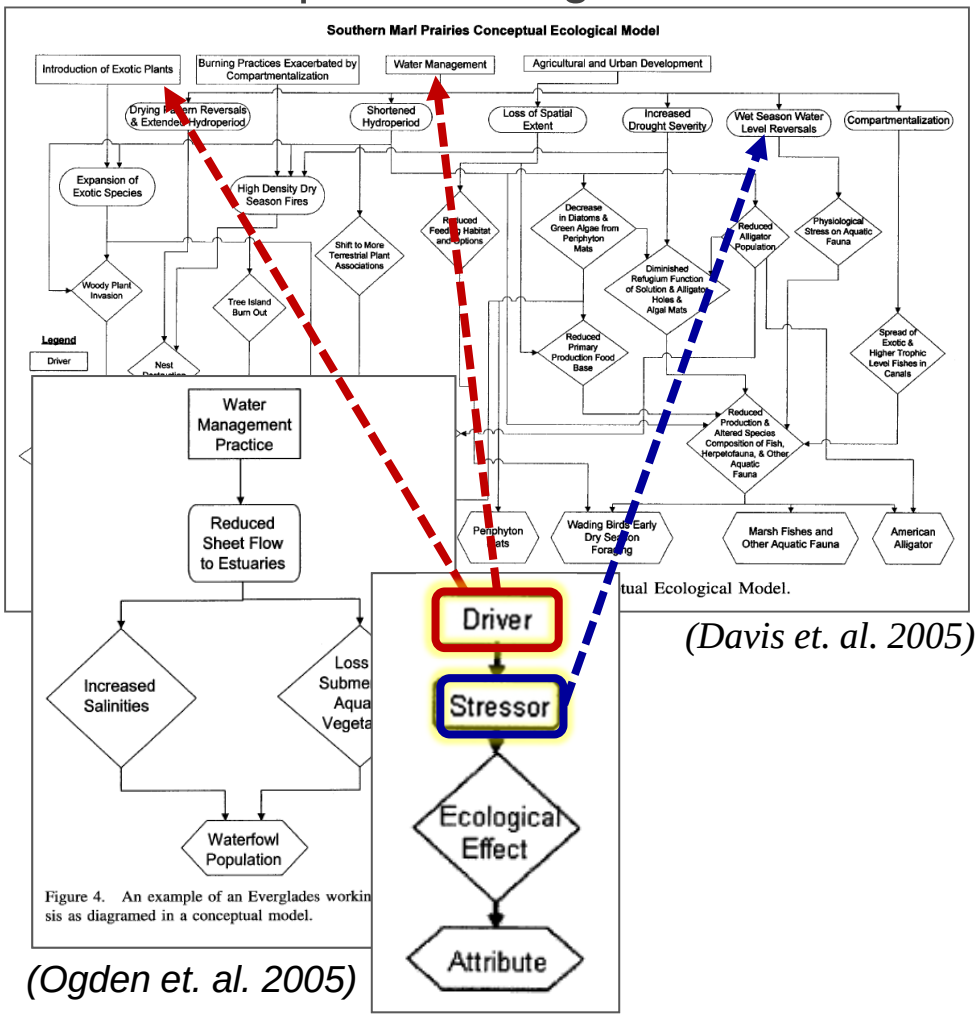
Potential Sources of Uncertainty

Conceptual Ecological Model



(Davis et. al. 2005)

(Ogden et. al. 2005)

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

All of the above, and more…

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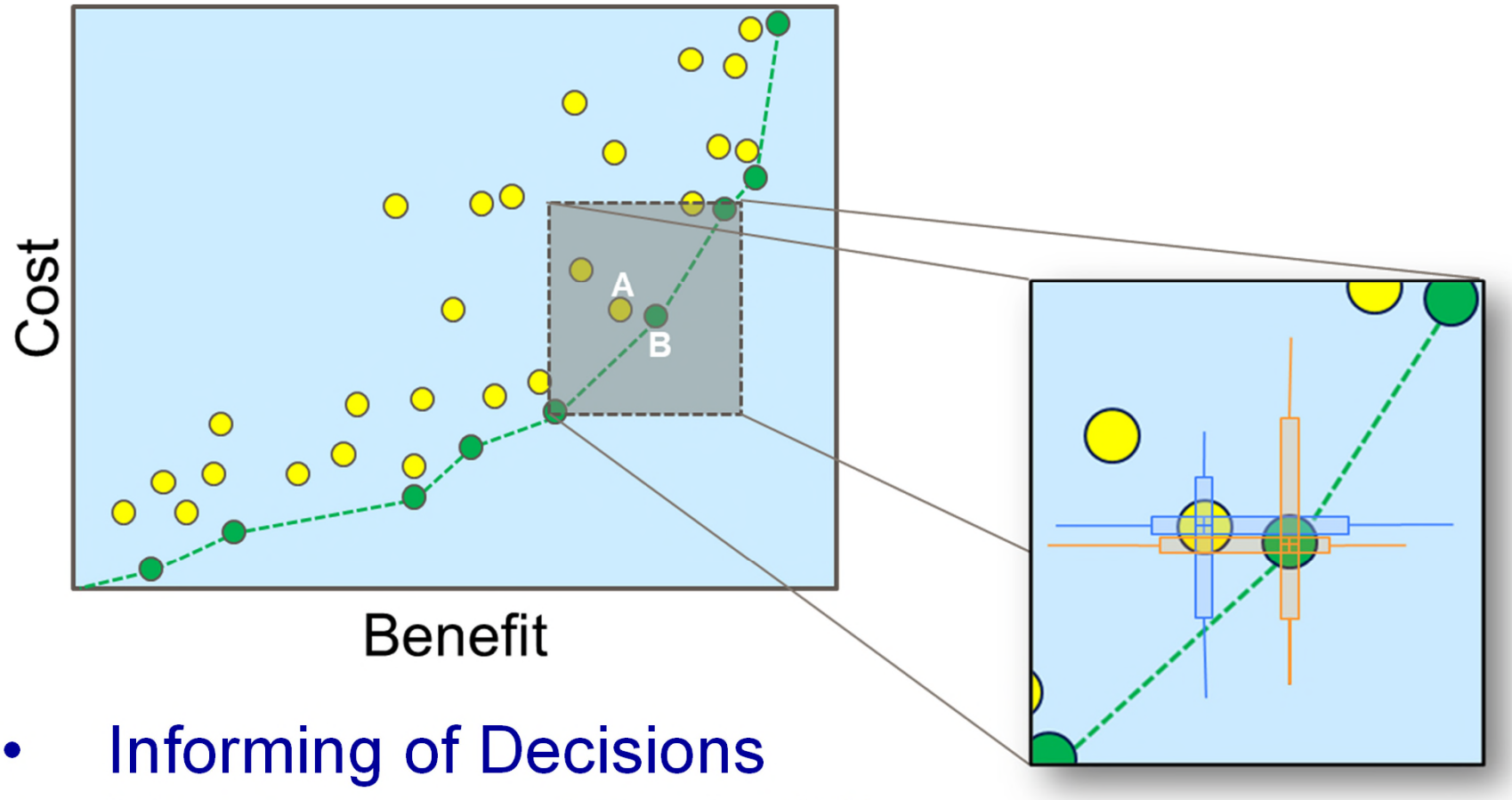
The General Concept…



- Informing of Decisions
- Management of Trade-Offs
- Communication of Risk

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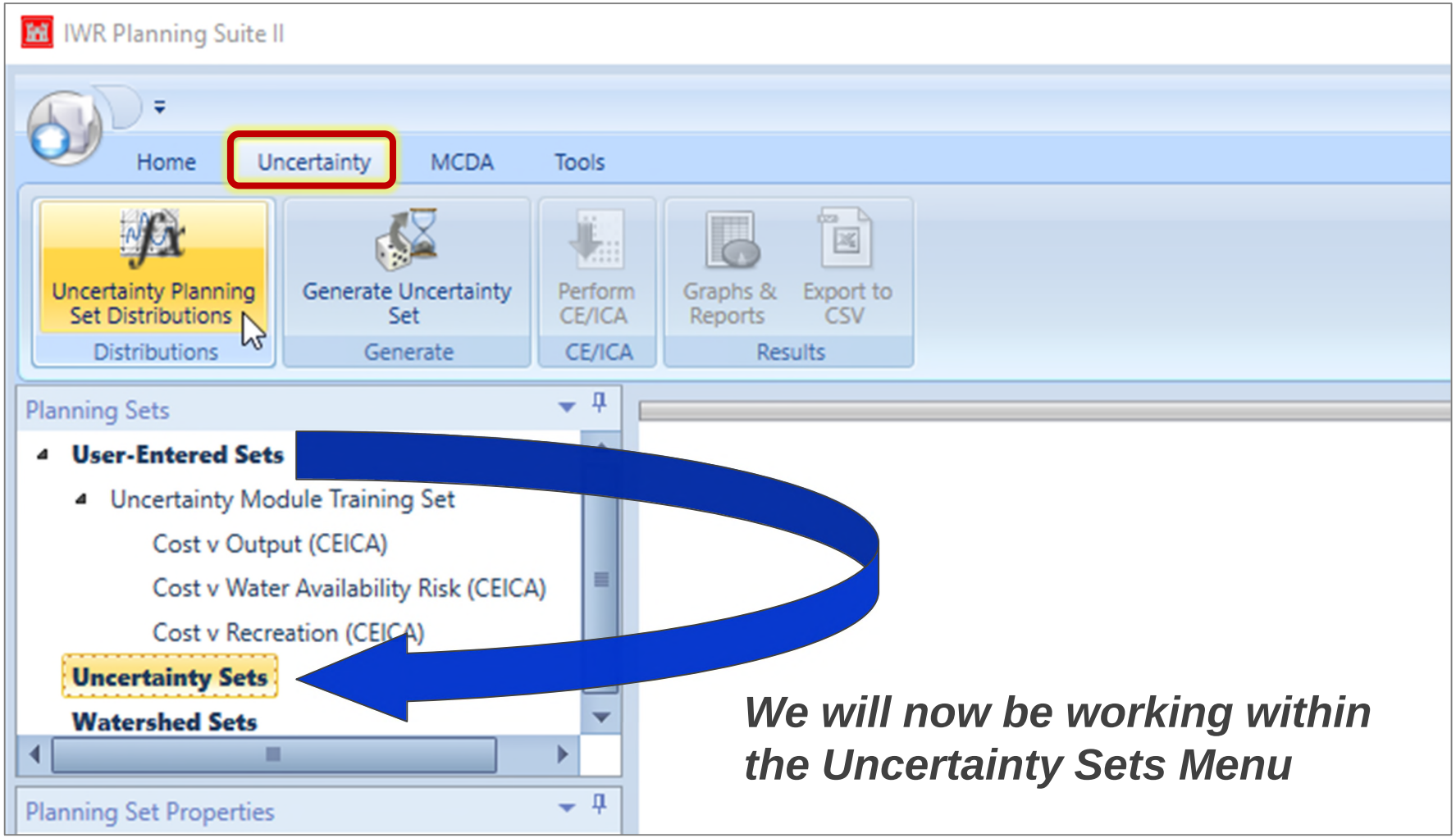
Initiating an Uncertainty Set…



