2019 Peregrine Falcon Project Report

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Photo by Acadia National Park

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Executive Summary

By the 1960's peregrine falcons nearly disappeared across the country due to the widespread use of the pesticide DDT. A ban on this environmental contaminant along with species restoration efforts, resulted in a resurgence of peregrine numbers. The species was delisted Federally in 1999, however the Maine breeding population is still considered endangered. To better understand the current population status of peregrines, resources were allocated in 2019 to conduct a statewide survey.

Data collection was a great success thanks to a full-time survey position and numerous partners who followed a standardized survey protocol and submitted data into a shared database. The 2019 Maine peregrine falcon population consisted of 38 pairs with 23 breeding pairs documented. Of the 23 pairs that attempted to nest, 20 pairs were successful and hatched 53 chicks and produced 49 fledglings (~ > 28 days old), with 15 young observed at the flight stage. The overall productivity rate was 1.29 fledglings per territorial pair. Most pairs were present on cliffs (55%), but also included buildings (21%), quarries (10.5%) bridges (8%), and previously used osprey nests (5%).

Considering inter-annual variability in breeding activity and changing threats, it is important to continue survey and management efforts to promote population stability within Maine and throughout the Northeast. The Maine Department of Inland Fisheries and Wildlife will pursue management actions in collaboration with our partners including: site specific management, further developing the monitoring network, developing a long-term monitoring plan, placing additional nest aids and cameras, pursuing banding opportunities, and consideration of contaminant sampling.

If you have questions, comments, or would like to join our efforts (e.g. participate in standardized surveys, placement of nest trays/boxes, etc.) please contact Erynn Call, erynn.call@maine.gov. Additionally, any observations of peregrine falcons can be reported at ebird.org. Always feel free to contact the Maine Department of Inland Fisheries and Wildlife at (207) 287-8000 or at maine.gov/ifw.

I-395 Bridge, Bangor/Brewer, photo by Maine Department of Transportation

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White Mountain National Forest, photo by Jennifer Norris

Background

Photo by Craig Koppie, USFWS

The peregrine falcon nearly vanished from the continental United States due to widespread use of the pesticide DDT. The Eastern population was historically rare and disappeared by 1964 (Enderson et al. 1995). After the peregrine was listed as a Federally endangered species in 1970, recovery efforts included a ban on DDT and other environmental contaminants, as well as captive breeding programs. Criteria to measure success were based upon: 1) population size and trend, 2) reproductive performance, 3) pesticide residue in eggs, and 4) eggshell thickness. These goals were met within each of the four regional recovery plans and the species was subsequently Federally delisted in 1999 (U.S. Fish and Wildlife Service 1999).

Despite the Federal delisting, several eastern states maintained the protected status including Maine. There are two subspecies of peregrines in Eastern North America: Tundra (*Falco peregrinus tundrius*), and American (*Falco peregrinus anatum*). The Tundra is the more migratory of the subspecies and does not breed in Maine but travels through from mid-September through October, and early April through May. It was Federally delisted in 1994, is not currently State listed, and their numbers continue to increase. The American subspecies was historically found in Maine but little was known with only 16 eyries documented. A large-scale, captive breeding program for eastern reintroductions was initiated by the Peregrine Fund in the early 1970's (Cade and Fyfe 1978). These birds were identified only by species because of the mix of subspecies and races from around the world. In Maine, a total of 144 birds were released from 1984 to 1997. In 1999, the American peregrine falcon was Federally delisted. The reintroduced Eastern population of breeding peregrines in Maine is currently listed as state endangered.

The recovery of peregrines in Maine and the entire Northeast has been promising. Banding and resighting efforts document inter-state movements of this metapopulation (Faccio et al. 2013). The state management goal in 1983 was to restore a self-sustaining peregrine falcon population in Maine. It is known that rates of productivity of expanding or stable populations average between 1.0 and 2.0 young per occupied territory (Grier and Barclay in Cade et al. 1988, Wootton and Bell 1992). The first post-recovery nesting was documented in 1987, and by 2002 there were 15 breeding pairs. In 2003, U.S. Fish and Wildlife Service (USFWS) initiated the first of five nationwide monitoring efforts as part of

the post-delisting monitoring plan (Green 2003). Maine participated in these post-delisting surveys, but logistical challenges limited comprehensive state-wide monitoring of eyries.

