

A knapsack problem: How do we hand-out the knapsack's contents when there are 70 federally managed lands needing the lunch money within?



Society of Decision Professionals  
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Arlington, VA  
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**U.S. Fish & Wildlife Service**

# Process Background

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- ❑ EDRR invasive species funding in 2020 – New to the Region  
– Leadership wanted to allocate this in a strategic way
- ❑ Leadership asked representatives from the field & region to aid in the development of a strategic approach for allocating EDRR invasive funding
- ❑ Funding allocation tool constructed during FY21-22 by Invasive Species Resource Allocation Team (IRAT)
  - Team comprised of 1 Refuge supervisor & 2 biologists for each of 3 Areas (9 field staff), Invasive Species Coordinator, IPM Coordinator, & 2 process coaches



# Process Background

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- ❑  $\beta$ -tested allocation tool using FY22 proposals
  - Incorporated feedback from project proponents, IRAT team members, & the  $\beta$ -testing review team
  - Lessons-learned resulted in final changes to tool criteria, significant modifications to RFP language & RFP format
- ❑ FY20 to FY24 funding has been allocated
- ❑ Allocation Tool Used to aid in selection of FY22-24 projects
- ❑ Tool finalized as of decision meeting in FY23 (1 year ago)
- ❑ Invasive Species Resource Allocation Tool accepted as way forward for allocating these funds as of FY23
  - FY25 will be year 3 of implementing this process



# Problem Statement

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The Invasive Species Resource Allocation Team developed a transparent, coordinated process to allocate annual HQ funding, better leverage all relevant resources, and reduce the impact of non-native species, in turn, facilitating achievement of BIDEH across the Midwest Refuge System recognizing capacity, variability in station priorities, and adherence to HQ funding constraints,\* relevant law and policy.

\* HQ funding Constraints include 1) focus on EDRR, 2) limited to non-native invasives, 3) spend funds on NWRS lands or affected lands adjacent to the NWRS



# Objectives & Attributes

## What we value and how we are measuring those values

Objectives	Measurable Attributes	Strategies	
		Project X	Project Y
Condition of ROCs & Habitat	# objectives addressed, Proportion of refuge impacted by target invasive pre- and post-project ( $\Delta$ invasives), ability to conduct effectiveness monitoring post-project	<ul style="list-style-type: none"> <li>Request for proposals developed as a self-scoring system (in Sharepoint forms)</li> <li>Use measurable criteria to predict how well proposed projects will perform relative to objectives (aka: values, goals, the things we care about...)</li> </ul>	
Project Success	Expected probability of success, Funds for follow-up monitoring or treatments		
Project efficiency	Project cost in \$, Partner resource match in \$		
# of refuges benefitting from funding	# of refuges funded, # of years since 1 <sup>st</sup> detection of target species, Uniqueness of target species to refuge		
Partner & landowner Acceptance	# of letters of support, State or County noxious weed, probability of spread to non-FWS lands, # of landowner complaints		



# RFP Self-scoring Form in SharePoint

## FY23 Midwest Region Invasive Species Project Proposal

**Instructions:** Proposals should be *as concise, detailed, and specific as possible*. Please see RFP Guidelines for more information.

Contact Angela Romito [[angela\\_romito@fws.gov](mailto:angela_romito@fws.gov), (312)833-6948] with any questions about this RFP.

Hi, Angela. When you submit this form, the owner will see your name and email address.

\* Required

### Refuge information

1. Name of Refuge Complex or WMD. Be sure to include all Complexes or WMDs that will receive resources from the project. \*

2. How many Refuges and/or WMDs are involved in the project? \*

3. Name of satellite refuge(s) or specific management unit(s) involved in the project. \*

4. Project contact information (name, position, phone number, email). \*

[Hyperlink](#)



U.S.

Next

# Objective Weights

## Weights on objectives used to attribute relative importance

- Think of weight being distributed across 100 points with each objective receiving some portion of that spread (# in parentheses)

Condition of ROCs & habitat (23) = Project Success (23)

> # of refuges that benefit from allocation (18)

≈ Project efficiency (17)

> Equality of access to funding (11)

> Partner & landowner acceptance (9)

Relative  
Importance



# Results: Quantifying Conservation Value

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Some definitions:

- 1) Project Benefit – Criteria scores | Cost constraint
- 2) Expected Benefit – (Criteria scores\*Project risk) | Cost constraint
- 3) Expected Benefit with partial funding – Same as solution 2 but allows for partial funding of projects *after* projects in optimal portfolio are funded





