CLIMATE SMART ADAPTATION DESIGN – CBP GOALS/OUTCOMES

Climate-informed goals and outcomes – Documentation of Results *Check the appropriate box*	
☐	Keep existing goals and outcomes without modification *If yes, provide reasoning*
☐	Use existing goals and outcomes but with minor modifications *If yes, note modifications and the reasoning behind them*
X	Use existing goals and outcomes but with significant modifications *If yes, provide the reasoning* Change the focus of the goal/outcome from the direct management of numbers of black ducks to quantity of viable black duck habitat, though including monitoring methods to confirm black duck use of the habitat.

Climate Smart Adaptation Design at the CBP Goals/Outcome Level – Black Ducks

Current Goal	*What is the CBP goal and its linked outcome?*	
	Current goal and outcome	**Vital Habitats Goal**: Restore, enhance and protect a network of land and water habitats to support fish and wildlife, and to afford other public benefits, including water quality, recreational uses and scenic value across the watershed. **Black Duck (outcome):** By 2025, restore, enhance and preserve wetland habitats that support a wintering population of 100,000 black ducks, a species representative of the health of tidal marshes across the watershed. Refine population targets through 2025 based on best available science.
Step 1 Screening	*Will the goal/outcome be influenced by climate change?*	
	Screening for goals/outcomes.* If yes (influenced by climate change), proceed; if no, set aside the strategy (check the first box in the check list below).	Yes, this goal & outcome is vulnerable to both direct and indirect climate change effects (proceed with subsequent questions).
Step 2: Category 1 Considerations: Climate change effects on	*What are the main stressors, environmental factors, or other drivers impacting the target resource addressed in the goal?*	
	Stressor(s), factor(s), or driver(s). [List separately, include uncertainty and relative sensitivity (low, medium, high.]	• Loss of food/foraging habitat (vegetation, tubers, bivalves) • Loss of wintering (& breeding) habitat (wetlands, especially tidal marshes) due to changes in land uses. • Human development that results in habitat fragmentation, loss of connectivity; proximity to human disturbance • Invasive species • Hunting/overharvesting

	What are the key climate change impacts or influences directly affecting the resource (direction, magnitude, mechanism, uncertainty)?	
	Key climate influences on target resource(s)	• SLR that inundates tidal wetlands and reduces available acreage (quantity) or quality for black duck wintering habitat. High magnitude, medium uncertainty. • Storm surge combined with SLR (as well as increases in precipitation) that increase wetland flooding and reduce overwintering wetland habitat availability. Medium magnitude, medium uncertainty. • SLR, combined with storm surge and increases in precipitation that cause saltwater intrusion, pushing salinity zones up-Bay and resulting in salt marsh migration. • Large storm events that contribute to marsh break-up and habitat loss (for foraging and over-wintering). Medium magnitude, medium to high uncertainty. • Regional changes in temperature patterns that result in changing black duck migration patterns and/or shifts in wintering range. Medium magnitude, high uncertainty.
	What are the key climate change impacts (direction, magnitude, mechanism, uncertainty) or influences on each stressor, environmental factor, or other driver?	
	Key climate influences on drivers	• [see question above regarding loss/impairment of wintering/foraging habitat, as these are key drivers of black duck success, but black duck habitat/food is treated as a direct effect on the black duck resource]. • Although wetland-based foods (vegetation) are generally covered under changes in habitat quality, black ducks also utilize bivalves as an important food source. The same climate change influences of SLR, altered precip & storms, and temperature increases that will drive wetland quantity & quality changes are expected to impact Bay bivalve population, causing population losses and/or range shifts that will reduce food availability and alter foraging locations for black ducks. • Climate change is not likely to have a direct effect on the extent (or progression) of human development. • Increasing temperatures and altered precipitation patterns are expected to favor invasive species, including *Phragmites*, which represents poor foraging and wintering habitat for black ducks, • Climate change is not likely to have a direct effect on the extent of duck hunting activities (although changing temperatures could extend the hunting season unless otherwise managed, and thus increase hunting pressure).
	Over what timeframe will key climate change impacts affect targeted resources? Are there seasonal patterns or other short- or long-term temporal factors of the climate change effects of concern?	