Challenging access to some nest sites and the overall time required to monitor these sites has resulted in a patchwork of information on Maine's breeding peregrines. Detection of pairs is optimal during territorial displays prior to incubation in March and April; however, access to remote cliff sites can be extremely difficult during late winter. The broader challenge involved with a comprehensive monitoring effort is the time investment. To properly evaluate eyries, multiple, extended visits are necessary (Green 2003). The first visit determines occupancy and requires up to four hours of observation. A second, four-hour visit determines whether the unoccupied sites are unchanged. Additional visits are made to occupied sites to assess nest success and productivity.

Despite these difficulties, various Maine Department of Inland Fisheries and Wildlife (MDIFW) staff and partners contributed to annual assessments of peregrine breeding activity and results were encouraging. This included eBird reports by recreational birders, rock climbers, Acadia National Park (U.S. Department of Interior), Baxter State Park, White Mountain National Forest, Maine State Parks, Bureau of Public Lands, Maine Department of Transportation, and Maine Department of Inland Fisheries and Wildlife. As of 2018, pairs were observed at 15 eyries (urban [building, quarry] = 8, cliff = 7) and produced 22 fledglings (urban = 9, cliff = 13; MDIFW 2018). The installation of nest trays at some urban locations appear to have a drastic effect on nest success; a change from consistent failure to nest success and large brood size.

As the peregrine population increases in Maine and throughout the Northeast, downlisting from state endangered to threatened is now a consideration. To move forward with this conversation, data will be collected in a standardized and comprehensive approach. Some of the challenges associated with access at certain eyries cannot be overcome, however the high time investment of monitoring can be addressed at accessible sites if resources are allocated.

Based on the research objectives, questions, assessments of peregrine status, and survey results, we will develop and facilitate management recommendations intended to directly influence statewide peregrine population levels. These efforts will incorporate long range strategic planning considerations to attain stable peregrine populations in Maine and contribute to metapopulation stability throughout the Northeast. Results will inform the state management goal of establishing a self-sustaining population of peregrines through understanding their breeding status. These data will both inform current and future conservation and management of peregrines as well as the process of potential species downlisting.

Survey Methods

Contact author for unabridged survey methods.

Site selection - Effort focused mostly on known (priority 1, n = 42) but also included potential (priority 2 and 3, n = 84) sites (Figure 1, see Appendix 1 for MDIFW regional maps and Appendix 2 for complete list of sites).

Survey frequency - Sites were visited two or more times to determine occupancy, nest success, and productivity (U.S. Fish and Wildlife Service, 2003). The first visit occurred during courtship, egg laying, or early incubation to determine occupancy; a second visit occurred during the early nestling stage to determine the age of the nests, or to check the 'unoccupied' status of territories still in question; and a third visit (or more) was made to occupied territories during the late nestling stage, when young were 28-42 days old to determine nest success and productivity.