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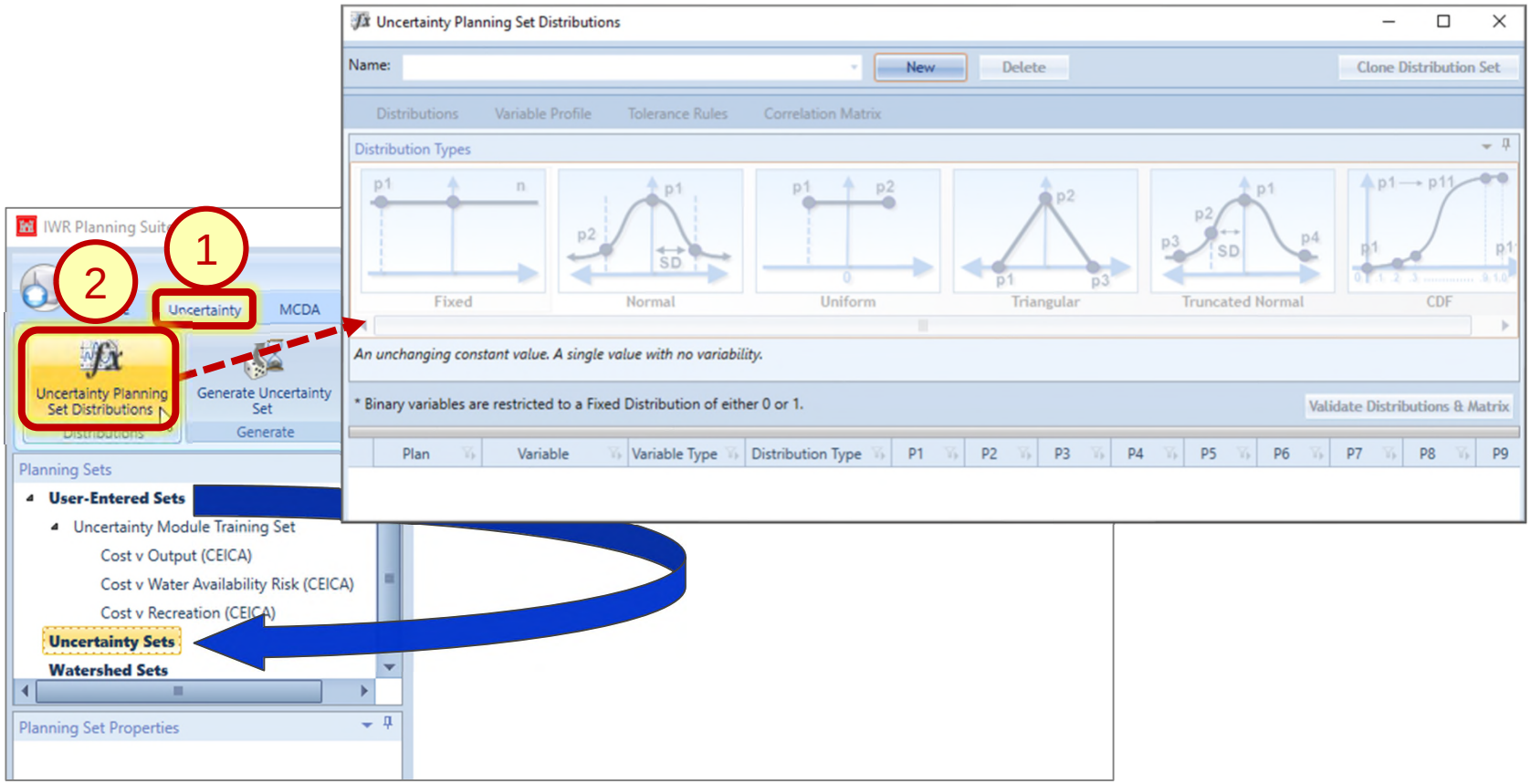
Initiating an Uncertainty Set…



Your ***Uncertainty Planning Set*** will be constructed from a ***Planning Set*** that you have already created, or a subset of those plans.

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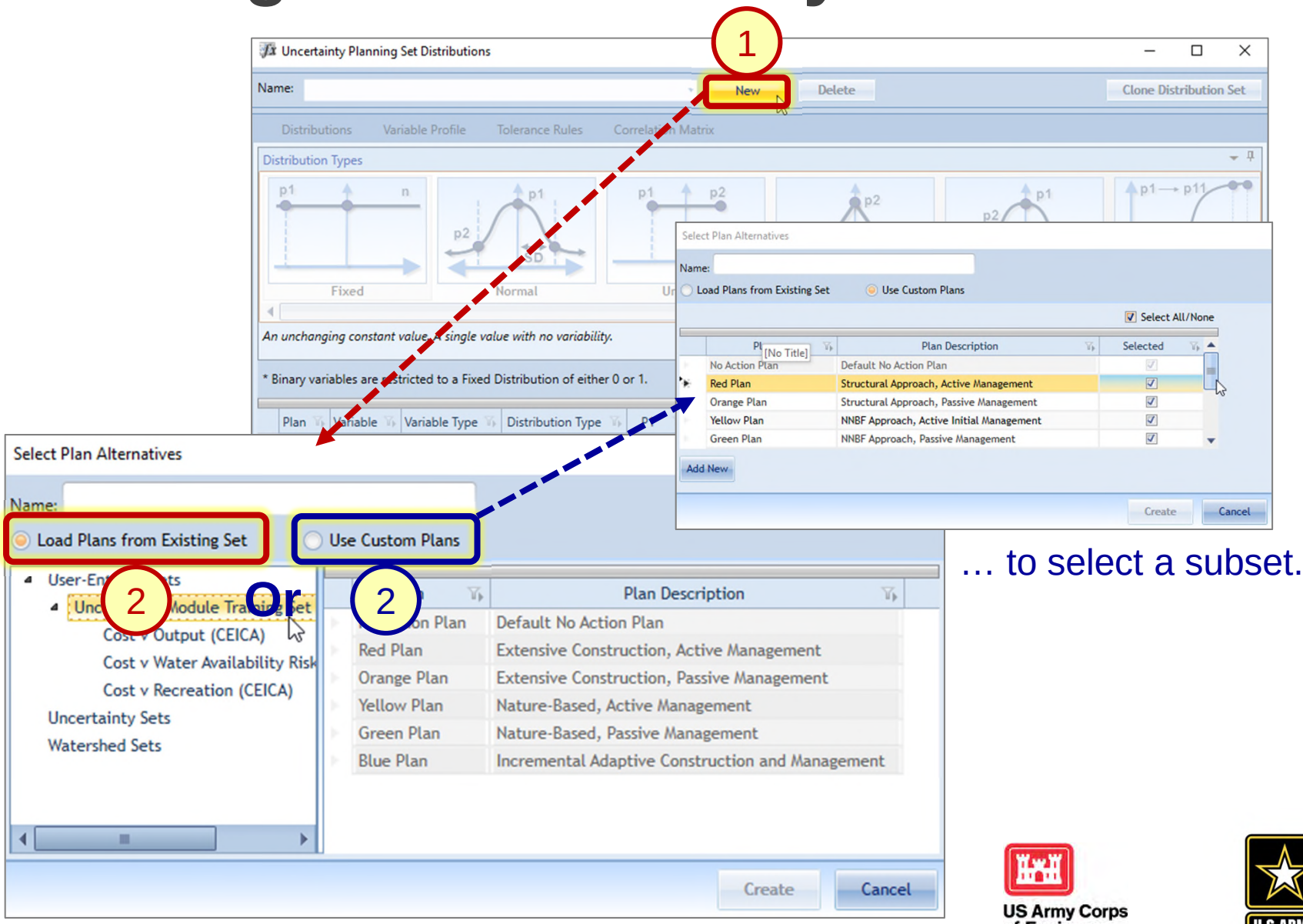
Selecting Plans for Analysis…



… to select a subset.