# Results: Portfolio Explanations

- 1) Portfolio 1: Optimal - Derived using scores from performance measures, project risk, and a cost constraint while also maximizing the # of projects funded.
- 2) Portfolio 2: Project Benefit - Derived using scores from performance measures and a cost constraint
  - Similar to P1 minus the # of projects criterion
- 3) Portfolio 3: Emphasis on Eradication - Funded projects by minimizing the proportion of a refuge invaded by target species after proposed project implementation (until cost constraint is reached)
  - Uses 1/15 criteria
- 4) Portfolio 4: Emphasis on  $\Delta$  Invasives - Funds projects by maximizing the predicted change in invasives (until the cost constraint is reached) once proposal objectives have been realized
  - Uses 2/15 criteria



# RFP Qs for Portfolios 3 & 4

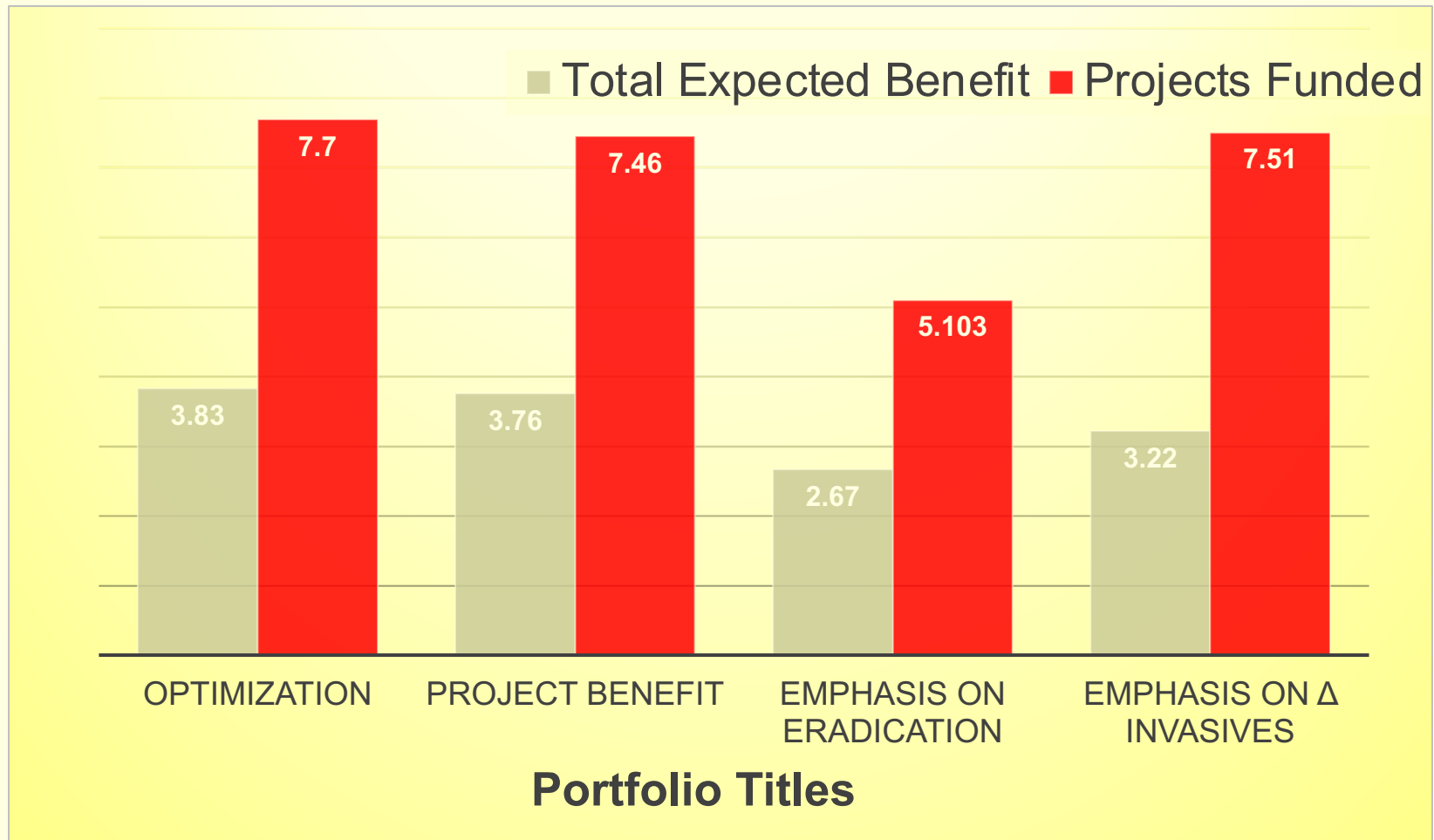
## Maximize condition of ROCs & Habitat

- Proportion of refuge impacted by invasive(s) pre-project
- Proportion of refuge impacted by invasive(s) post-project