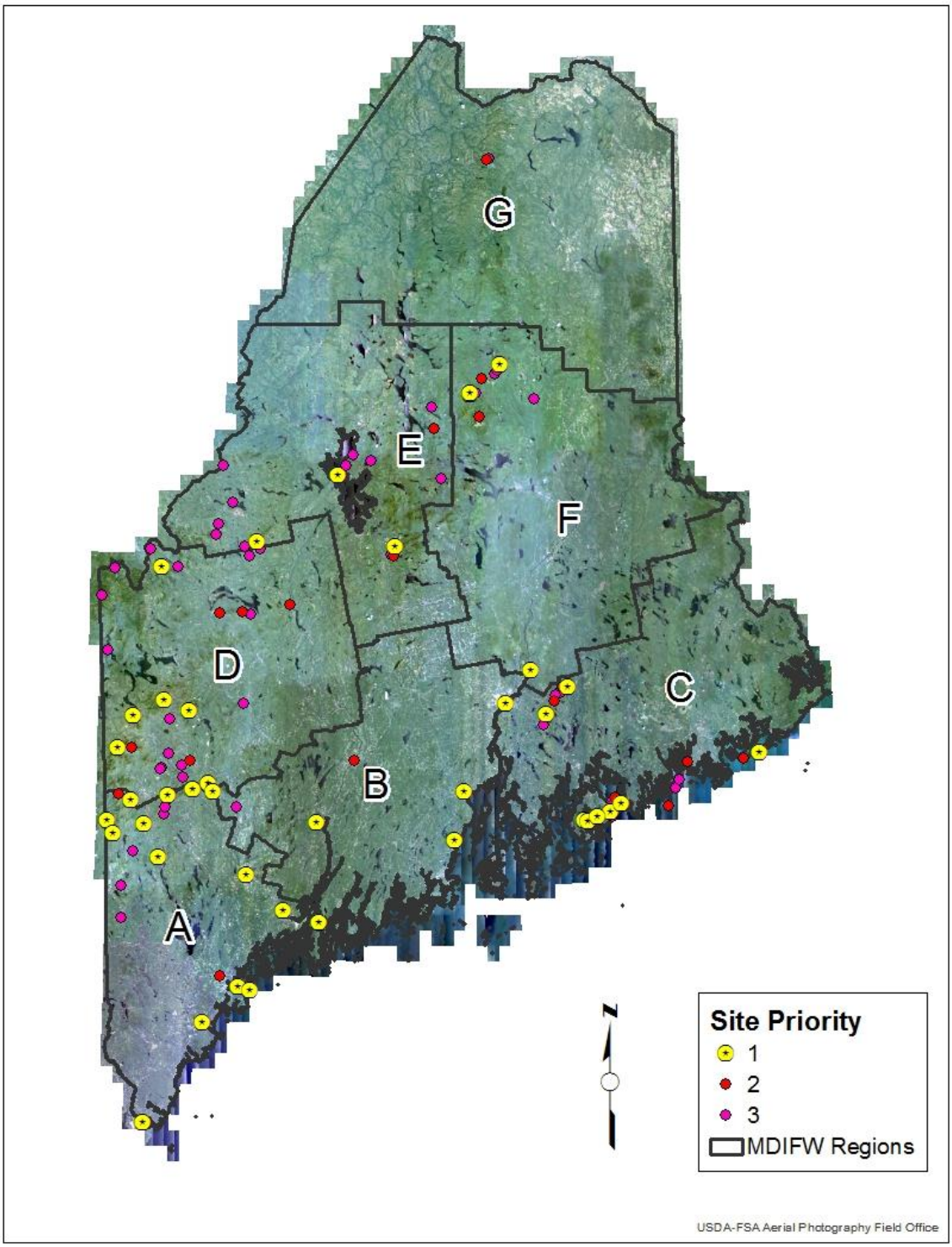
If a pair was detected at a site during the first or second survey, a follow-up visit during June or July verified nest success and productivity. Additionally, a follow-up survey within three weeks was conducted if a single adult was observed at the site or if the location of the eyrie was unknown. If young were not detected at sites where a territorial pair was observed prior, a follow-up visit verified nest failure. Additional surveys beyond these minimums occurred depending on surveyor availability and management needs.

Survey duration - Surveys were up to four hours as peregrines will often either change incubation duties, cache or deliver food to young within a four-hour span and thus be visible. A minimum of two four-hour observation periods separated by three weeks were necessary to assume a site was unoccupied. A combination of smaller observation periods was not sufficient to infer an absence of resident peregrine(s) with much confidence.