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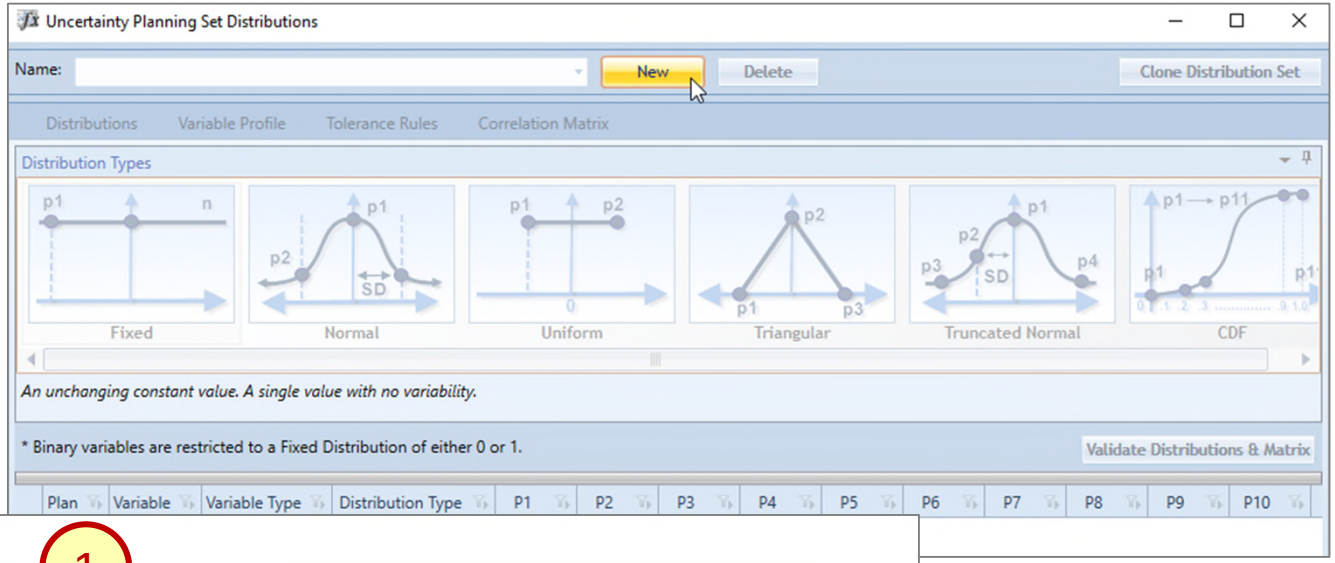
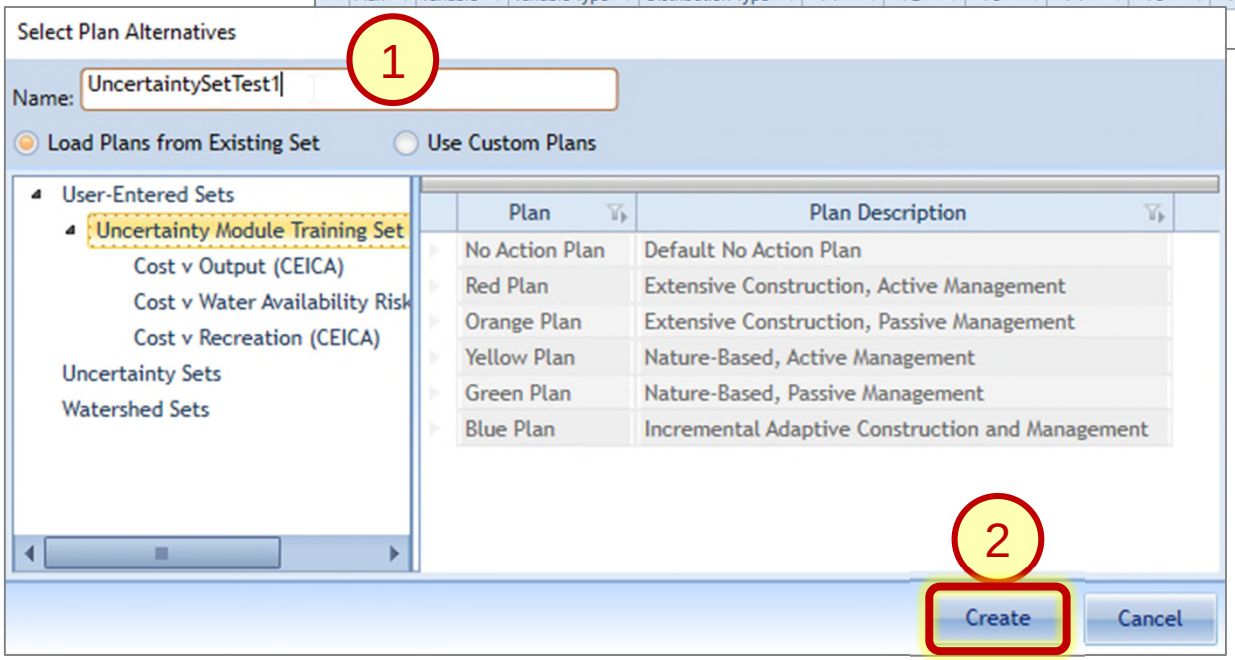
Naming the Uncertainty Set…





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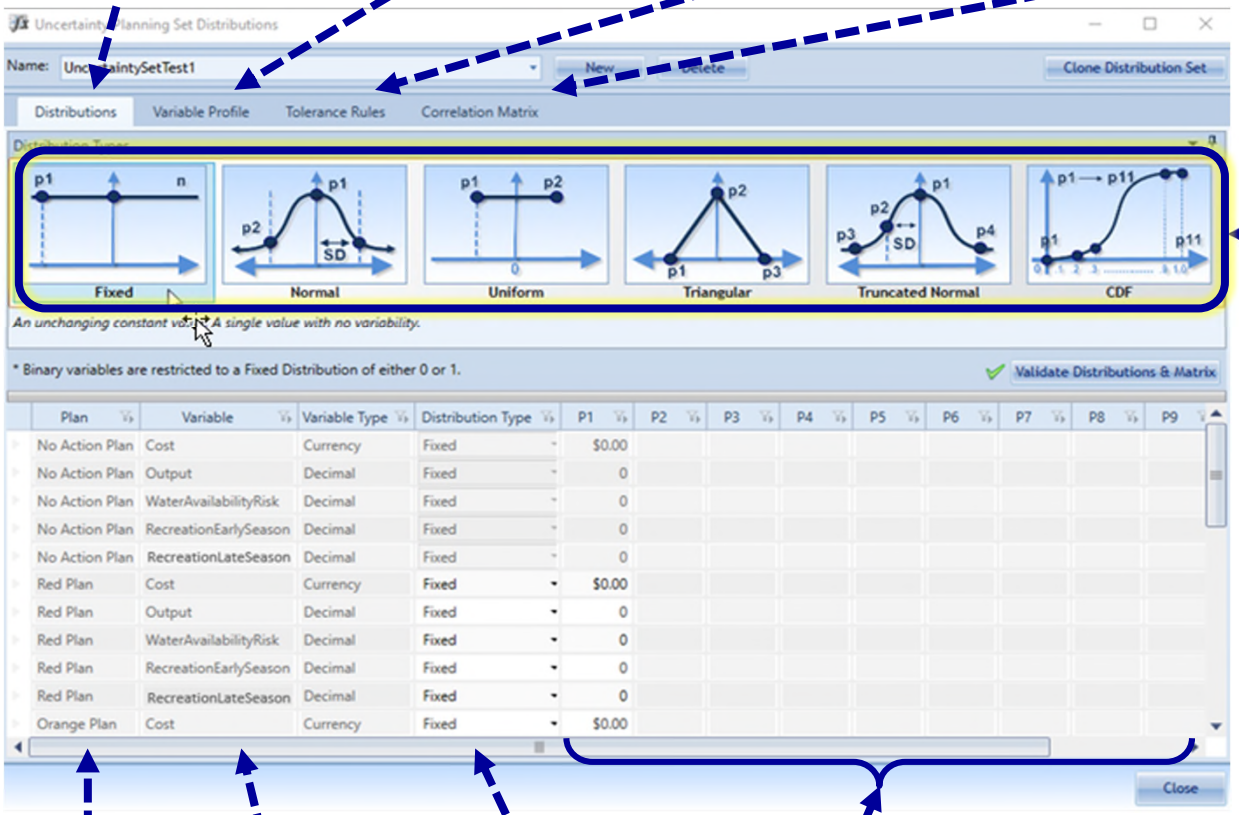
The *Uncertainty Set* Window

Distribution Tab

Variable Profile Tab

Tolerance Rules Tab

Correlation Matrix Tab



Distribution Options

Plans

Variables

Distribution

Distribution Parameters

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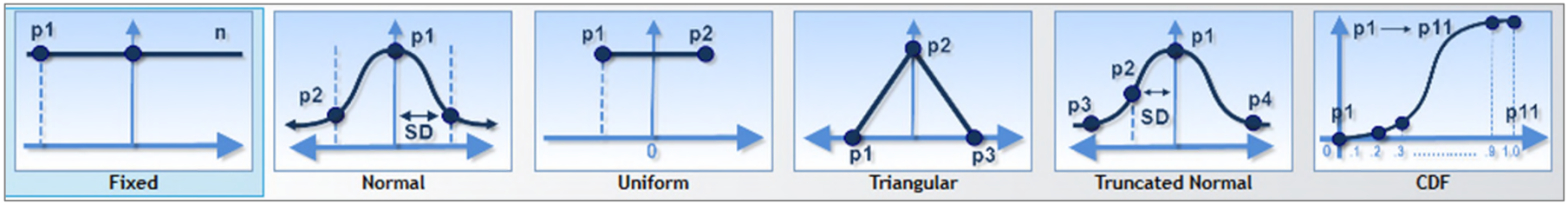
Distribution Options



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.

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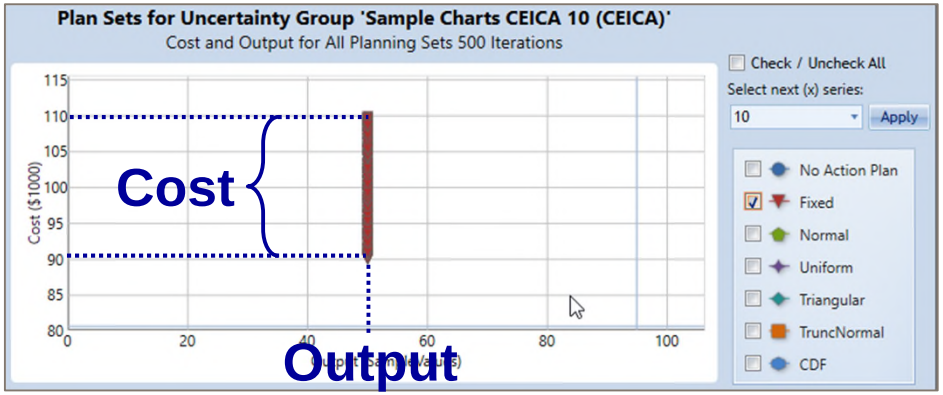
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as…
Fixed



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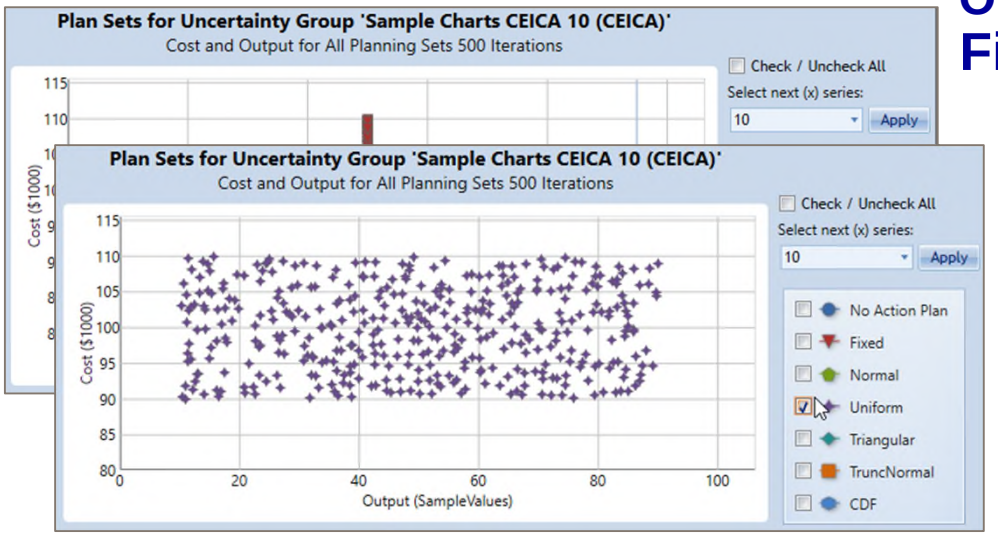
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as…
Fixed

