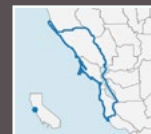


Belted Kingfisher

Climate Change Vulnerability
and Adaptation Strategies for the
Golden Gate Biosphere Region



Species Description

The belted kingfisher (*Megaceryle alcyon*) is a medium-sized bird closely associated with freshwater wetlands, ponds, lakes, streams, riparian areas, coastal lagoons and estuaries, and marine shorelines. They nest in burrows in sandy, vertical banks along streams or shorelines, and primarily consume small fish. Within California, they are found throughout most of northern and central California and south along the California coast. Within the Golden Gate Biosphere (GGB) region, many belted kingfishers are year-round residents, though some may make seasonal movements outside the breeding season.

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Species Vulnerability - Moderate

Sensitivity & Exposure - Moderate

Projected Changes	Trend
Water temperature	▲ Increase
Precipitation	▲▼ Varies
Stream flow	▲▼ Varies
Air temperature	▲ Increase
Flooding	▲ Increase

Potential Impacts:

- Increased mortality or redistribution of fish and other aquatic prey due to drier conditions and warmer water temperatures
- Washout of fish eggs and mortality of juvenile fish as a result of high stream flows, leading to a decline in available prey
- Loss of nests and nesting burrows, eggs, and nestlings as a result of increased flooding

Non-climate stressors may interact with climate stressors and disturbance regimes:

- *Residential and commercial development* drives habitat fragmentation and loss of key riparian habitat and can increase egg and nestling predation from human-associated species such as feral cats
- *Dams and diversions* impact thermal regimes, flow volume and timing, sediment transport processes, and the movement of aquatic organisms, all of which impact the fish populations belted kingfishers depend on
- *Pollutants and poisons* introduced via stormwater and runoff lead to excess nutrients, metals, pesticides, and PCBs that can impact belted kingfisher food resources
- *Oil spills* that enter lagoons or waterways can impact kingfisher foraging areas and degrade their habitat



Belted kingfishers are sensitive to climate stressors that impact access to and availability of prey, survival of nestlings, and the extent and integrity of their riparian and wetland habitats.

Species Vulnerability - Moderate

Adaptive Capacity - High

Intrinsic factors (i.e., inherent characteristics) that enhance or undermine adaptive capacity:

Enhance:

- Highly mobile species
- Flexibility in nest site selection and foraging habitats

Undermine:

- Significant fragmentation and degradation of riparian and wetland habitats

Extrinsic factors (i.e., management potential) that enhance or undermine adaptive capacity:

Enhance:

- Charismatic species, highly valued by the public
- Existence of regulatory support for protecting and restoring aquatic and riparian habitats

Undermine:

- Can be challenging to mitigate the impacts of pollution and degradation in riparian and wetland habitats



Although belted kingfishers are abundant and highly mobile, significant loss of riparian and wetland habitats and threats to prey availability due to climatic and anthropogenic factors may limit resilience to climate change.



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Adaptation Strategies & Actions

Adaptation strategies can reduce climate change vulnerability of a given ecosystem or species by addressing any or all of the three components of vulnerability (i.e., by reducing sensitivity, reducing exposure, and/or increasing adaptive capacity). The table below presents examples of adaptation strategies and actions, which fall within five categories, or approaches: Resistance/Resilience **(R)**, Acceptance **(A)**, Direct/Response **(D)**, Knowledge **(K)**, and Collaboration **(C)**. *Please note that the strategies and actions provided here should not be considered a checklist or plan, but rather as a set of examples for land managers to consider for further study when developing site- or species-specific actions.*

Adaptation Strategies	Adaptation Actions
Maintain water quantity and quality in waterbodies used by kingfishers	<ul style="list-style-type: none"> • Monitor changes in water quantity, such as those caused by changes in precipitation levels or by dams or diversions (K) • Monitor changes in water quality (including temperature and presence of pollutants) (K) • In areas where stream flows are managed, attempt to reduce extreme flow events during nesting season that might wash out nest cavities or negatively impact fish populations (R)
Conduct habitat restoration along streams	<ul style="list-style-type: none"> • Implement riparian habitat restoration to ensure adequate and connected foraging habitat, reduce evaporation, maintain cooler water temperatures, and support adequate fish populations (R)
Restore natural flow regimes	<ul style="list-style-type: none"> • Remove artificial barriers along streams and rivers, and increase floodplain connectivity, natural flow-regimes, and in stream complexity to promote healthier fish populations (R) • Reduce or prevent streamside hardening and increase extent of softer stream banks in order to increase nesting habitat (R)

Adaptation strategies and actions suggested by individual stakeholders (not discussed during the December 2023 adaptation workshop).



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