

Balancing social and ecological objectives at a landscape scale: The Platte River Watershed Case Study

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Decision problem

The United States Fish and Wildlife Service, state conservation agencies, and other non-profit private organizations in Nebraska, Colorado, and Wyoming restore, enhance, and protect wetlands, river channels, and backwaters in the Platte River floodplain. The goal of this conservation partnership is to provide wintering and migration habitat to support midcontinent waterfowl and waterbird populations. This effort is coherent with the longstanding strategic goal of sufficient wetlands and associated habitats to sustain abundant and resilient waterfowl populations put forth in the 1986 North American Waterfowl Management Plan (NAWMP) and its subsequent updates.

Increasingly, the professional wildlife conservation community has recognized that conservation depends on societal support. Therefore, in addition to the familiar strategic objectives of habitat conservation and abundant and resilient populations, the 2012 NAWMP revision introduced a third objective of increasing financial and political support for riverine and wetland conservation by increasing the number of “waterfowl hunters, other conservationists, and citizens who enjoy and actively support waterfowl and wetlands conservation.” Simultaneous implementation of these linked objectives represents an opportunity for strategic innovation.

The Platte River provides continentally significant wintering and migration habitat for North America’s abundant midcontinent waterfowl population and many other waterbird populations that depend upon the Platte River for a portion of their annual lifecycle. Due to the deeply rooted tradition of waterfowl hunting, birding, and collective conservation partnerships, the Platte River system provides a potentially valuable case study for development and implementation of a new strategy to align conservation efforts with all three of the current NAWMP objectives.

Conservation entities working on the Platte River develop and implement individual and cooperative conservation projects using limited funds provided by multiple public and private sources including, but not limited to, the North American Wetlands Conservation Act, philanthropic donations to Ducks Unlimited, Inc., and hunting license fees paid by sportsmen and sportswomen. The challenge before our workshop team is how to best allocate limited resources to maximize the value of ongoing work on the Platte River in the context of the new NAWMP objectives. Specifically, can we define a strategy and associated tactics to

simultaneously maximize the value of both individually initiated and cooperative Platte River habitat conservation efforts for 1) sustaining wetlands and wetland-reliant bird populations and 2) increasing society's active support (e.g., hunter participation, donating funds to conservation) for wetlands conservation.

Background

The Platte River (hereafter Platte) has experienced significant reductions in habitat quantity and quality in the past 50 years due to primarily land-use change and competition for water. However, the Platte still provides important habitat for waterfowl and other migratory birds including three federally listed threatened and endangered species. The Platte is a world-class destination for bird-watchers that come to central Nebraska each March to observe the largest concentration of Sandhill cranes on the continent. The Platte also has a strong waterfowling tradition that produces some of the highest mallard harvest rates in the Central Flyway. Despite that storied tradition, waterfowl hunter numbers continue to decline; a trend that is underscored by decreasing duck stamp sales (Figure 1).

