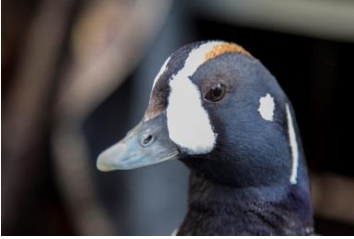


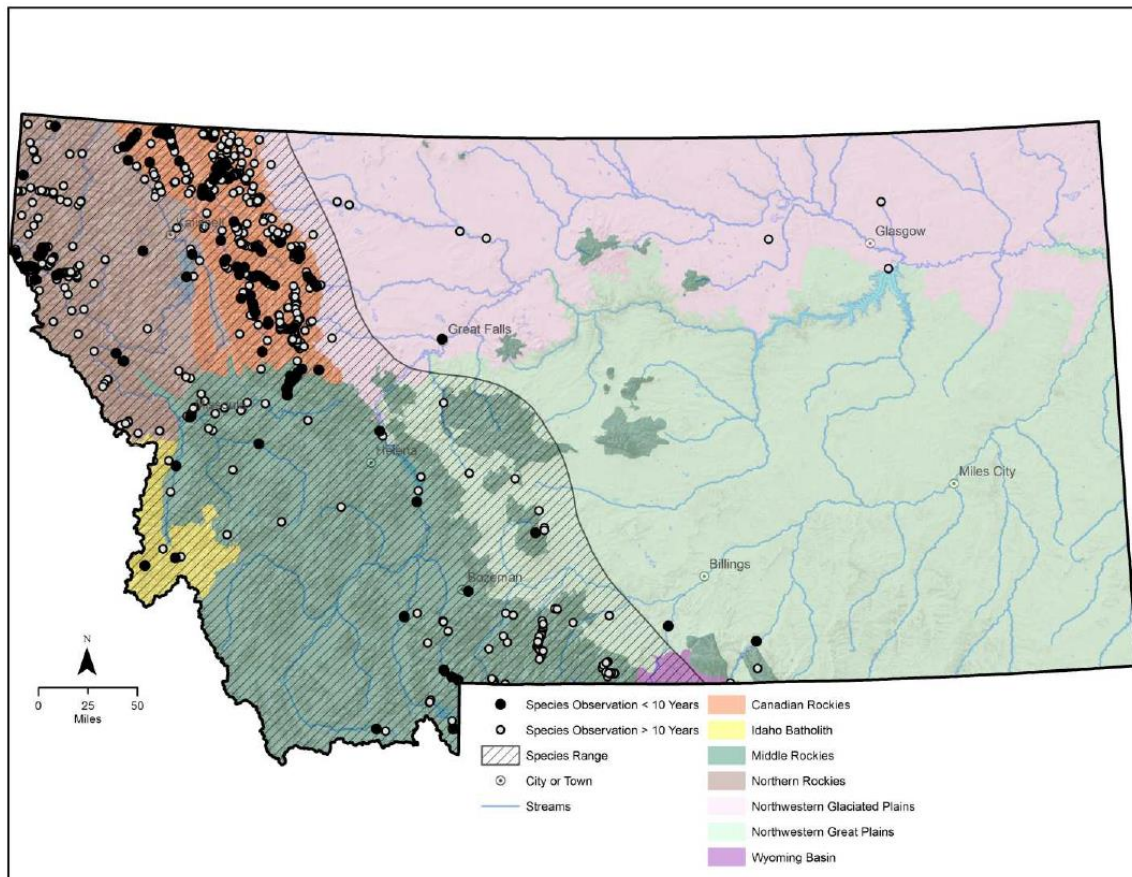
## International Harlequin Duck Migration and Connectivity Project (by Chris Hammond, FWP Wildlife Biologist, Kalispell)



Male Harlequin Duck

Harlequin ducks are small sea ducks that winter on the coast and migrate inland to breed on fast-moving streams where the female hatched. They are slow to mature and reproduce, exhibit a boom or bust reproductive pattern, and are vulnerable to climate change. They typically choose nest sites within 1 meter of the water's edge and initiate incubation as stream volume starts to recede after peak spring runoff. Stream flow severity—higher stream flow, greater number of peaks, and elevated highest peak—has increased in recent history. These processes are also predicted to become worse due to climate

change, potentially flooding out an increased number of harlequin duck nests. In the event of a nest failure there is no chance for a second clutch because males migrate back to the coast once the female initiates incubation. Females show strong nest site fidelity and are only known to breed in the drainages where they hatched. Montana's first statewide survey effort for harlequin ducks was conducted in 2014. Fish, Wildlife and Parks and its partners documented 31 hens and 115 chicks. In 2015, we attempted to duplicate our 2014 effort, but a bad fire season limited access to several areas and the survey was incomplete. In northwest Montana, Glacier National Park has consistently surveyed for harlequin ducks since the late 1980s and that population appears to be the only population in the western continental U.S. and western Canada that has not observed declines.





