Insights From a Rapid Prototyping Exercise Focused on Management of Double-crested Cormorants

Decision Problem

- Increasing populations of DCCO have had perceived or real impact on natural resources.
- Multiple competing objectives suggest the need to develop a framework to inform management decisions.

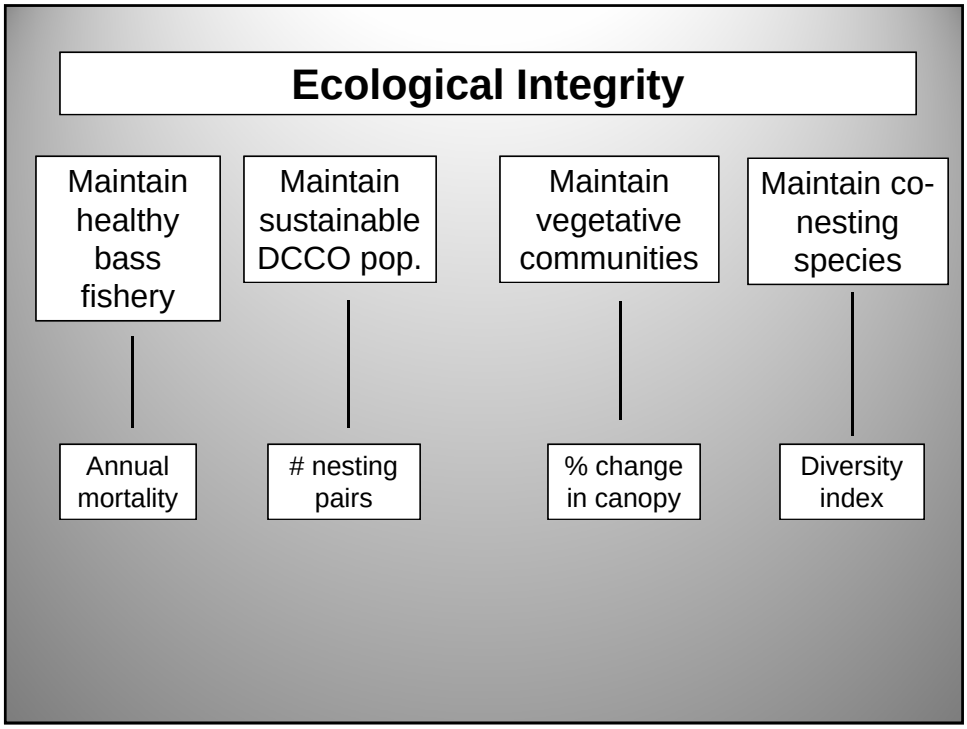
Objectives

Responsible Management

- Budget
  - Dollars spent
- Safety
  - Risk to WS staff
- Collaborativeness
  - % of available agencies involved

Public Satisfaction

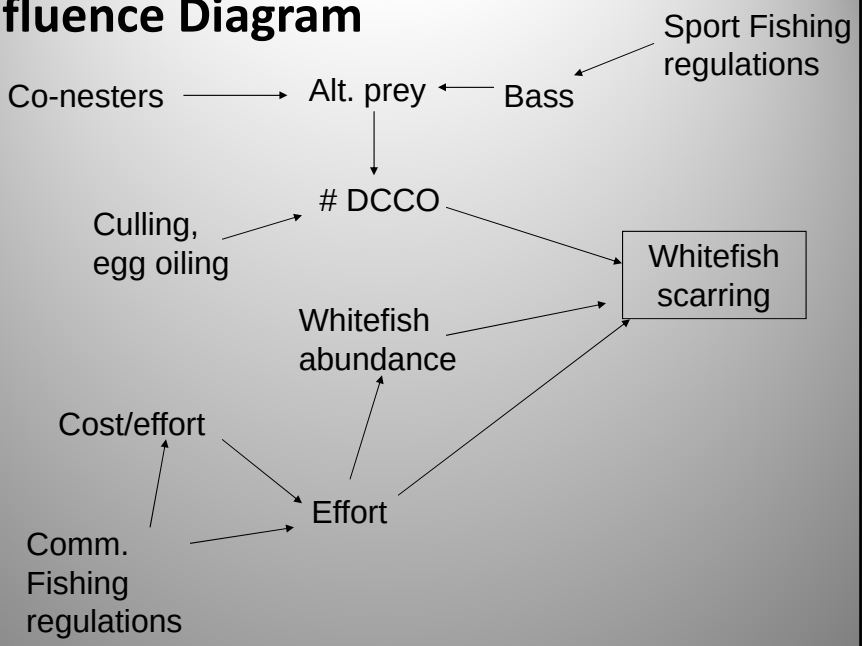
- Fisheries satisfaction
  - Comm. fisheries
    - % scarring of whitefish
  - Sport fisheries
    - "experience" and catch (constructed scale)
- Ethics
  - Humane trtment
  - Keep natural
    - (Constructed scale)
- Management
  - Responsiveness
    - # of complaints
- Aesthetics
  - # of complaints