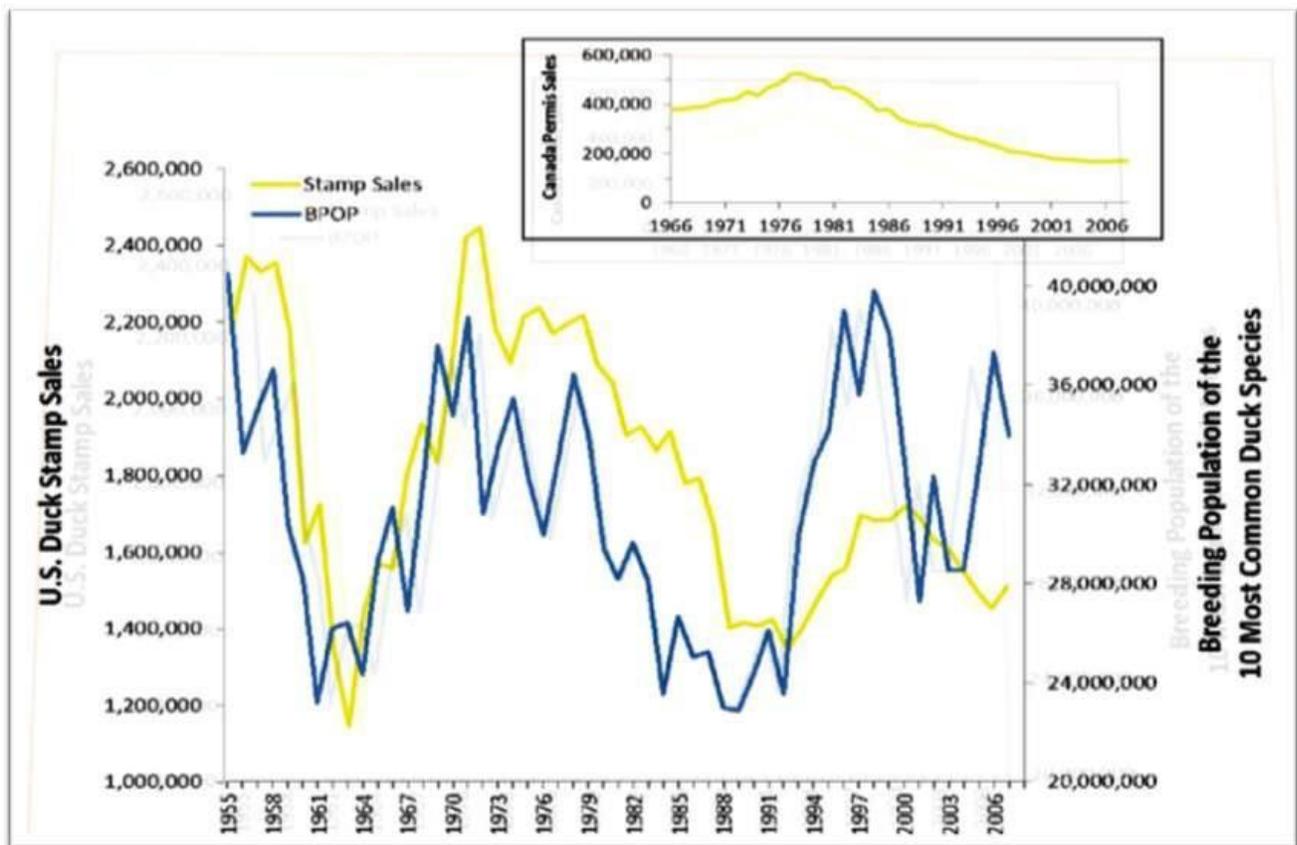


Figure 1. The relationship between declining hunters during a period of high duck populations.

With declining hunters and loss of their revenue, wetland conservation support may be impacted negatively politically, financially, and socially. Although the current habitat base may be

adequate to meet the needs of migrating waterfowl from a population recruitment standpoint, the overwhelming majority of remaining habitat is unprotected and subject to ongoing loss and degradation due to factors such as aggregate extraction, subdivision and development and/or severing of water rights for non-agricultural purposes. Therefore, declining public support for conservation will be insufficient to maintain current habitat base and bird populations. The coalition of partners brought together acknowledges the need to consider the current allocation of limited resources and develop quantifiable and realistic strategies to accelerate conservation participation.

Objectives

We identified four overarching fundamental objectives to address our problem statement with regards to the Platte River. These three objectives included maintaining and acquiring sufficient wetlands and associated habitats to support waterbird populations, sustaining abundant and resilient waterbird populations, and increasing overall conservation participation. It was apparent and acknowledged by the group the fundamental objectives were all required in order to optimize or at the very least maintain those objectives (Figure 2).