Uniform



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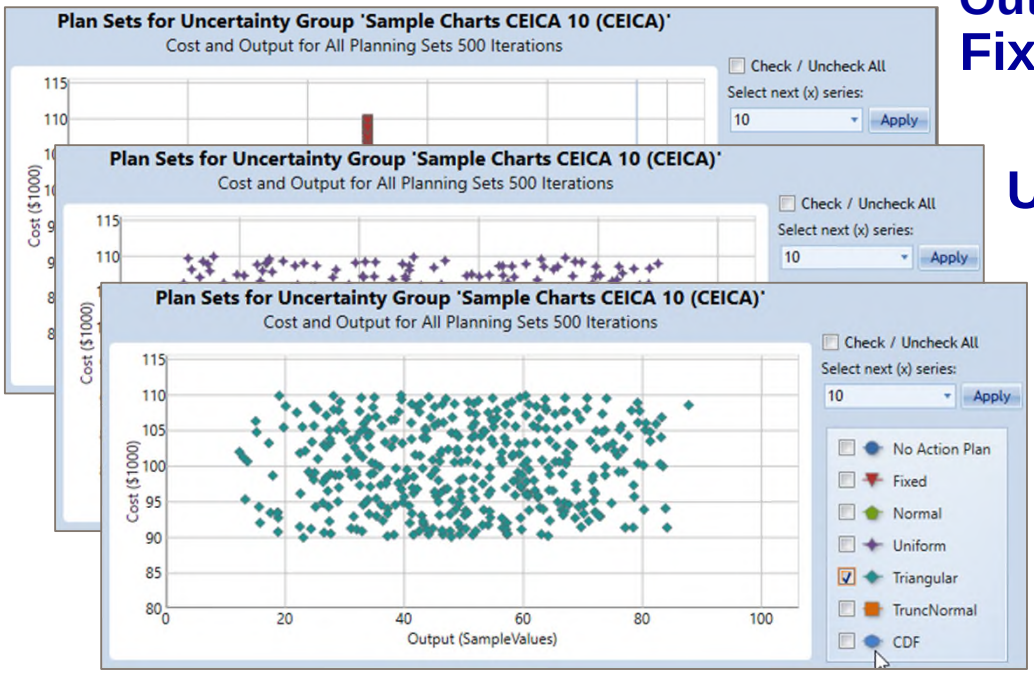
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as…
Fixed

Uniform

Triangular



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Distribution Options

Cost reflected as uniform (90-110)

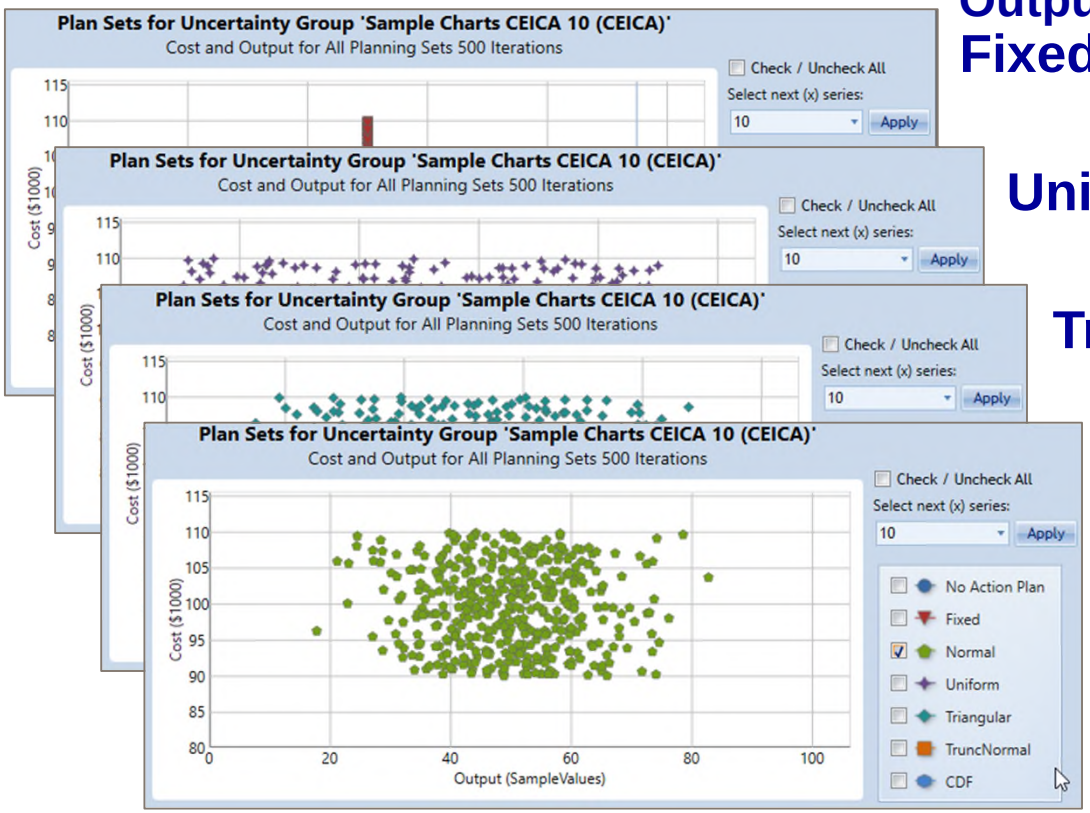
Output reflected as…

Fixed

Uniform

Triangular

Normal



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Distribution Options

Cost reflected as uniform (90-110)

