

Triage of endangered species assessment work to effectively support decision making

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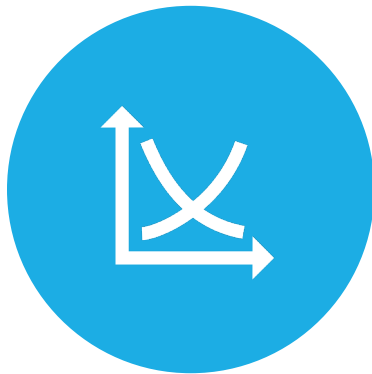
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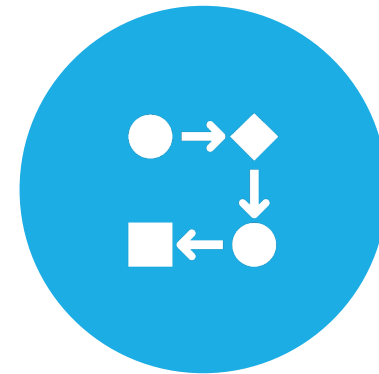
Triage of endangered species assessments



SSAs & the need for
optimization



Using Excel Solver



Current and future
applications

Species Status Assessments

Important decision-making documents

- Required for Endangered Species Act listing decisions
- Can be quantitative or qualitative based on available data

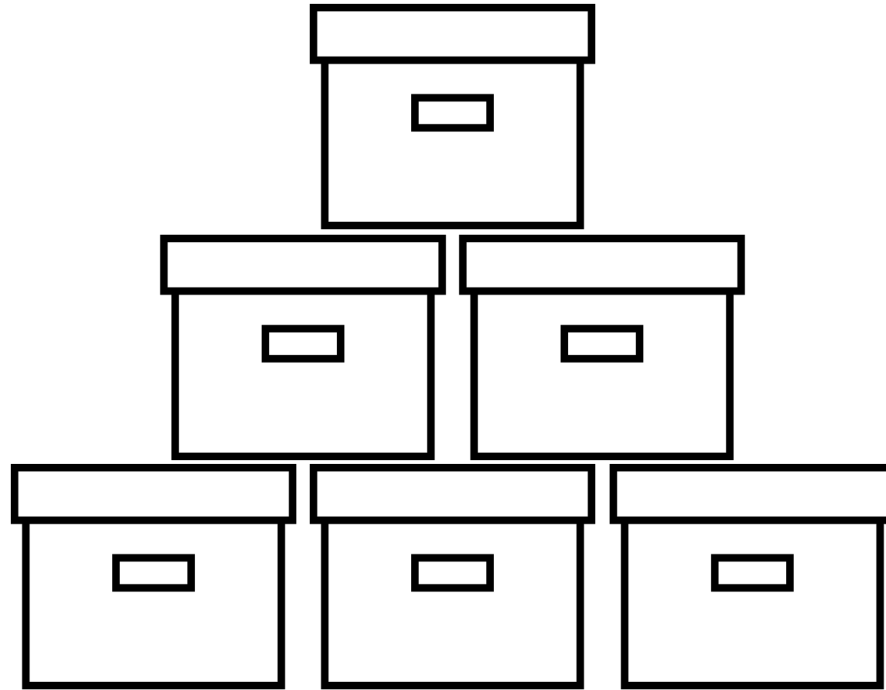
Require data

- Populations, demographics, and habitat
- Threats
- Taxonomy

Require time and expertise

- ~1 year
- Affected by controversy issues
- Limited by workforce capacity and expertise

Previous Triage Efforts

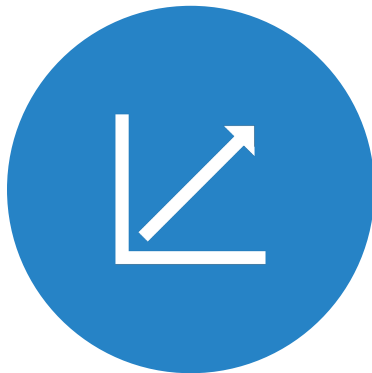


Immediate backlog when SSAs were introduced

Bin method – based on whether there was available data at the time the species was added to the assessment list