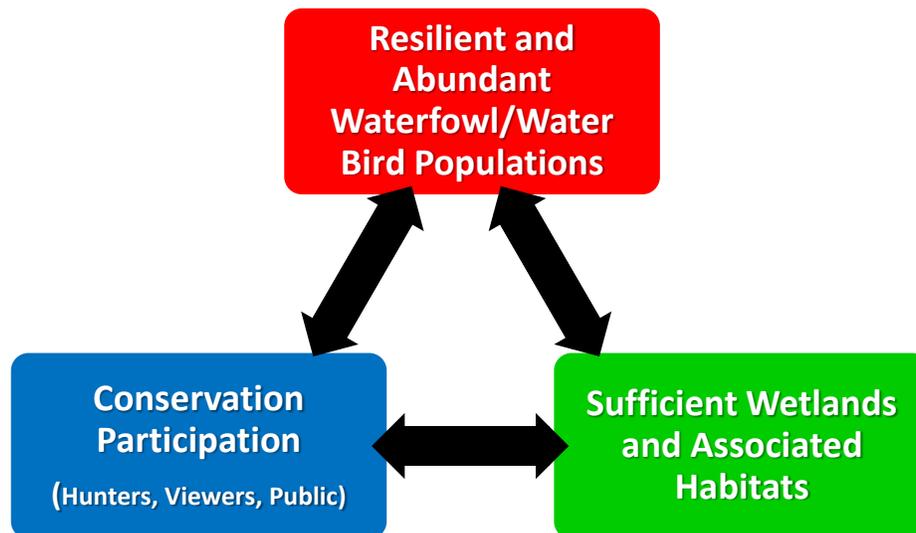


Figure 2. The direct linkage of fundamental objectives exemplifies that each objective requires the other in order to be successful in making decisions.

The group also identified a number of priority means objectives that would help us to realize our fundamental objectives. Organizing these objectives into an influence diagram underscored the high level of connectivity between all our objectives (Figure 3).

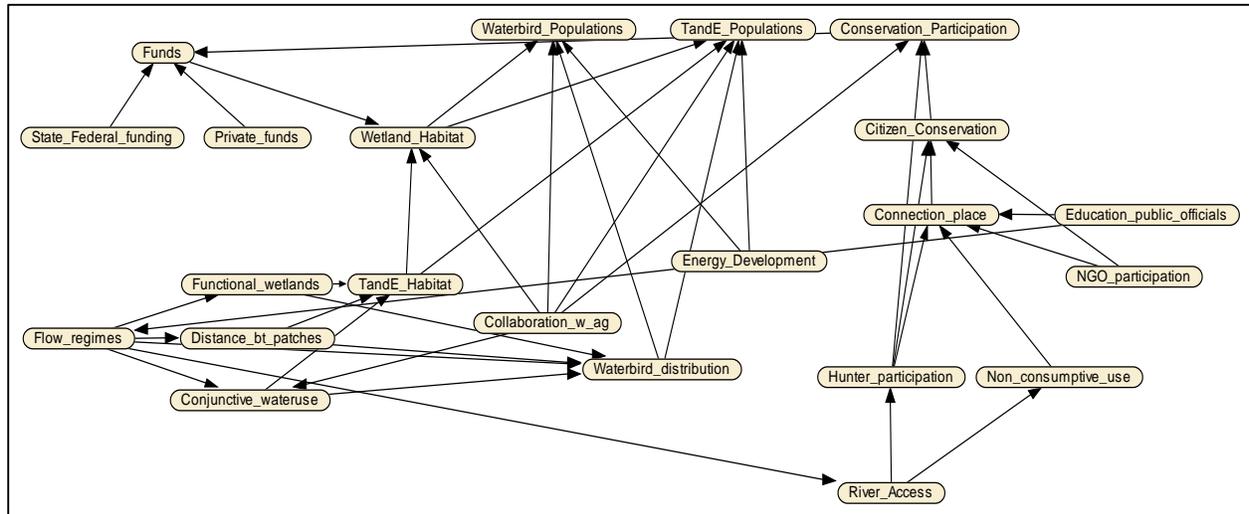


Figure 3. Influence diagram of fundamental and means objectives for Platte River Watershed Structured Decision Making case-study.

Alternatives

We identified alternatives to address our objectives that represented three different approaches, including habitat management, building landowner cooperation, and increasing outreach efforts. Our brainstorming sessions resulted in a long list of numerous alternatives for each category, which we grouped into 3 different action categories for ease of initial analyses (Table 1).