Output reflected as…

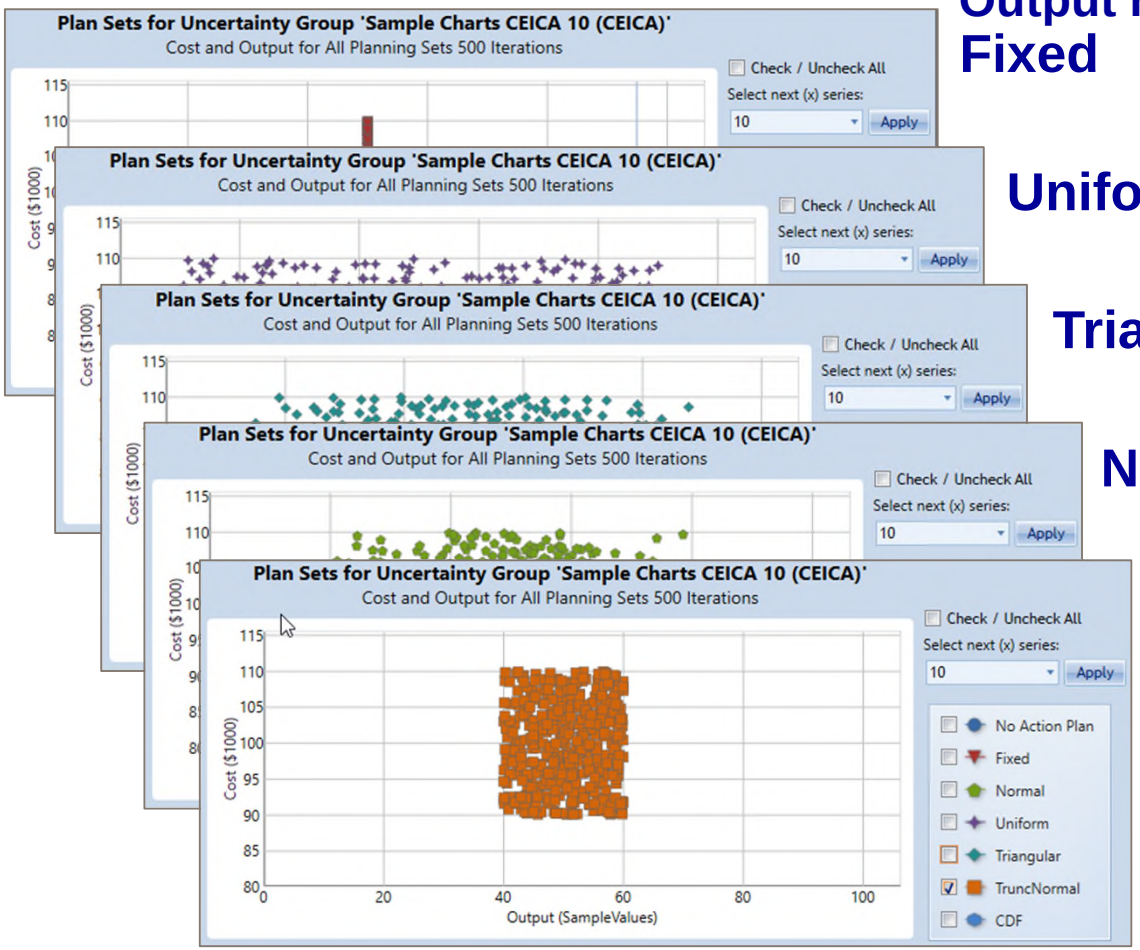
Fixed

Uniform

Triangular

Normal

Truncated Normal



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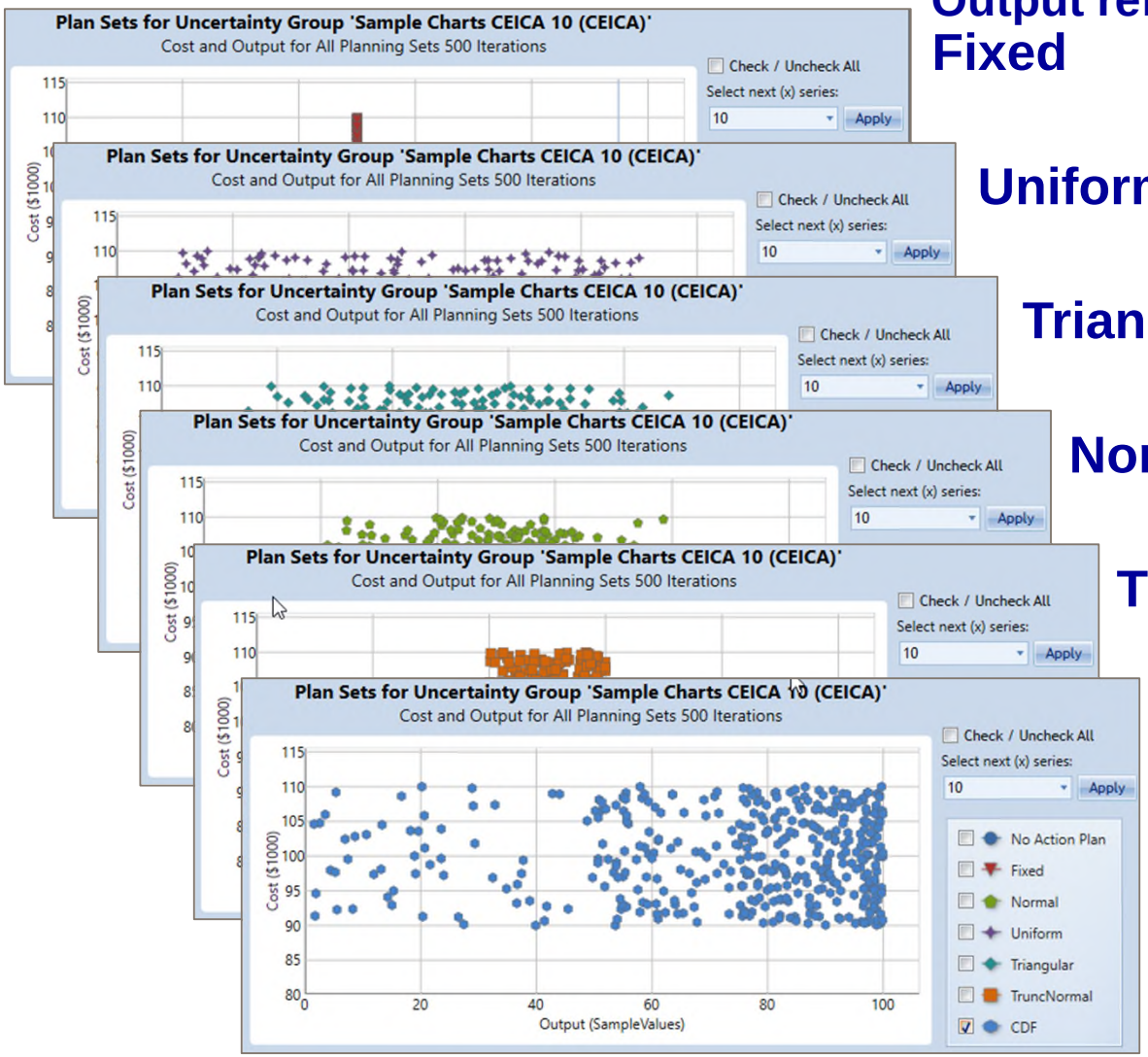
Distribution Options

Cost reflected as uniform (90-110)

Output reflected as…

Fixed



Uniform

Triangular

Normal

Truncated Normal

Custom (CDF)

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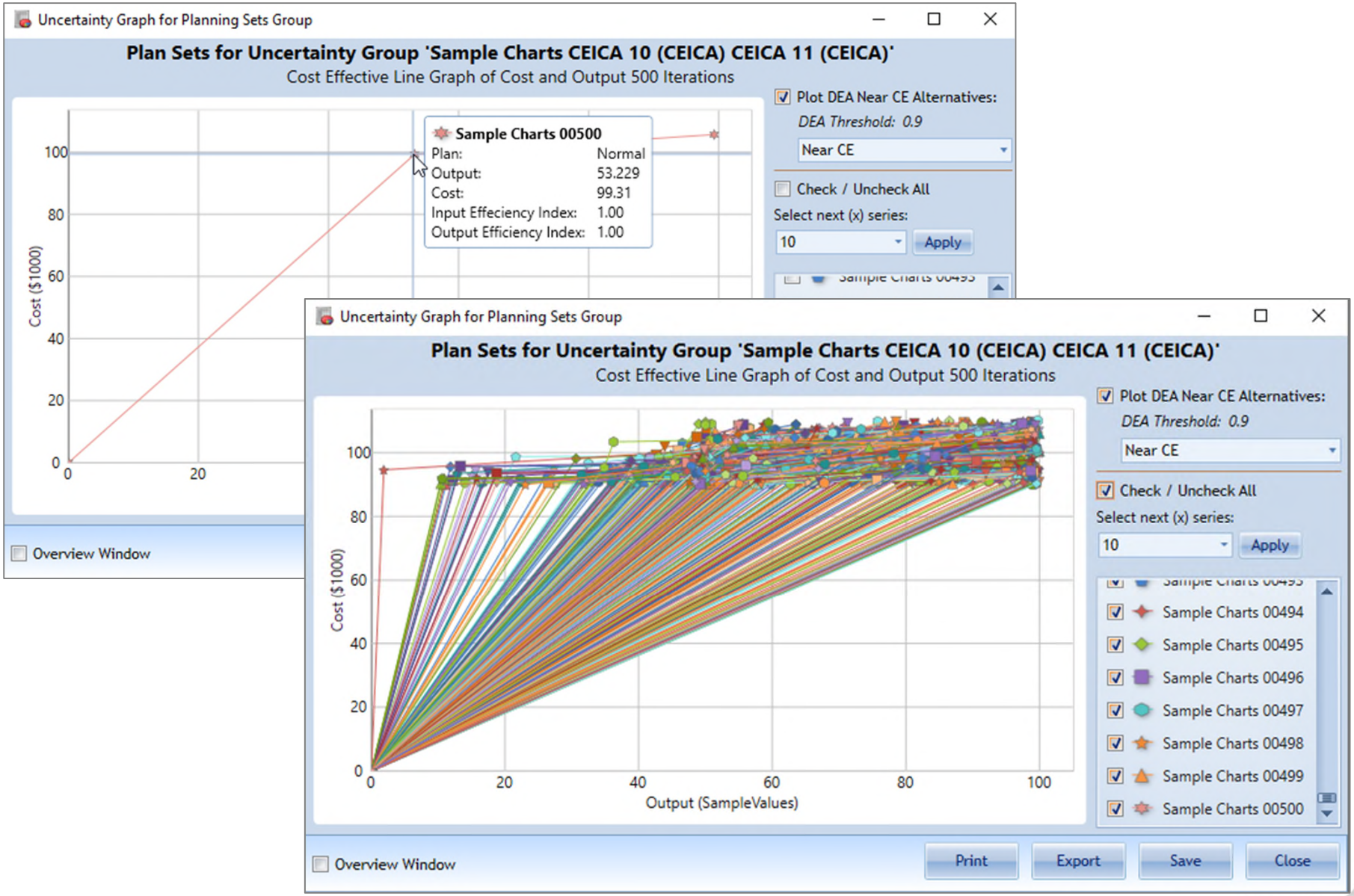
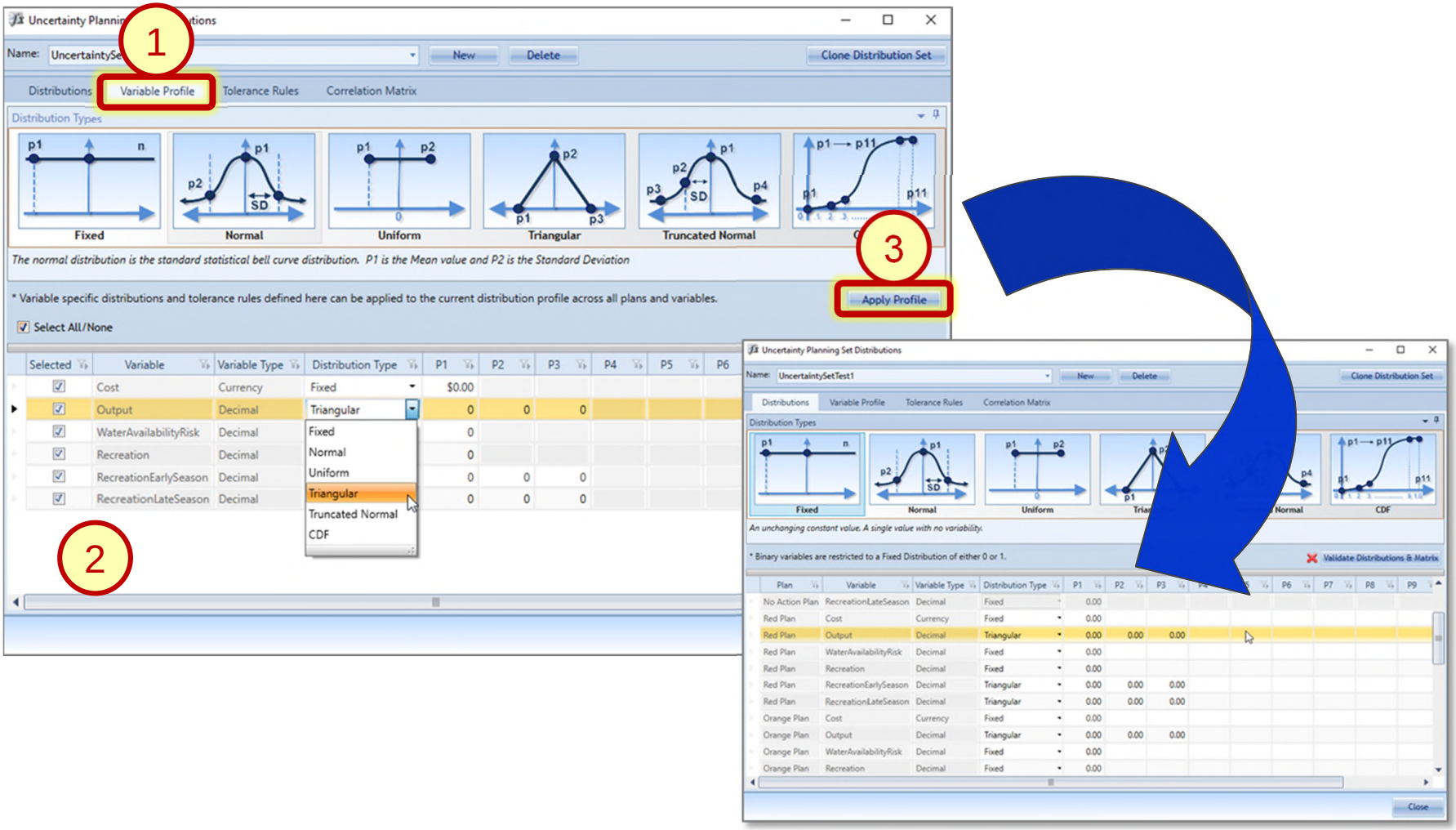
Distribution Options



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.