Alternatives

- **A**: "Do nothing" alternative
- **B**: Culling 50% of adults
- **C**: Egg oiling on all local colonies
- **D**: Status quo option (i.e., culling 20% of adults; egg oiling on select colonies)
- **E**: Culling 50% of adults & egg oiling on all local islands

Influence Diagram



Data Needs/Model Table

Objective	Attribute	Most important data needed	Model	Uncertainty
# DCCO	# nesting pairs; Natural scale (threshold)	Population at t-1 DCCO culling	DCCO demographic model	Immigration/ emigration rates; controllability of culling and oiling; observability of results
Vegetation Persistence	% cover change; Natural scale (positive)	# DCCO; vegetation composition and configuration metrics	Demographic transition model	Vegetation recovery rates; Vegetation sensitivity/resiliency
Fishery	Annual mortality	DCCO diet; creel; fish data; # DCCO	Fish demographic model	Mortality uncertainty; model uncertainty; effects of regulations; Recruitment uncertainty
Co-nesting birds	Diversity index	abundance; # species	diversity index	Management effects on co-nesters

Objective	Attribute	Most important data needed	Model	Uncertainty
Satisfaction with fishing	Fish scarring	# DCCO; avg. net hours; fish abundance	Probability of individual scarring	DCCO distribution; market forces; partial observability (fish)
Ethics	Constructed scale	Attitude surveys; public meetings comment content	Attitude change model	Sensitivity to management actions and outreach
Public satisfaction with management	Responsive-ness	# complaints; # DCCO; % colony reduced; # outreach events	Index	Perceived severity of problem; outreach effectiveness

Objective	Attribute	Most important data needed	Model	Uncertainty
Public satisfactions	Aesthetics	# DCCO; vegetation parameters; proximity to humans; proximity to land type	Constructed scale	Human perception variability
Maintain staff safety	Constructed scale 1-10 (max)	Birds killed; water time; staff time	Safety index	Weather; training level; human error
Collaborative-ness of agencies	% agency involved	Potential agencies, number agencies involved	Tally	Budgets; public
Budget	$$$$			

Consequence Table

	FISHERIES	SAFETY	CO-NESTS	#DCCO	VEG	FISH
A:Do Nothing	0.15	10	0.3	9,000	-10	0.35
B:Cull 50%	0.03	5	0.5	4500	0	0.22
C:Egg oil on all colonies	0.12	6	0.2	9000	-12	0.3
D:Status Quo	0.1	4	0.25	7000	-5	0.31
E:Cull 50%+all oil	0.03	3	0.2	4500	0	0.2

	ETHICS	MGMT-RESP.	AESTHETICS	BUDGET	COLLAB.
A:Do Nothing	8	10	8	0	0
B:Cull 50%	4	2	3	20,000	0.8
C:Egg oil on all colonies	6	6	6	12,000	1
D:Status Quo	4	2	3	20,000	1
E:Cull 50%+all oil	3	1	1	35,000	1

Trade-Off/Sensitivity

Special Considerations

- Time step
  - Benefits may not be seen on annual time step
- Spatial scale
  - Local vs. Flyaway
- Layers of uncertainty
- Additional alternatives

Next Steps

- Maintain momentum
- Form “steering committee” with stakeholder involvement at national and state level
- Need additional coordination
  - MI DNR and other stakeholders
  - NY DEC and other stakeholders
  - Integrate with flyway scale
- Find funding support
  - $$ for coordination meetings & travel support
  - Resource support (e.g., for coach and staff time)
  - Future SDM proposals (MSU, Cornell)
- Use process to inform development of next Environmental Assessment