Still the primary method for triage

A need for an optimized plan



More species being added to assessment list every year



Litigation and court-ordered assessments



Scheduling based on a rational tool and available data

Developing an Optimization Tool

Must be flexible

- Add/remove species
- Change objective priorities
- Test scenarios

Must be easy to use

- Will be used by many people
- Output must be understandable

Must address many issues

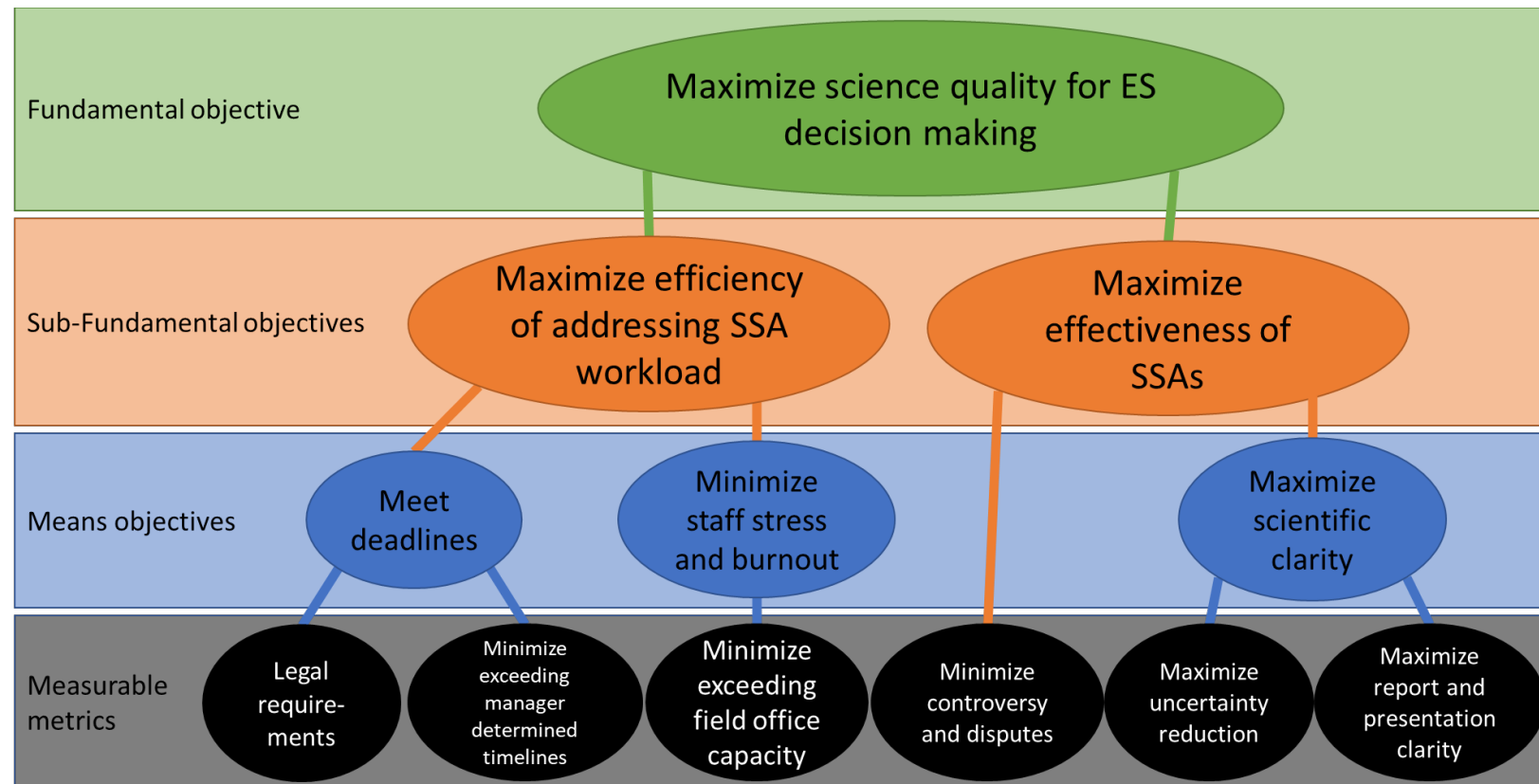
- Variability among species (range, habitat, data available, etc)
- Clear objectives
- Uncertainty in the workforce/workload
- Visibility/controversy

Outlining of Objectives

Problem: Species to be assessed need to be prioritized so that they can be funded in a timely manner and assigned to field offices based on their staffing and expertise capacity.