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Inputting Parameter Values

Plan	Plan Description	Cost	Output	WaterAvailabilityRisk	Recreation	RecreationEarlySeason	RecreationLateSeason
No Action Plan	Default No Action Plan	$0.00	0	0	0	0	0
Red Plan	Extensive Construction, Active Mana	$48,000.00	2,400	50	15	0	15
Orange Plan	Extensive Construction, Passive Man	$45,000.00	2,000	45	10	0	10
Yellow Plan	Nature-Based, Active Management	$36,000.00	2,400	30	20	5	15
Green Plan	Nature-Based, Pass						

Complete for all plans…

Uncertainty Planning Set Distributions

Name: UncertaintySetTest1 | New | Delete | Clone Distribution Set

Distributions | Variable Profile | Tolerance Rules | Correlation Matrix

Distribution Types

The Cumulative Distribution Function (CDF) parameters P1 through P11 describe the probability of a returned value less than the parameter. P1 corresponds to zero and P11 to 1. Other parameters have equally spaced correspondences between 0 and 1, namely, 0, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9, and 1.

* Binary variables are restricted to a Fixed Distribution of either 0 or 1.

Validate Distributions & Matrix

Plan	Variable	Variable Type	Distribution Type	P1	P2	P3	P4	P5	P6	P7	P8	P9
No Action Plan	RecreationLateSeason	Decimal	Fixed	0.00								
Red Plan	Cost	Currency	Fixed	0.00								
Red Plan	Output	Decimal	Triangular	1,600.00	2,400.00	2,800.00						
Red Plan	WaterAvailabilityRisk	Decimal	Fixed	0.00								
Red Plan	Recreation	Decimal	Fixed	0.00								
Red Plan	RecreationEarlySeason	Decimal	Triangular	0.00	0.00	0.00						
Red Plan	RecreationLateSeason	Decimal	Triangular	0.00	0.00	0.00						

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

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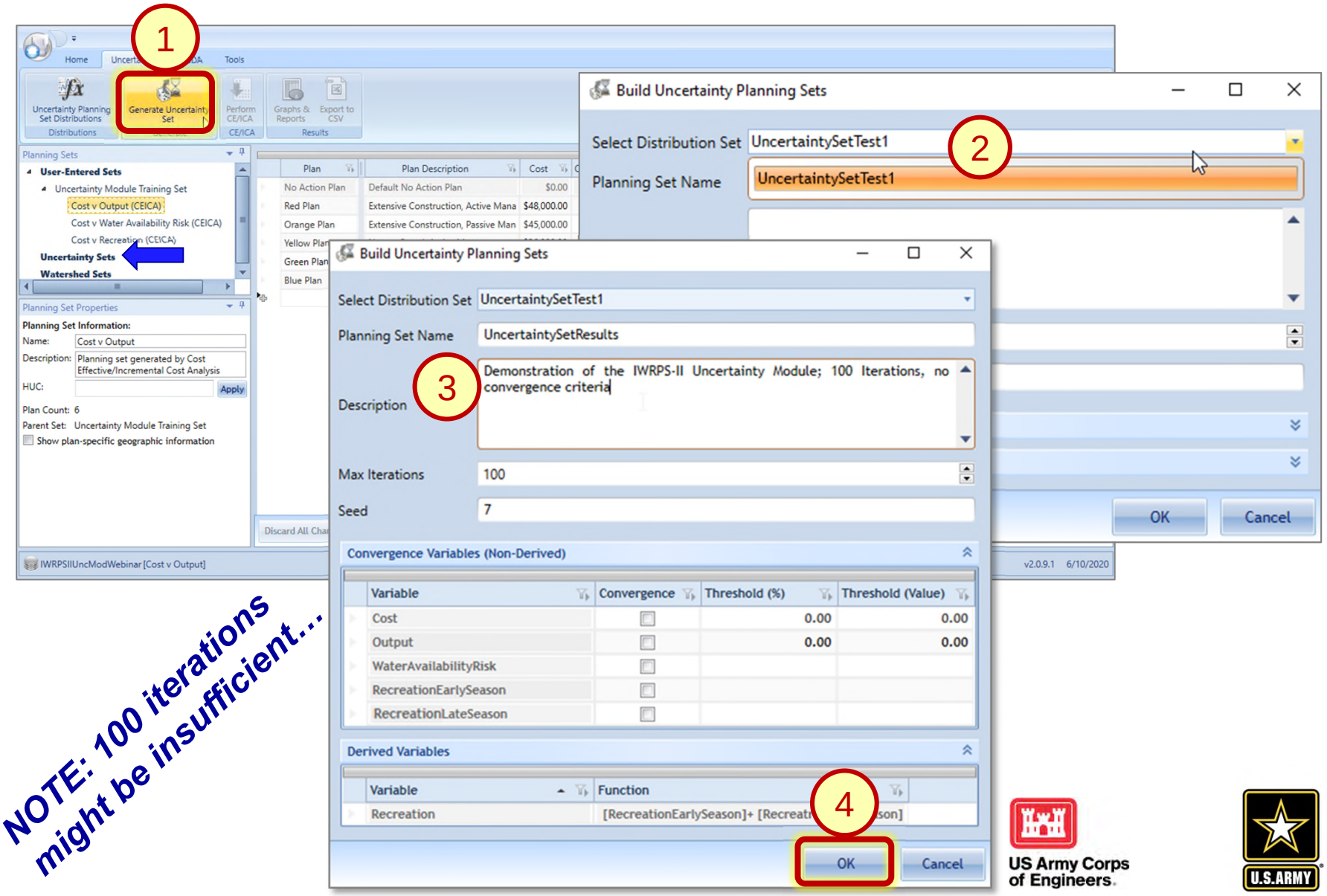
Generate Uncertainty Set



NOTE: 100 iterations might be insufficient…

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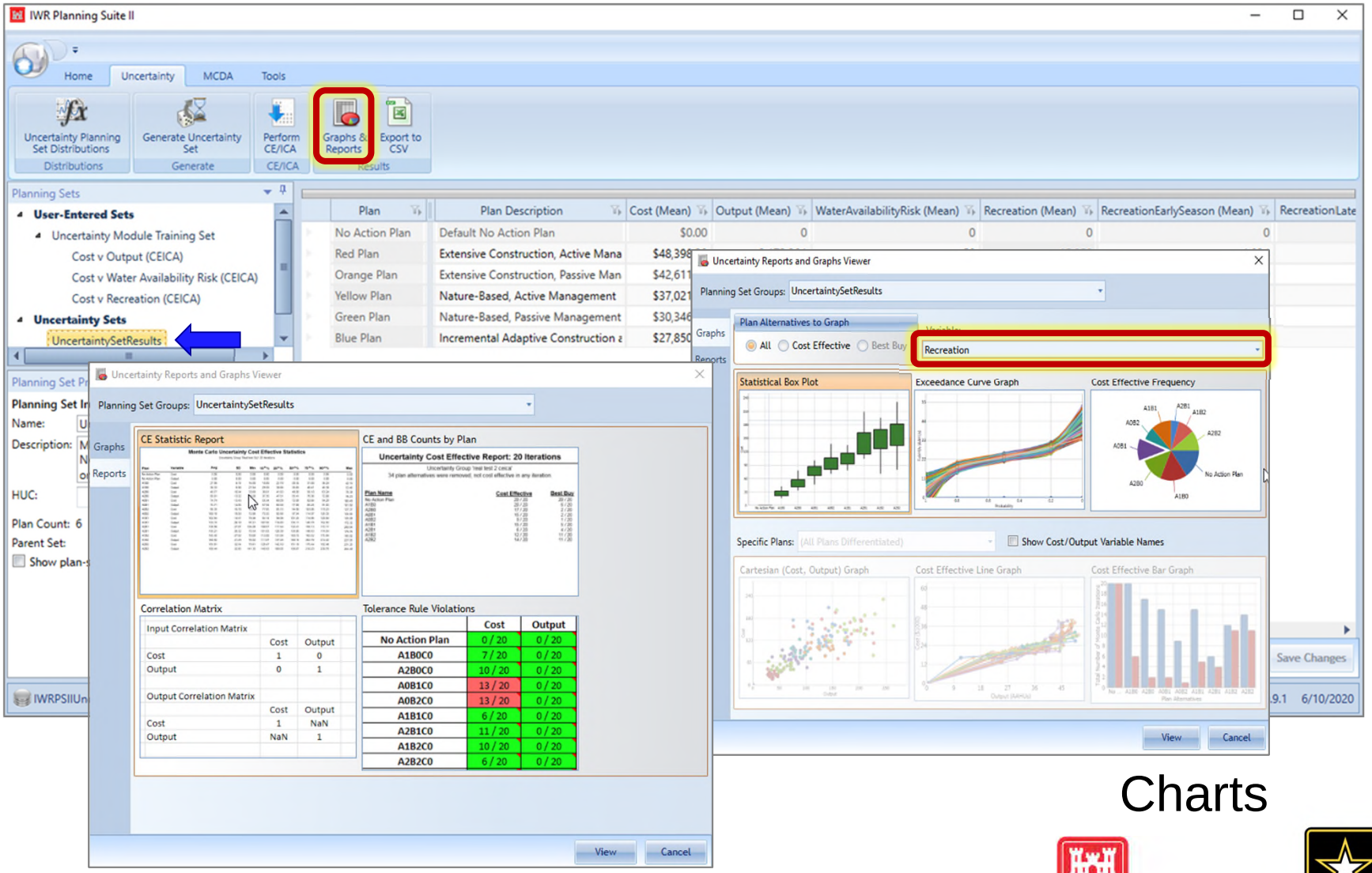
Viewing Monte Carlo Results