<u>The survey was four hours if:</u>
1) no birds were observed
2) a single bird was observed
3) location of eyrie was unknown during the incubation or fledgling phase, (~after April 15)
4) presence of nestlings/fledglings not known (~after May 15)

<u>The survey was less than four hours if:</u>
1) pair observed during courtship phase (~Mar 15 – April 15), perched conspicuously or copulating (i.e. clearly not tending a nest)
2) presence of nestlings/fledglings is known (~after May 15)

Figure 1. Distribution of peregrine falcon survey sites categorized by sampling priority. Priority 1 locations are historical nesting sites where breeding activity has been documented since 1987. Priority 2 and 3 locations have pre-1961 breeding activity or post-1987 resident peregrine observations that may serve as nest sites or are historic Golden Eagle (*Aquila chrysaetos*) sites and serve as potential peregrine nesting habitat.



Survey timing - Timing of initial surveys at eyries varied depending on accessibility, but generally occurred between mid-March through May and continued through July. In northern New England, peregrine falcons generally occupy breeding sites and initiate courtship and territorial defense behaviors beginning in early March, although these behaviors are often delayed in inexperienced birds into April and early May. The optimal time of year to conduct surveys to detect presence at breeding sites is from late March through late April, when pairs are in courtship and before secretive incubation behavior begins. Variation in timing occurs, however in general the following timeframes apply:

Territory occupancy/courtship: Mar 15-Apr 15
Incubation: Apr 15-May 15, *low visibility/detection*
Hatch: May 15-Jun 15, *high detection but failed nesting attempts can easily be missed*
Fledging: Jun 15-Jul 15, *high detection but difficult to confirm occupancy at inactive/failed sites*

Call-broadcast - Observers had the option of broadcasting a peregrine call (i.e. call-broadcast) using a speaker as this has been found to shorten the time necessary to detect breeding pairs (Barnes et al. 2012). The call-broadcast approach was found to be equally effective throughout the day and most effective earlier in the breeding season (Barnes et al. 2012). Success of call-broadcast in soliciting a territorial peregrine response has been documented between 0.7 and over 1.5 km from the eyrie (Ambrose et al. 2014 and Barnes et al. 2012 respectively).

Data collection and submission - Data was collected using a standard survey form during each visit and an eyrie record form, which described the physical site characteristics, was completed once per season. Forms and other information (e.g. site access details, photos, etc.) were submitted to a shared Google Drive account to facilitate consistent data collection and reporting, real-time information sharing, and thus optimize survey effort.

Photo by Peter Green

Nesting Season Summary

Survey results - The 2019 Maine peregrine falcon population consisted of 38 known pairs (note one pair shares border with NH and included in that statewide total) with 23 breeding pairs documented (evidence indicates that eggs were laid, incubation, or young were produced) and three territories occupied by a single adult (Table 1). Of the 23 pairs that attempted to nest, 20 pairs were successful and hatched 53 chicks and produced 49 fledglings (~ > 28 days old), with 15 young observed at the flight stage. The overall productivity rate was 1.29 fledglings per territorial pair.

Of the 44 priority 1 sites (high sampling priority due to recent breeding history or pair presence), 42 were monitored in 2019 and 39 (93%) were found to be occupied (one or more peregrines observed), and 36 (86%) by territorial pairs (see Appendix 2 for full list of sites and sampling status). Only one site was sampled sufficiently to define as unoccupied (e.g. two four-hour surveys separated by three weeks).

Most pairs were present on cliffs (55%), but also included buildings (21%), quarries (10.5%) bridges (8%), and previously used osprey nests (5%).