Identified metrics

- Reflected the problem
- Measurable
- Accessible



Developing a Value Function

Determine priority of metrics

Court-ordered deadlines are #1

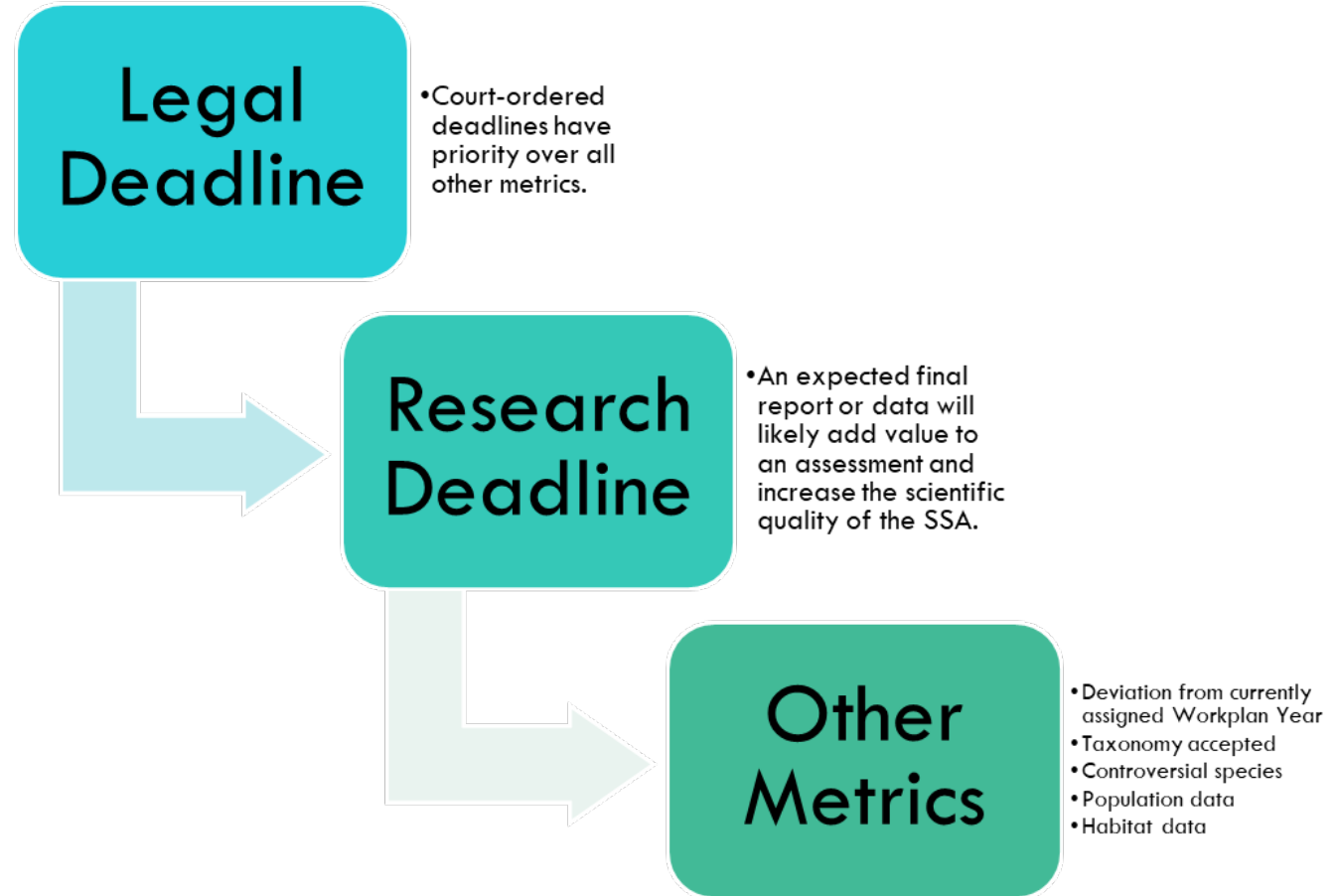
Research must be completed before assessment can be done.

Constraints

Strict – Capacity

Flexible – Impacts on published workplans

How should time contribute to value?



Developing a Value Function

Components gain or lose value based on how soon or late they are assigned.

Weights make it easy to add value to priority components.

Key:
Metric Weight
Difference between workplan year and selected year
Value of Metric

$$\begin{aligned} \text{Value} = & (\text{Schedule Weight} * \Delta \text{Year} * \text{Schedule Value}) \\ & + (\text{Taxonomy Weight} * \Delta \text{Year} * \text{Taxonomy Value}) \\ & + (\text{Controversy Weight} * \Delta \text{Year} * \text{Controversy Value}) \\ & + (\text{Population Data Weight} * \Delta \text{Year} * \text{Population Data Value}) \\ & + (\text{Habitat Data Weight} * \Delta \text{Year} * \text{Habitat Data Value}) \end{aligned}$$

Using Excel Solver to optimize value

What is Solver? A model optimizer add-in for Microsoft Excel

What types of problems can Solver solve?