Table 1. A subset of over 50 alternatives proposed to address mean and fundamental objectives for the Platte River Watershed Structured Decision Making case-study.

Habitat management	Building landowner cooperation	Increasing outreach efforts
Habitat acquisition	Address conjunctive water use	Marketing program
Grassland restoration	Increase availability and benefits of programs to landowners	Conservation round table
Conservation easements	Create an education program about easements	Increase duck stamp costs
Wetland restoration	Increase availability and benefits of programs to landowners	Conservation round table
Sediment augmentation	Increase availability and benefits of programs to landowners and	Conservation round table

education of benefits to downstream users and at-risk species

Decision Analysis

We used tradeoffs and optimization to determine what the most efficient allocation of time and resources was given our group’s three fundamental objectives and three action categories. We estimated the consequences of a set of eight different portfolios in which time spent within each of the three action categories varied from 0% to 100%. The consequence metrics for the fundamental objectives within each portfolios varied by objective with the habitat objective being measured by acres gained or lost, the 2 population objectives by percent population increase or decrease, and the conservation participation objective by percent changes in membership numbers (Table 2).

Table 2. Consequence table listing estimated consequences for the 4 fundamental objectives within 8 different portfolios wherein SQ represents the status quo.

Resource allocation				Consequence for fundamental objective			
Portfolio (%)	Habitat acquisition (%)	Landowner relations (%)	Public outreach (%)	Sufficient habitat	Waterbird populations	Threatened and endangered species recovery	Conservation participation
				(acres)	(% change in population)	(% change in population)	(% change in population)
1	100	0	0	8000	8	32	-50
2	50	50	0	3583	0	-8	-42
3	50	0	50	3500	0	-8	5
4	0	100	0	333	-14	-36	-29
5	0	50	50	333	-14	-36	5
6	0	0	100	667	-16	-40	-9
7	33	33	33	2025	-3	-12	-1
SQ	75	10	15	5100	3	9	0

By normalizing the consequences, we were able to demonstrate the various tradeoffs that we would make between each alternative portfolio (Table 3). Further, we ranked the portfolios using weights that reflected the goals of our individual organizations, as well as the conservation group as a whole.

Table 3. Tradeoff table for eight portfolios including the status quo scenario (SQ).

Resource allocation				Tradeoffs for fundamental objectives			
Portfolio	Habitat acquisition (%)	Landowner relations (%)	Public outreach (%)	Sufficient habitat	Waterbird populations	Threatened and endangered species recovery	Conservation participation
	1	100	0	0	1.00	1.00	1.00
2	50	50	0	0.42	0.64	0.44	0.14
3	50	0	50	0.41	0.64	0.44	1.00
4	0	100	0	0.00	0.06	0.06	0.38
5	0	50	50	0.00	0.06	0.06	1.00
6	0	0	100	0.04	0.00	0.00	0.74
7	33	33	33	0.22	0.51	0.40	0.88
SQ	75	10	15	0.62	0.76	0.68	0.91

Rankings generated for the entire group indicated that the current resource allocation plan (SQ) was actually the optimal management scenario within the portfolio. Interestingly, however, the non-governmental organizations (NGOs) and governmental organizations differed when it came to the individual analyses. While the optimal solution within the eight alternative portfolios for all three NGOs was still the status quo, the federal and state government weights indicated that optimally, 100% of time should be spent on habitat conservation (Table 5).

Table 5. Portfolio scores using averaged and individual weights for the fundamental objectives wherein SQ is the status quo portfolio, USFWS (CO) represents the United States Fish and Wildlife Service in Colorado, USFWS (NE) represents the United States Fish and Wildlife Service in Nebraska, and NGPC represents the Nebraska Game and Parks Commission. Top ranking scores for each organization and for all organizations together (Average) are highlighted in grey.