FWP and Environment Canada biologists taking measurement on male harlequin duck.

Genter 1996).

More recently in 2015, a male harlequin duck captured and fitted with a platform transmitter terminal (PTT) in southern British Columbia spent its breeding season on Nyack Creek in Glacier National Park. Harlequins not only show strong mate fidelity, but they also display high winter site fidelity. In addition, the males and females reunite on the wintering grounds after the breeding season raising concerns that Montana's breeding population of harlequin ducks are wintering/molting in areas with high rates of non-breeding population decline.

Recognizing that conservation efforts for harlequin ducks would benefit from research on how migration, connectivity, and fidelity to breeding and non-breeding habitat influence harlequin population persistence, biologists from several agencies in two provinces (British Columbia and Alberta), and three states (Montana, Washington, and Wyoming) agreed to expand an existing large-scale harlequin duck research project that was already investigating migration, connectivity, and

Figure 1. Statewide harlequin duck range and observations (Montana's State Wildlife Action Plan 2015).

On their breeding grounds, harlequin ducks have been disturbed or displaced by recreational boating, logging, mining, and road building operations. However, longer term negative impacts on molting and wintering populations have been observed where harlequin ducks congregate in large numbers. It took approximately 25 years for harlequin duck populations to recover after the Exxon Valdez oil spill. The harlequin duck is a Species of Greatest Conservation Need in every northwestern state in the US. In Alberta, the harlequin is listed as a Species of Special Concern due to low population size and specific breeding requirements. Although harlequin ducks are not listed as an "at risk" species in British Columbia, the White Rock wintering/molting population has declined by nearly 50% between the early 1980s and 2015. In addition, more than 10,000 birds use the Strait of Georgia, BC for non-breeding habitat where the population declined 2.6% per year from 1999-2011 (Crewe et al. 2012). Up to the mid 1990s, 21 birds banded in western Montana had been sighted off the coast of southern British Columbia (Bate 2014, Reichel and



Figure 2. Study area map.

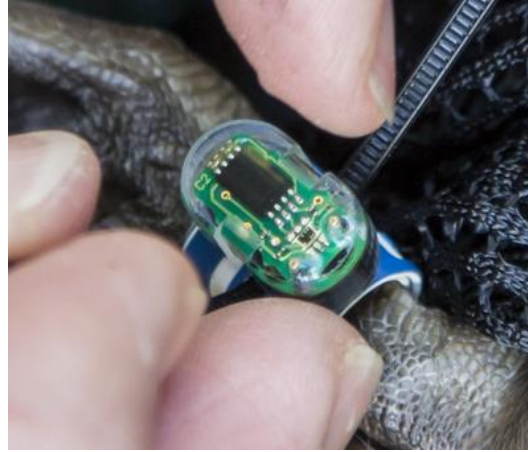
fidelity in

southwestern British Columbia (Figure 3). The expanded project is known as the International Harlequin Duck Migration and Connectivity Project.

Specific to Montana, the international project addresses 6 out of the 9 objectives outlined in the FWP Northwest Montana Terrestrial Climate Change Species Monitoring and Conservation Plan (Hammond 2010). The project is also closely tied to conservation actions identified in its State Wildlife Action Plan (2015). The objectives of the project are:

- 1) Characterize breeding habitat use.
- 2) Identify local movement patterns on inland breeding streams.
- 3) Identify home range characteristics (i.e. size, core area, distribution) of inland and winter range.
- 4) Through banding, better understand site-fidelity and both adult and juvenile dispersal.
- 5) Identify timing of movement between inland breeding streams and coastal molting and wintering areas.
- 6) Identify location of coastal molting and wintering areas.
- 7) Identify where birds from specific breeding populations (e.g. AB, MT, WY, WA) spend the winter.
- 8) Identify where birds wintering in the Salish Sea spend the breeding season.
- 9) Compare PTT and geolocator technologies.
- 10) Examine abundance/trend on breeding areas.
- 11) Assess mercury concentration in breeding harlequin ducks.