Questions	Responses
<p>18. <b>Estimate the percent of the Refuge(s)/WMD(s) (involved in the project) that is currently impacted by primary target species. Estimates should include some measure of uncertainty.</b> (Enter a percentage between 0 and 100%. Uncertainty may be reflected via the use of a range, Confidence Interval, etc...) *</p>	<input type="text" value="Enter your answer"/>
<p>19. <b>Predict the percent of the Refuge(s)/WMD(s) (involved in the project) expected to be impacted by target species after project benefits have fully matured. Predictions should include some measure of uncertainty.</b> (Enter a percentage between 0 and 100% along with some measure of uncertainty. Uncertainty should be reported in the same format used for question #18). *</p>	<input type="text" value="Enter your answer"/>
<p>20. <b>Using your responses to questions #18 &amp; #19, predict the expected overall percent change in (primary) target invasive species coverage on the refuge(s) and/or WMD(s) involved in the project.</b> (Example: If I estimated that 8%±2% of the refuge was currently invaded, in response to Q18, and predicted that 2%±0.5% of the refuge would be invaded following project treatment, in response to Q19, my response to Q20 would be 8%-2% = Δ6%±2.5%). *</p>	<input type="text" value="Enter your answer"/>



# Results: Projects Funded & Benefit



# Results: Projects Funded & Benefit

Refuge Name	Portfolio Number			
	1	2	3	4
Big Muddy NFWR Complex - Big Muddy NFWR - Loess Bluffs NWR - Swan Lake NWR	0.575	0.428052179	0.552546551	0.552546551
Big Stone Complex (Big Stone NWR/Big Stone WMD), Morris WMD, Northern Tallgrass Prairie NWR	0.440	0.435919589	0.574849358	0.574849358
Crab Orchard National Wildlife Refuge	0.553	0.597899686	0	0.44049395
Cypress Creek NWR	0.598	0.582443576	0.597899686	0.597899686
Detroit Lakes WMD/Glacial Ridge NWR Complex	0.436	0.147918146	0	0
Mingo NWR, Duck Creek Conservation Area, and adjacent private landowners.	0.000	0	0	0
Trempealeau National Wildlife Refuge	0.000	0.574849358	0.324619193	0.324619193
Two Rivers NWR*	0.219	0	0.033195236	0
Upper Mississippi River National Wildlife and Fish Refuge	0.428	0.44049395	0	0.428052179
Windom Wetland Management District, Iowa Wetland Management District, Northern Tallgrass Prairie National Wildlife Refuge	0.582	0.552546551	0.582443576	0.582443576
<b>Total Expected Benefit</b>	<b>3.83</b>	<b>3.76</b>	<b>2.67</b>	<b>3.22</b>
<b>Projects Funded</b>	<b>7.7</b>	<b>7.46</b>	<b>5.103</b>	<b>7.51</b>



# Results: Some Trends

- ❑ 10FY24 < 11FY23 < 17FY22
  - We're seeing many of the same refuge (complexes) & WMDs submit & not as many submitting
  
- ❑ Last year → New projects, follow-up funding (monitoring), not funded (last year), funded
  - New (Units): Detroit Lakes, Windom WMD Group + Iowa WMD + Northern TP NWR, Two Rivers NWR, Crab Orchard, Big Stone Complex
  - Last Year (Units): Cypress Creek NWR, Big Muddy NFWR Complex, Upper Miss. NFWR, Trempealeau, Mingo NWR
  - Encourage the same refuges to submit for follow-up funding, monitoring, additional projects, etc...



# Tool Benefits

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- ❑ The results make sense
  - Decision optimization performed better than other portfolios
  - More projects funded & a higher expected benefit according to the measures the IRAT selected for rating proposals
- ❑ Allows for comparison of multiple portfolios in terms of expected conservation benefit → a transparent, strategically derived value based on metrics developed
- ❑ Multiple, objective, & strategically derived portfolios are presented to decision-makers
  - Allows space for the human element in decision-making



# Tool Benefits

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- ❑  $\beta$ -testing revealed that solutions derived using decision optimization (Portfolio 1) performed better than others → more projects funded, highest expected conservation benefit
- ❑ The process allows for productive, post-selection discussions about project selection and improvement
- ❑ The influence of (perceived) important uncertainties on project portfolio selection can be evaluated to assess true importance
- ❑ Feedback from the field and leadership can, and will continue to be, incorporated to improve this process



# Questions?



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