Portfolio	Habitat acquisition (%)	Landowner relations (%)	Public outreach (%)	Average score	Non-governmental organization scores			Government agency scores		
					Crane Trust	Ducks Unlimited	Audubon	USFWS (CO)	USFWS (NE)	NPGC
1	100	0	0	0.73	0.60	0.67	0.60	0.95	0.95	0.75
2	50	50	0	0.39	0.32	0.41	0.34	0.43	0.47	0.41
3	50	0	50	0.63	0.65	0.68	0.67	0.47	0.51	0.62
4	0	100	0	0.13	0.16	0.14	0.16	0.03	0.05	0.12
5	0	50	50	0.31	0.41	0.35	0.41	0.06	0.08	0.28
6	0	0	100	0.23	0.31	0.26	0.31	0.07	0.05	0.19
7	33	33	33	0.50	0.52	0.54	0.53	0.31	0.39	0.50
SQ	75	10	15	0.75	0.75	0.77	0.76	0.66	0.69	0.74

Due to time constraints and the results of the allocation of time and resources optimization, we focused on project selection and allocation. Unlike the previous exercise, the stakeholders at the appropriate scale were part of the group and currently make project selection and allocation decisions) Using data from past projects, we analyzed three different project options– an acquisition, a restoration and an easement purchase. Based on our best knowledge of waterbird biology and human dimensions, we estimated the consequences that each project might have for the four fundamental objectives. An additional layer of complexity was added to this analysis, as we broke the conservation participation objective down into several mean objectives specific to the recruitment and retention of hunters and recreationists (Table 6).

Table 6. Consequence table for 3 different project options for duck-use-days equivalents, (DUDEs), public use, , infrastructure, signage, and number of hunting parties (crowding) for the Platte River, Nebraska.

		Consequences for objectives								
Project	Project type	Sufficient habitat (acres)	Waterbird populations (DUDEs)	Threatened and endangered species recovery (DUDEs)	Conservation participation					
					Hunters			Recreationists		
					Public use (1/0)	Distance from home (minutes)	Crowding (# parties)	Public use (1/0)	Infrastructure (1/0)	Signage (1/0)
Anest	Acquisition	680	100000	0	1	40	5	1	0	1
Timberlake	Restoration	100	118750	0	1	30	1	1	1	1
Kugler	Easement	180	120000	10	0	45	1	0	1	0

^a1/0 represents “yes” or “no”.

^bthe maximum number of hunting parties expected to be on the property at one point in time.

We averaged the relative importance of each objective as estimated by each of the six organizations within the group and applied the resulting weights to a normalized tradeoff table to obtain scores for the three potential projects (Table 7).

Table 7. Tradeoff table containing normalized consequences and weighted project scores wherein DUDEs represents duck use days equivalents, 1/0 under public use, infrastructure, and signage represents “yes” or “no” respectively, and # parties under crowding indicates the maximum number of hunting parties expected to be on the property at one point in time.

		Tradeoffs									
Project	Project type	Sufficient habitat (acres)	Waterbird populations (DUDEs)	Threatened and endangered species recovery (DUDEs)	Conservation participation						
					Hunters			Recreationists			
					Public use (1/0)	Distance from home (minutes)	Crowding (# parties)	Public use (1/0)	Infrastructure (1/0)	Signage (1/0)	Score
Objective weights		0.53	0.16	0.11	0.13			0.07			
Anest	Acquisition	1.00	0.00	0.00	1.00	0.33	0.00	1.00	0.00	1.00	0.67
Timberlake	Restoration	0.00	0.94	0.00	1.00	1.00	1.00	1.00	1.00	1.00	0.35
Kugler	Easement	0.14	1.00	1.00	0.00	0.00	1.00	0.00	1.00	0.00	0.38

Given our priorities as a group, the second decision analysis indicated that the acquisition project in this scenario would be the best management option. There are long-term benefits to the resource through purchasing the tract, it provides public access, located in a region with high wildlife populations, and near a large city. Interestingly, if the fundamental participation objective was weighted heavier in relation to the other fundamental objective, the restoration project then ranks highest and would be the better management decision given limited funds to complete one (Figure 4). Given the relative importance of supporters, a key element for the group to proceed is to determine and agree on the weight of that fundamental weight of conservation participation.