Tables

Charts

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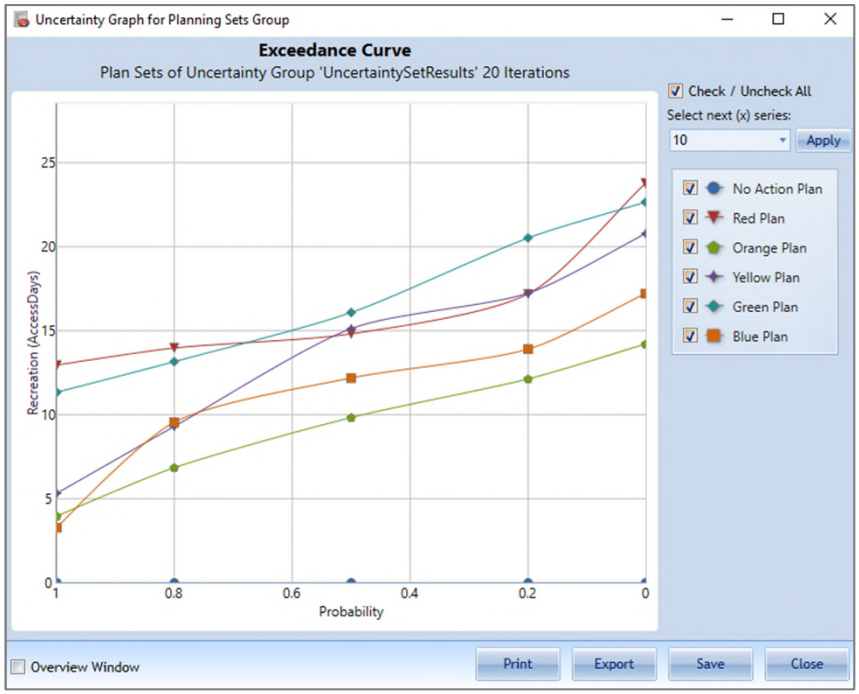
Viewing Monte Carlo Results



Charts

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Viewing Monte Carlo Results

Monte Carlo Uncertainty Cost Effective Statistics

Uncertainty Group 'UncertaintySetResults' 20 Iterations

Plan	Variable	Avg	SD	Min	10th%	25th%	50th%	75th%	90th%	Max
No Action Plan	* Cost	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Action Plan	* Output	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Action Plan	* WaterAvailabilityRisk	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Action Plan	* Recreation	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Action Plan	* RecreationEarlySeason	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
No Action Plan	* Recreation LateSeason	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Red Plan	Cost	48,398.20	3,131.18	42,978.39	45,245.75	46,460.63	47,979.14	50,002.70	51,874.59	56,015.81
Red Plan	Output	2,173.39	210.71	1,761.28	1,901.68	2,070.57	2,150.45	2,381.20	2,401.19	2,507.59
Red Plan	* WaterAvailabilityRisk	50.00	0.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Red Plan	* Recreation	15.96	2.77	12.96	13.48	14.11	14.82	16.80	19.95	23.83
Red Plan	RecreationEarlySeason	1.03	0.63	0.04	0.34	0.58	1.04	1.32	1.69	2.66
Red Plan	Recreation LateSeason	14.92	2.51	12.54	12.75	13.04	14.48	15.35	17.30	22.14
Orange Plan	Cost	42,611.96	2,846.30	36,760.40	37,700.09	40,514.77	43,497.22	45,043.08	45,572.09	45,812.93
Orange Plan	Output	2,000.55	276.84	1,553.53	1,641.65	1,752.19	2,022.68	2,182.07	2,369.68	2,526.75
Orange Plan	* WaterAvailabilityRisk	45.00	0.00	45.00	45.00	45.00	45.00	45.00	45.00	45.00
Orange Plan	* Recreation	9.66	2.91	3.95	5.96	7.38	9.84	12.05	13.30	14.22
Orange Plan	RecreationEarlySeason	1.30	1.18	0.14	0.35	0.54	0.86	1.62	3.15	4.42
Orange Plan	Recreation LateSeason	8.36	3.07	3.35	3.59	6.19	8.69	10.99	11.65	13.73
Yellow Plan	Cost	37,021.88	1,910.31	33,557.08	34,831.80	35,914.97	36,682.93	38,015.23	39,538.00	41,215.64
Yellow Plan	Output	2,359.17	143.03	2,085.81	2,162.93	2,260.68	2,381.57	2,443.15	2,535.84	2,634.15
Yellow Plan	* WaterAvailabilityRisk	30.00	0.00	30.00	30.00	30.00	30.00	30.00	30.00	30.00
Yellow Plan	* Recreation	14.04	4.16	5.28	8.73	10.12	15.13	16.74	18.79	20.79
Yellow Plan	RecreationEarlySeason	4.21	1.48	1.34	2.03	3.32	4.46	5.15	5.74	7.13
Yellow Plan	Recreation LateSeason	9.83	3.97	1.79	3.88	7.04	11.12	12.90	13.97	14.52
Green Plan	Cost	30,346.81	643.69	29,363.38	29,511.85	29,863.26	30,410.06	30,814.95	31,004.46	31,680.51
Green Plan	Output	2,105.42	300.77	1,557.41	1,613.03	1,887.08	2,178.26	2,364.67	2,438.71	2,476.12
Green Plan	* WaterAvailabilityRisk	25.00	0.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
Green Plan	* Recreation	16.45	3.54	11.35	12.74	13.25	16.09	18.91	21.76	22.67
Green Plan	RecreationEarlySeason	5.55	1.89	2.33	3.25	4.23	5.54	6.46	8.02	9.56
Green Plan	Recreation LateSeason	10.91	3.01	5.36	7.23	8.19	11.00	13.24	15.05	15.96

6/10/2020 12:14:31PM * Fixed Distribution (No Uncertainty) **IWR Planning Suite** Page 1 of 2

Tables

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Something to remember…

Early Season

Late Season

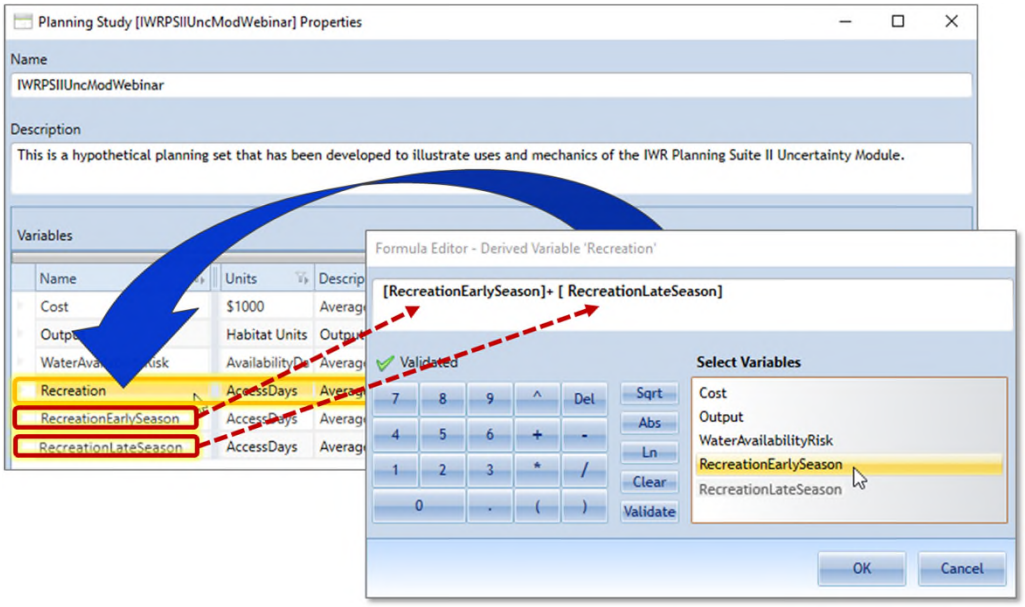
=

Total Season

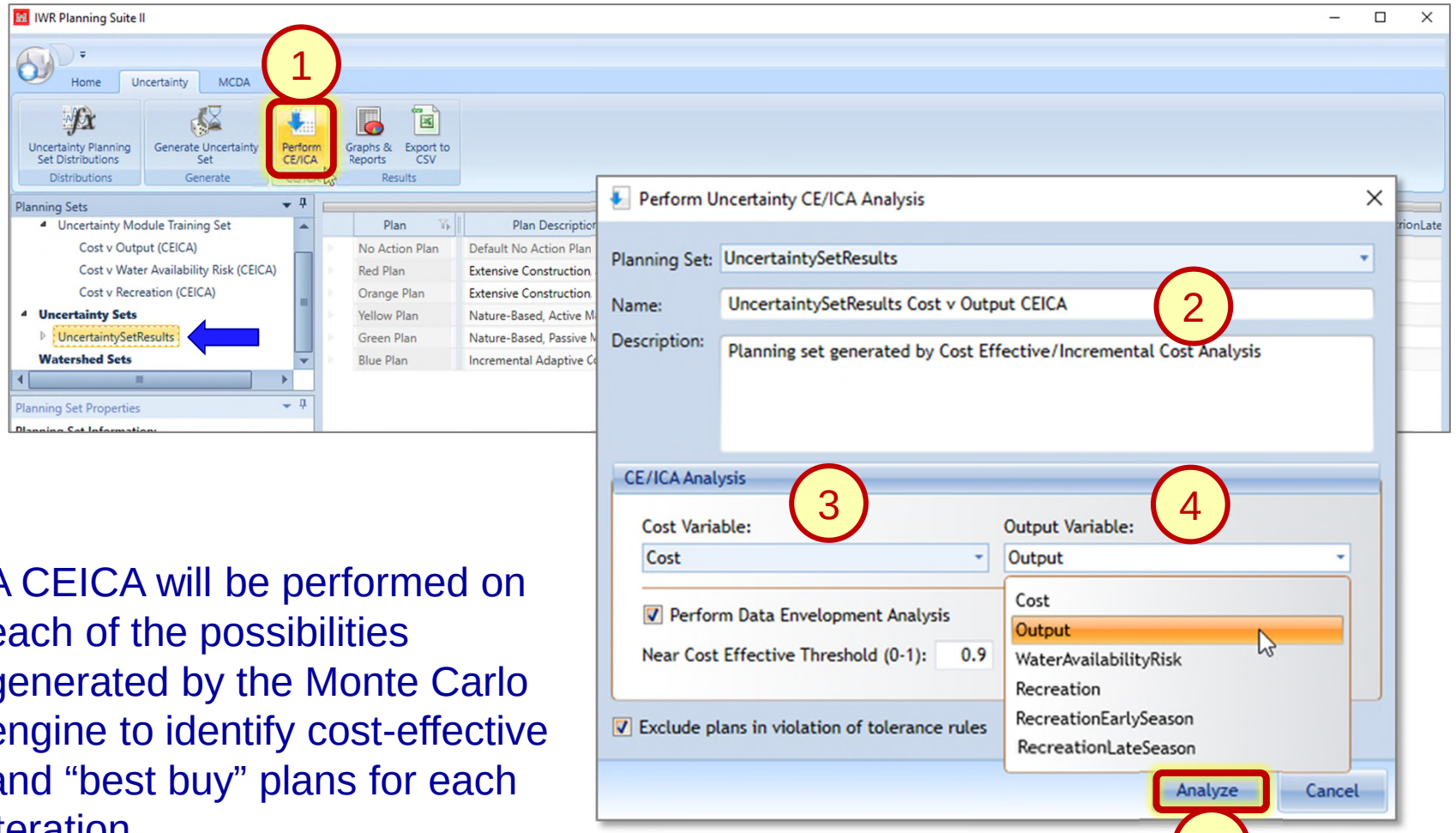
Recall that we defined one variable as a formula.