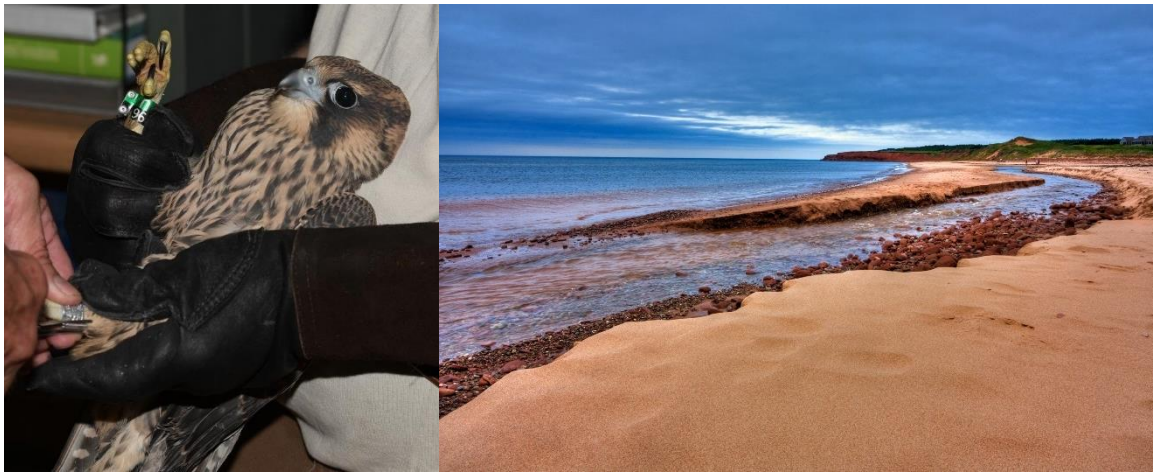
Survey effort - A full-time, seasonal (March 18 to August 2) peregrine survey position in addition to contributions of dedicated and experienced partners led to an impressive and consistently documented survey effort. A total of 297 surveys were conducted, with 473 hours of effort, and 83 sites visited between January 31 and August 6.

Photo by Eric Risberg

Weather conditions - Spring (March through May) 2019 was remarkably cold and wet, with temperatures averaging 1.5 to 3 degrees below the long term mean within all three months. Precipitation ranged from 110 to 135 percent of the average (NOAA, 2019). These tough weather conditions can often push nest initiation dates later or result in nest failure and/or re-nesting attempts.

Timing of initial surveys at eyries were based on site conditions and accessibility. Early visits in mid-March to the Western Mountain region noted nesting ledges covered in ice, snow, or very wet from melt. Other areas were inaccessible due to deep snow. A few sites in Acadia National Park and other urban areas were accessible early in the year. Surveyor Jerry Smith observed the first pair on the I-395 Bridge spanning the Penobscot River between Bangor and Brewer on March 14.

Banding, Resighting, and Recovery – When possible, adult or young peregrines are fitted with a United States Geological Survey (USGS) leg band etched with a unique nine-digit number and a bi-colored band with a unique series of colors, letters, and numbers. In the Northeast, peregrines are banded with the colors black over green. Resighting of leg bands is often accomplished using a spotting scope or photographs but information can also be collected if a bird is found injured or a carcass is collected. These recoveries allow biologists to distinguish individuals and to verify the origins and history of the falcon. No peregrines were banded in 2019 in Maine, however we hope to pursue banding as opportunities arise in the future. One of three peregrine fledglings banded as 49/U on 5/31/18 at Valley Cove in Acadia National Park was observed on 6/7/19 at Parker River National Wildlife Refuge, MA. A fledgling banded as 96/U on 7/3/18 at the 395 Bridge in Brewer/Bangor was observed on 3/9/19 at Brackley Beach, Prince Edward Island, Canada. One fledgling was recovered in Portland on 8/11/19 and unfortunately died the following day at Avian Haven Rehabilitation Center. No other peregrines were in their care this year. The origin of the Portland fledgling is uncertain, the nearest documented fledgling was in Westbrook.



Color-banded fledgling 96/U was observed at Brackley Beach, Prince Edward Island on 3/9/19. Photos by Avian Haven (left) and Nicolas Raymond (right).

Nest aids – Artificial nest structures greatly improve urban nesting success by providing a safe place for peregrine to lay their eggs. Urban peregrines often lay eggs on cement or other hard surfaces which become too hot, cold, or wet. Nest boxes or trays contain a layer of gravel, mimicking the natural cliff habitat where temperature and moisture are better regulated to improve hatching success. Nest aids can be placed on buildings, bridges, or other structures. Peregrines are helpful in that they keep pigeons and their droppings at bay.