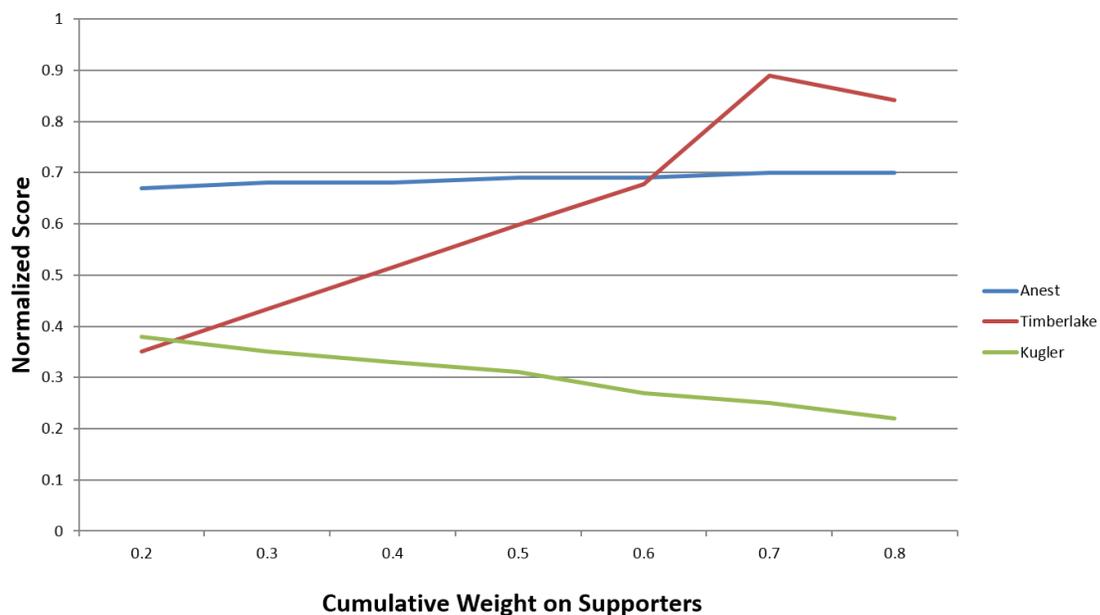


Figure 4. Optimal project selection as a function of relative weight of supporter goal.

Uncertainty

It is evident that our model development will include numerous levels of uncertainty due to the nature of the information. Most of the parameters of a social or human dimensions nature are poorly understood and difficult to measure and quantify. Greater consideration is needed on what social parameters need to be measured is required and that can be explicitly valued in relation to the other fundamental objectives. Therefore further discussion is needed to better understand what empirical data is available and required to improve the performance metrics associated with conservation participation fundamental objective.

Discussion

The Structured Decision Making (SDM) process provided a valuable framework for Platte River conservation groups to critically evaluate shared objectives, identify means to accomplish them, and acknowledge and increase solidarity to focus efforts on implementing actions that garner more support for wetland conservation in relation to habitat delivery. It also revealed serious gaps in information as well as the true complexity of our decision problem.

Many parameters in our SDM analysis incorporated some level of human dimensions, due to the nature of our decision problem. Unfortunately, parameters of a social or human dimensions nature are poorly understood and difficult to measure or quantify. If increasing conservation participation is a goal that our organizations are looking to incorporate into future decision-making processes, our analyses suggest that serious consideration should be given to what social parameters will need to be measured to assess progress or movement towards fundamental objectives.

Progress towards our fundamental objectives and even the appropriate weighting of these objectives will also require that all decision makers be present for SDM or other similar processes. Our journey through the SDM process underscored that our decision problem was not 'flat' but rather consisted of a decision hierarchy (Fig. 5) that tunneled down from a regional level to a project scale. Most individuals at this workshop were involved in decision-making at the project-scale level. Without the involvement of higher level decision-makers altering traditional values (e.g. valuing habitat over conservation participation) might be more difficult and could explain why the SQ was on average considered to be the best portfolio in the first part of the decision analysis. Resource allocation decisions from a management or program scale need to occur first in order to scale down to the project-level decisions emphasizing greater conservation participation.