In 2016, FWP and collaborators marked 18 males and 17 females. Of those, 5 breeding pairs were marked in Montana. Males were banded and implanted with PTTs. Females were also banded, but instead of PTT implants, geolocators were attached to the color band. The PTT allows biologists to receive data on a preprogrammed schedule via data downloads and generally provides more accurate location information. One mortality occurred within the first week of capture. Although we were unable to rule out the potential for capture myopathy, an investigation of the recovered PTT and the surrounding area suggested that the duck may have been predated. Of the remaining 4 males, departure dates from breeding to molting areas ranged from June 4 to June 17 with initial arrival dates ranging from June 6 to June 21. Migration duration ranged from 1.7 to 9 days with distances between approximately 444 and 1118 miles. Stopover habitat consisted primarily of rivers and mountain streams while one bird made a single stop on a lake in Washington. Apparent molt areas were Port Angeles, WA for the Snyder Creek bird; Allison Harbour Provincial Park (Smith Sound), BC for the Upper McDonald Creek bird; Lyell Island, BC for the Grave Creek bird; and Read Island, AK for the Rock Creek bird (Figure 6).



Male harlequin duck after surgical implant of  
 In 201 PTT.  
 female  
 the geolocators and retrieve the data.  
 In addition, FWP plans to mark 2  
 more pairs while seeking approval  
 and funding to mark an additional 8-  
 10 pairs in 2018. Glacier National  
 Park has received funding to mark 6  
 more pairs in 2018. Collaborators in  
 other states and provinces are also  
 working on details for their work in  
 2017 and 2018. Field work beyond  
 2018 will include the recapture of  
 marked females to collect all  
 geolocators. Once data from the  
 geolocators is retrieved biologists can  
 continue with their analysis to  
 address the objectives identified for  
 this international project. For  
 questions regarding the International  
 Harlequin Duck Migration and  
 Connectivity Project please contact  
 Chris Hammond at 406-751-4582 or  
 chammond@mt.gov.

Female harlequin duck being fitted with a  
 geolocator on a leg band.

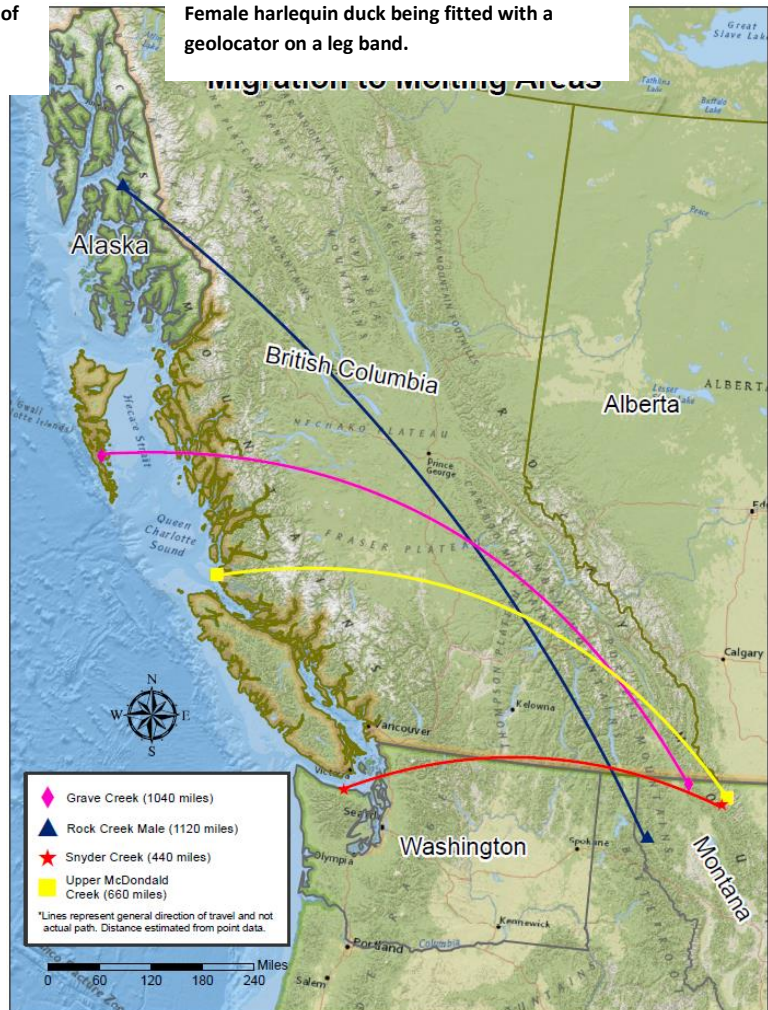


Figure 3. Map of four breeding male harlequin ducks' migration from Montana to molting areas in June 2016.

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