Photo by Peter Green

The Maine Department of Transportation (MDOT) and MDIFW have worked together to place nest aids for peregrines. In 2019, a nest box was moved to a new location at the Piscataqua River Bridge between Kittery, Maine and Portsmouth, New Hampshire. A new nest tray was also installed by MDOT at the Passagassawakeag Bridge in Belfast. A tray placed by MDOT in 2016 at the I-395 Bridge in Brewer/Bangor has led to a dramatic change in nest success. The pair experienced four years of failure prior to the nest tray and then consistent success in the subsequent three years after the tray was installed with 10 young fledged. The pair using the tray at the Casco Bay bridge in Portland was not successful this year at that location but were consistently observed in the area.

Nest cameras – Cameras set up at nests provide valuable information on nesting activity, timing, and success. Thanks to efforts of MDOT, video clips were captured at the I-395 Bridge nest this year. We hope to expand the use of nest cameras whenever there are opportunities to do so.

I-395 Bridge, Brewer/Bangor, photo by MDOT

Table 1. Site-specific results of peregrine falcon nesting in Maine, 2019.

Site Name, Location	Territorial Pair	Solitary Adult	# Fledged	Site Notes
Bridge				
I-395 Bridge, Bangor/Brewer	1	0	2	2013 first observation of pair, 2017 nest tray placed.
Casco Bay Bridge, Portland	1	0	0	Egg shell fragments observed in nest tray on 7/10/19.
Piscataqua River Bridge (I-95), Kittery/Portsmouth N.H.	1	0	0	NH Audubon monitored site and included in state total. Nest box removed and new one placed on bridge in 2019.
Bridge Total	3	0	2	
Building				
Dragon Cement Products, Rockland	1	0	4	Employees observed birds ~2012. 2019 first documented breeding, successful.
Franco-American Heritage Center, Lewiston	1	0	0	Late 1990's observation of pair, very sporadic success.
MERC Incinerator, Biddeford	1	0	0	Sporadic pair residency since 2010, no successful nesting.
Old Scott Paper Mill, Winslow	1	0	0	2018 first pair residency, no successful nesting.
Old Town Mill, Old Town	1	0	0	2018 first successful nest.
Ram Island Ledge Lighthouse, Portland	1	0	0	2018 first successful nest.
Rumford Mill, Rumford	1	0	0	2019 first pair residency documented.
Sappi Paper Mill, Bath	1	0	1	Count as breeding pair and one fledgling based on video taken within mill even though only a single adult was observed at site during surveys. Removing pair observed from Westbrook Quarry and assuming the pair is at Sappi Paper Mill.
Building Total	8	0	5	

Dragon Cement Products, Rockland, photo by Erynn Call

Table 1 cont. Site-specific results of peregrine falcon nesting in Maine, 2019.