On a related note, habitat delivery and project use at a watershed scale can be measured at regional levels. However, resilient and abundant bird populations are evaluated at a continental scale with many other factors that influence the outcome. Additionally, conservation support is not only a local response but also has national implications to funding sources, political support, regulations,

and future generations. Therefore, efforts will need to include determining parameters but also scaling down or rolling up measurable to address all fundamental objectives.

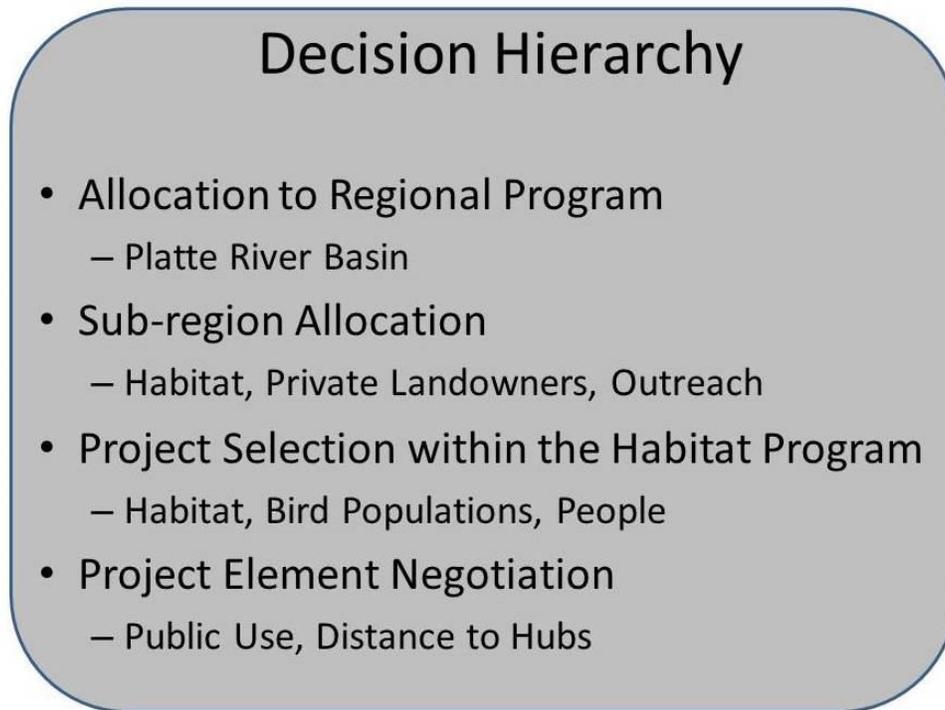


Figure 5. The complexity of the question requires multiple decisions.

To proceed with the process, it will require both intra- and inter-organizational negotiations during further partnership development. Organization goals and objectives must be better aligned within the broad coalition, and more importantly, entities must be able to and willing to potentially reallocate resources depending on model results. Once achieved, applying values or weighting of the fundamental objectives will provide clarity and transparency in building the models along the hierarchical scale.

Recommendations

The Structured Decision Making workshop was an initial effort to generate action within the conservation community to attempt to integrate social challenges into habitat conservation decisions. The greatest benefit of the exercise was the establishment that all partners agree that efforts to increase conservation participation and support are necessary to maintain or increase habitat delivery in the future. Secondly, the development of the decision hierarchy clarified decision makers and decisions to be made at any given level of the scale. This allows the group to now determine at what scales we initiate discussion and development of the SDM process. In addition to these upper level decisions, the group can work to:

- Determine the structure or mechanism that will coordinate further discussions to develop the process and the partnership. Leadership will be required to manage and organize project progress and to house the database.
- Define relative weights for each fundamental objective in order to proceed down the hierarchical scale.
- Develop more robust and detailed performance metrics related to the conservation participation fundamental objective.
- Continue valuable discussions initiated at the workshop regarding innovative conservation tools to elevate the “people” benefits achieved.
- Determine if the “decision” needs to complete the entire SDM process or is a partial decision more appropriate and applicable to the problem statement.