- “What-if analysis”
- Linear programming/linear optimization problems
 - “the optimization of a linear objective function, subject to linear equality/inequality constraints”
- Warehouse, stock, conservation planning, “travelling salesman”

Creating a Solver Model



Creating a Solver Model

Solver Data Tab

	A	B	C
1	Species	Year	Value
2	Elimia acuta	2026	2.425641
3	Graptemys pulchra	2025	0.615385
4	Elliptio arca	2027	-6.5641
5	Lampropeltis meansi	2025	0.615385
6	Percina sipsi	2025	0.365385
7	Procambarus delicatus	2030	-5.94359
8	Eriocaulon nigrobracteatum	2030	-1.75
9	Osmia calaminthae	2030	0
10	Lobelia boykinii	2030	0.523077
11	Faxonius hathawayi blacki	2030	-16
97	Amphinemura mockfordi	2027	0.175641
98	Isoetes microvela	2025	-0.28846
99	Gomphus westfalli	2030	-0.87692
100	Linum carteri var. smallii	2025	1.415385
101	Sporobolus teretifolius	2030	4.133333
102	Procambarus lucifugus lucifugus	2026	8.692308
103	Stylurus potulentus	2028	0.502564
104			
105			-110.809

Species Awaiting Assessment

Value function results

Decision variable cells -

Year selected by Solver model

Objective cell

Constraints

Method/Engine

Solver Model Dialog Box

Solver Parameters

Set Objective:

To: Max Min Value Of:

By Changing Variable Cells:

Subject to the Constraints:

-
-
-
-
-

Select a Solving Method:

Solving Method
Select the GRG Nonlinear engine for Solver Problems that are smooth nonlinear. Select the LP Simplex engine for linear Solver Problems, and select the Evolutionary engine for Solver problems that are non-smooth.

Buttons: Add, Change, Delete, Reset All, Load/Save, Options, Help, Solve, Close

Solver Output and SSA Scheduling

List of species assessments to be completed by year and state

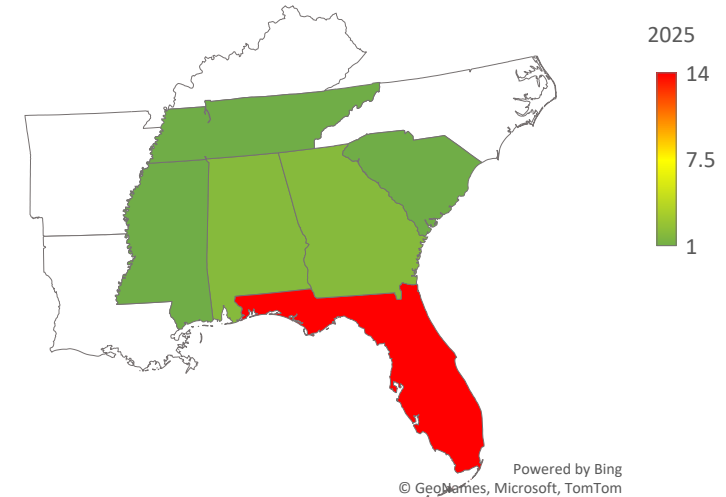
Identifies some flexibilities

- Gives decision makers options
- Indicates value of each scenario

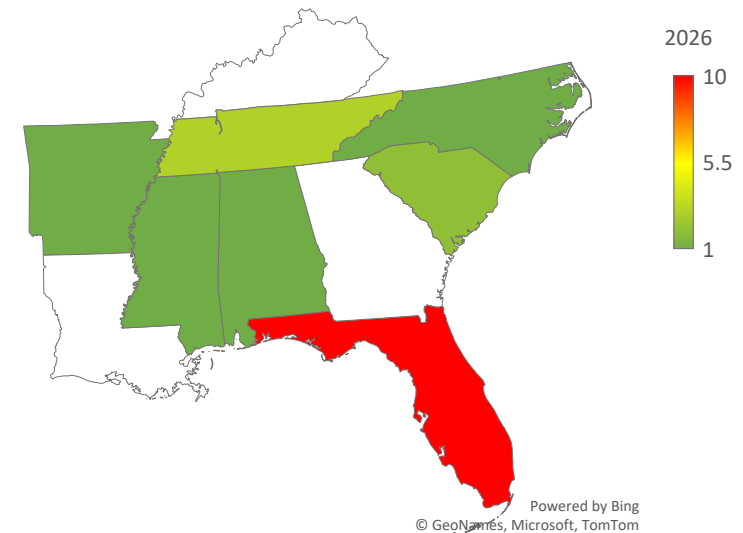
Comparison of objective values as value of information

- Compare scenarios
- Rank schedules under each scenario

Workplan Year 2025



Workplan Year 2026



Current Applications

Discussions on field office capacity

Future workforce planning

- Manpower
- Expertise

Training

SSA assignment distribution

- Movement of assignments to other FOs
- Combining species into portfolio assessments

Current need and future extensions



Optimize based on
field office capacity



Test scenarios



Use for other
workload problems



Lab group at UF - Kaili Gregory, Francesca Erickson, Riley Andrade

FWS - Jessica Gilbert, Nicole Rankin

FWC-FWRI



Thank you!