Site Name, Location	Territorial Pair	Solitary Adult	# Fledged	Site Notes
Cliff				
Bald Mountain, Woodstock	1	0	0	
Barren Mountain, Baxter State Park	1	0	0	Possibly saw one adult and one juvenile flying on 7/10/19.
Bear Mountain, Waterford	1	0	0	
Beech Cliff, Acadia National Park	0	1	0	
Brimstone Mountain, W Central Franklin	1	0	1	Suspect there may have been an additional fledgling.
C Bluff Mountain, North Oxford	1	0	2	1988 first successful nesting.
Eagle Bluff (Mountainy Pond), Dedham	1	0	2	First documented in 1940's.
East Royce Mountain: Evans Notch, White Mountain National Forest	1	0	4	
Grafton Notch, Grafton Notch State Park	1	0	1	6/19/19 heard begging calls, no young seen during this survey or others.
Half Mile Pond, Amherst	1	0	3	First pair observed ~2010, very sporadic success.
Horse Mountain, Baxter State Park	1	0	0	First documented in 1880's.
Indian Stream Mountain, N Franklin	1	0	2	
Ironbound Island, Winter Harbor	1	0	0	
Jordan Pond, Acadia National Park	1	0	3	In old raven nest. Possibly 4 nestlings observed on 6/12/19.
Mount Kineo, Mount Kineo State Park	1	0	4	1940's first documented, 1987 first pair after reintroduction and first breeding since 1961.
Mount Megunticook, Camden State Park	1	0	2	
Pine Mountain, North Lovell	1	0	0	
Ragged Jack Mountain, Peru	1	0	0	
Rattlesnake Mountain: Shell Pond, White Mountain National Forest	0	1	0	
Squaredock Mountain, White Mountain National Forest	1	0	2	
The Precipice, Acadia National Park	1	0	4	1988 first pair observed.
Tumbledown Dick Mountain, Peru	0	1	0	1950's first pair observed.
Tumbledown Mountain, Weld	1	0	2	1990 first pair observed, 6/28/19 heard calling juveniles (>1).
Valley Cove, Acadia National Park	1	0	2	
Cliff Total	21	3	34	

Table 1 cont. Site-specific results of peregrine falcon nesting in Maine, 2019.

Site Name, Location	Territorial Pair	Solitary Adult	# Fledged	Site Notes
Quarry				
Belfast Quarry, Belfast	1	0	1	2019 first nest, successful.
Dragon Fields Quarry, Portland	1	0	0	
Granite Hill Quarry, Hallowell	1	0	0	
Pejepscot Quarry, Topsham	1	0	4	
Westbrook Quarry, Westbrook	0	0	0	Assume pair is at Sappi Paper Mill even though observed copulating here.
Quarry Total	4	0	5	
Tower				
Bath Iron Works, Bath	1	0	2	2019 first nest, successful. Nest in old osprey nest on top of old light tower.
Transmission line tower: Verso Mill, Prospect	1	0	1	Nest in old osprey nest on top of transmission line tower.
Tower Total	2	0	3	
Grand Total	38 pairs	3 solitary	49 fledglings	

View from Mount Megunticook, Camden State Park, photo by Erynn Call

Management Recommendations

The breeding population of peregrine falcons in Maine is currently listed as state endangered and may be considered as a candidate for downlisting to a state threatened species. With 38 pairs and productivity of 1.29 fledglings per territorial pair, the population appears to be headed in the right direction. However, due to inter-annual variability it is important to collect more than one year of data to best understand population status. To promote population stability within Maine and throughout the Northeast, we recommend the following:

Site management – Each site has its own unique needs and challenges. We will continue to expand partnerships and consider opportunities for improvements. At urban locations, this may include working with private landowners/companies to: 1) improve sighting reports to identify presence of pair, fledglings and/or location of eyrie, 2) provide locations to view birds during surveys, 3) consider nest aids or cameras, and 4) consider if there are opportunities to time construction and maintenance activities, thus limiting disturbance to nesting peregrines and in some cases, ensuring safety of staff. At remote locations, site management can sometimes include trail closures of high use areas (e.g. Acadia National Park) or education of outdoor enthusiasts as to 1) limiting disturbance by maintaining a distance buffer where birds are not agitated, and 2) how to report sightings of peregrines.

Recommendations previously developed by the MDIFW Endangered Species Program are also important to promote (MDIFW 2003):

- Prior to land development near peregrine falcon eyries, consult with a biologist from MDIFW to assist with planning.
- Use voluntary agreements, conservation easements, conservation tax abatements and incentives, and acquisition to protect important habitat for threatened and endangered species.
- Prohibit climbing on the cliff and hiking near the cliff rim if activity causes aggressive response from peregrines during the nesting season (March 15 to August 15). Falcons are especially disturbed by nearby activity on the cliff or on trails that are line-of-sight from the nest or perches. (Where falcon nests are already established in proximity to humans, these recommendations can be relaxed, unless the birds show evidence of disturbance from human activity.)
- Maintain trail closures until five weeks after the last bird has fledged (usually late July to mid-August).
- Avoid construction of permanent roads within 660 feet of a known peregrine site.
- Avoid logging within ¼ mile of an active eyrie during the nesting season.