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…



Running Uncertainty-Informed CEICA



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.

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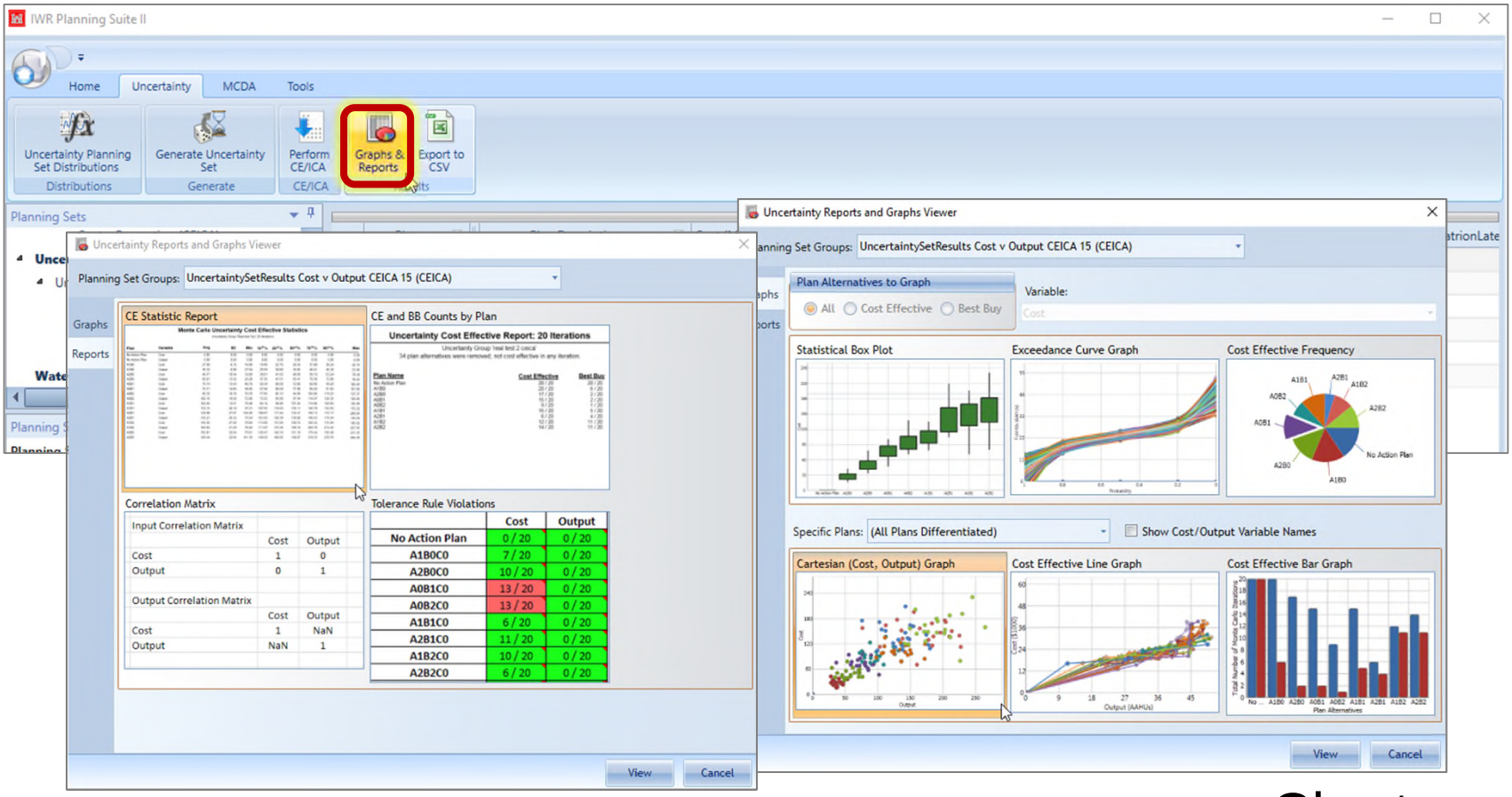
Viewing Your CEICA Results



Tables

Charts

You will see that several chart options are now available…

Which plans were cost effective and/or best-buys most often?

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Viewing Your CEICA Results

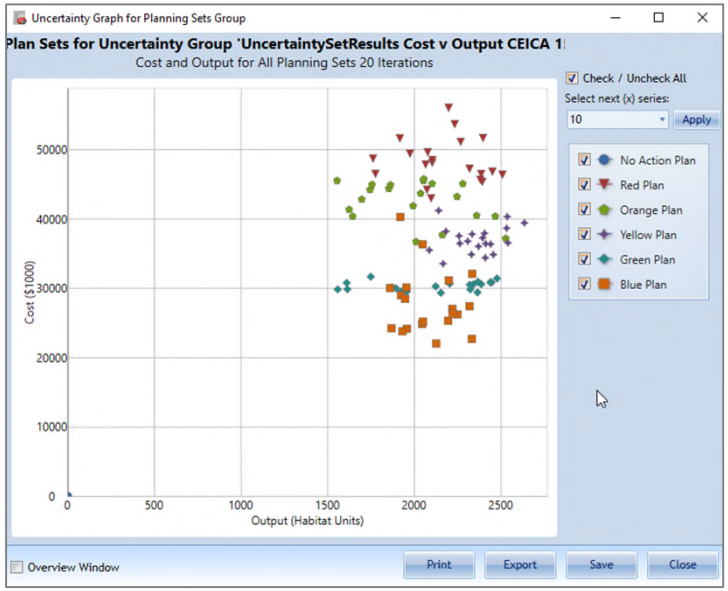
Table

Uncertainty Cost Effective Report: 20 Iterations

Uncertainty Group 'UncertaintySetResults Cost v Output CEICA 15 (CEICA)'
0 plan alternatives were removed; not cost effective in any iteration.

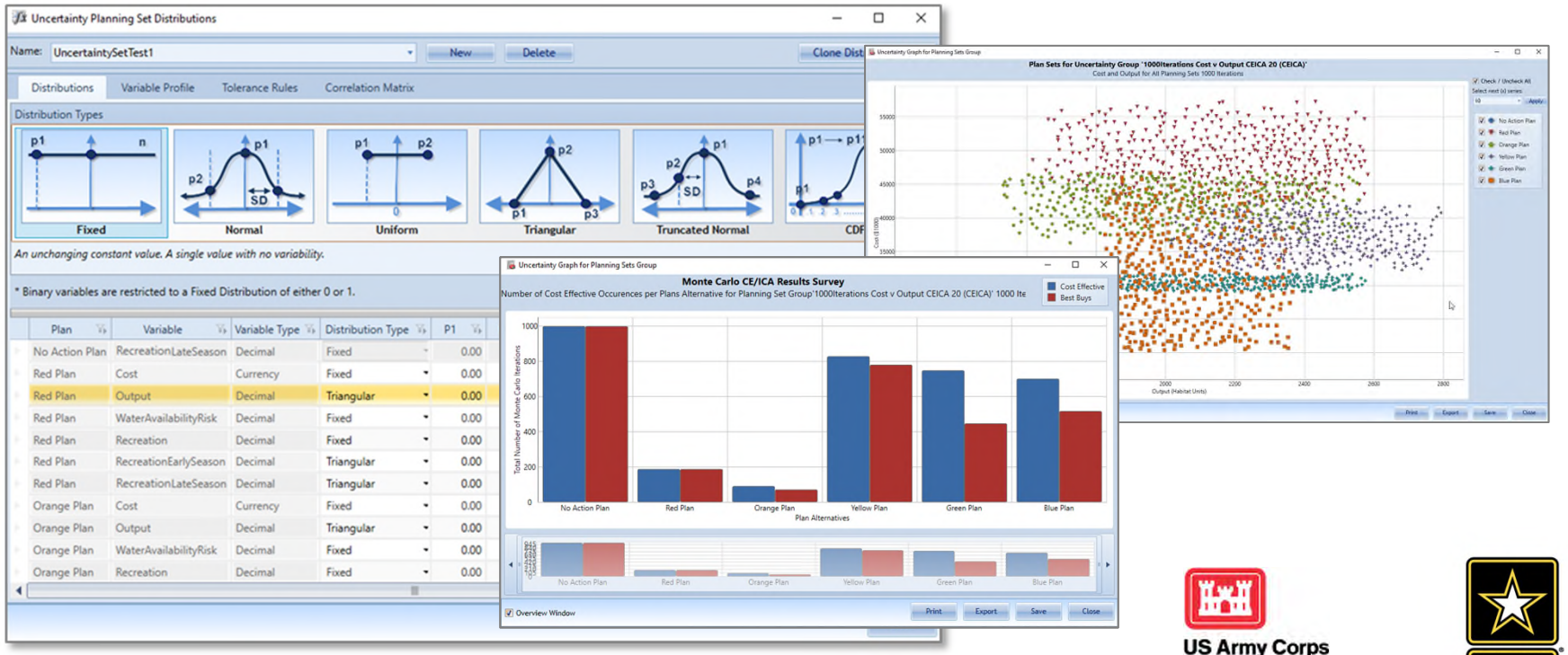
Plan Name	Cost Effective	Best Buy
No Action Plan	20 / 20	20 / 20
Red Plan	1 / 20	1 / 20
Orange Plan	2 / 20	2 / 20
Yellow Plan	16 / 20	16 / 20
Green Plan	16 / 20	11 / 20
Blue Plan	18 / 20	15 / 20

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.



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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

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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

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