	Timing of climate change effects	• SLR is already occurring and will continue to increase. • Temperature increases are already occurring and will continue to increase. • Seasonal timing of rainfall/runoff is already changing, with increased rainfall in winter, decreased in summer. • More intense storms are already occurring and are likely to increase, though confidence in ability to project these changes is low.
	How is progress toward goal/outcome attainment measured/tracked?	
	How is implementation being tracked (e.g. indicators, metrics)?	Not clear; apparently by tracking acres of available wetland wintering habitat, though the target is specified in number of black ducks supported (and winter bird surveys are used to estimate the winter black duck population).
	How will climate change alter ability to carry out progress measurements or monitoring protocols?	Current methods for black duck winter surveys may become ineffective if the range (spatial distribution) of black ducks changes with climate conditions and habitat/food availability a& distribution.
Step 3: Category 2 Considerations: **CC** implications for goals	*How will climate change impacts on the stressor(s), environmental factor(s), or other driver(s) change the condition (affect the quality or quantity) of and/or trend(s) in the target resource(s)?*	
	Indirect effects on resource condition	The climate changes discussed above will likely cause declines in black duck population size due to reduced total available tidal wetland habitat for wintering/foraging, as well as replacement of prime habitat with *Phragmites*. It also will shift the range of wetland types by salinity classification up-Bay, changing the location of preferred wetland types.
	How will climate change impacts on the target resource(s) affect the quality or quantity of the resource(s)?	
	Direct effects on resource condition	Direct effects of climate change on black ducks could include: • Effects of increasing temperatures that could increase metabolic needs (i.e. energetic demands) even during the winter and causing a greater foraging demand; • Increased incidence of disease or parasitism, with associated increases in mortality; • Decreases in breeding/nesting success due to altered temperatures, and increased winter precipitation, increased storm intensity;
	Do the key climate change influences act directly on the resource target specified in the goal or the outcome, or are they mediated through an ecosystem component [e.g., habitat, if that is not the specified management target. Potentially relevant to whether the goal targets are management-sensitive or not]?	
	Relationship between specified management target and climate change effects.	The key influences on black duck losses historically, and due to climate change appear to operate through impacts on wintering/foraging habitat quality & quantity, although some direct effects of climate change on black ducks will occur. In addition, black ducks can be difficult to accurately enumerate year to year, especially due to their movement and potential changes in specific locations utilized. Thus it might be recommended to manage and set outcome targets based on black duck habitat quantity & quality.

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	What are the climate change-related timeframe considerations or constraints on achieving the goal/outcome [e.g., urgency, synergies or dependencies on other goals/outcomes]?	
	Time frame considerations	Opportunities for wetland habitat of black ducks to be preserved or restored is typically opportunistic – dependent on landowner interest/cooperation.
	What changes are needed to adapt the goal/outcome to accommodate the combination of direct and indirect climate change effects or the target periods for implementing the goal? Or are there other ideas for goals suggested by these results?	
	Climate-driven adaptations needed	• Change the focus of the goal/outcome from the direct management of numbers of black ducks to quantity of viable black duck habitat, though including monitoring methods to confirm black duck use of the habitat. • Use the black duck energetics model along with SLR mapping and/or modeling to estimate where preferred wetland types for black duck habitat and food resources might persist in the future given SLR and other climate change influences. Use the results to promote, to the extent possible, a spatially targeted approach to the black duck outcome. In addition, use the results to what quantity of preferred wetland habitat can be realistically expected to persist in the future with climate change, estimate what population magnitude of black ducks this would be capable of supporting, and revise the black duck quantitative target accordingly.
Step 4: Climate-Designed Goal	***Climate Smart Goal/Outcome***	
	Description	By 2025, restore, enhance and preserve [xx acres preferably of high tidal marsh, or other] wetland habitats that support a wintering population of [~100,000?] black ducks, a species representative of the health of tidal marshes across the watershed. Use modeling of shifting range locations of preferred tidal marsh habitat and black duck energetics requirements to target restoration locations. Refine population targets through 2025 based on best available science.

* This is a screening question to identify and set aside (not proceed with climate smart revision) goals/outcomes not likely to be affected by climate change.

Notes on interactions needed with other GITs/Workgroups that are key to the planned goals/outcomes.
With wetlands workgroup to project areas within the Bay of wetland losses and range shifts, and coordinate on targeting, evaluation and selection of wetland protection/restoration projects.

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Are there any goals/outcomes missing?

Goals that may be needed to more comprehensively address the climate change impacts identified. The purpose is to identify any key vulnerabilities that are not sufficiently addressed in the existing plan and to craft additional goals to fill those gaps. Start by listing any new goals listed in the last question of Step 3.