- Aircraft should not approach closer than 1,500 feet above a nest. Closer approaches may cause peregrines to attack planes or may cause a frantic departure from the nest. Falcons startled from the eyrie have been known to damage eggs or injure nestlings.
- Route powerlines and other wires away from eyries to avoid collisions and electrocution hazards.
- Avoid applications of pesticides around occupied eyries during the breeding season.
- Wetlands, especially intertidal mudflats, estuaries, and coastal marshes, are key feeding areas. Protect wetlands used regularly by peregrine falcons at any time of the year from filling, development, or other disturbances that could alter prey abundance and habitat quality
- Maintain large trees and snags in areas where peregrines nest and feed. These perches are important for roosting and hunting. Leave snags and debris on mud flats for perching and roosting

Develop monitoring network – Continue to gain support from citizens and private landowners/companies to monitor and report breeding peregrines across urban and cliff areas. Expand awareness of novel habitats such as quarries in proximity to water, light houses, previously used osprey nests/transmission towers, in addition to more well-known habitats such as tall buildings and cliffs. Provide the following contact information to the public:

Please report observations of peregrine falcons at ebird.org or consider getting involved in the Maine Bird Atlas ebird.org/atlasme. Contact the Maine Department of Inland Fisheries and Wildlife peregrine project coordinator, Erynn Call, to get involved with standardized surveys (erynn.call@maine.gov).

Develop a long-term monitoring plan - State-wide monitoring in 2019 was intensive and relied upon a full-time position and considerable time investment from survey partners. A long-term monitoring plan which details inter- and intra-annual survey frequency and site selection in addition to the strength of inference from these data would be invaluable. Site selection would consider the tradeoffs of monitoring historically active eyries with exploring new locations to document population expansion. To achieve this, MDIFW will be partnering with the University of Maine – Orono.

Place additional nest structures – Nest trays and boxes can dramatically improve nest success where pairs are present and chronically unproductive. We will work with partners to place nest aids where appropriate. Generally, placement considerations include:

- Prioritize where birds are active (whitewash/droppings or prey remains (bones and feathers from small birds)
- Consider rooftops, window inset, railings, office buildings, apartments, industrial towers, water towers, transmission towers, and bridges.
- Prioritize area with minimal direct disturbance and access to box for banding of young and cleaning in winter.
- Face north through to the east.
- Prioritize areas above 80 – 100 ft.
- Provide perches and room for young to walk and stretch wings.
- Avoid hazards such as electrical lines.
- Place a camera to document nesting activity if possible.
- Tray dimensions are ~ 34"L X 22"W, box 22" H, dog igloo 48.5"L X 47"W X 37"H.
- Be aware of how to respond if an injured bird is found.

Place additional nest cameras - We hope to set up cameras to take photos and/or videos wherever the opportunity may arise to improve monitoring efficiency and outreach.

Pursue banding opportunities – The resighting of banded birds improves our understanding of movement, dispersal, distribution, survival, ancestry, and adaptability to changing environments. While the number of peregrines banded may currently be minimal (and in the case of 2019, none) we may consider expanding efforts as opportunities arise.

Consider contaminant sampling – Chemical contaminants are important to monitor as they can have population-level impacts on apex avian species (Shore and Taggart 2019). Peregrines and other apex predators tend to accumulate pollutants through the food web. Despite the ban on DDT which led to the peregrine resurgence, there is still a chemical cocktail of contaminants that are persistent in the environment – which means they don't break down and can accumulate over time. These include perfluoroalkyl substances found in food packaging, household cleaners, stain- and water-repellant fabrics, and nonstick cookware (PFAS, Vorkamp et al. 2019), mercury (THg, Barnes et al. 2019), brominated flame retardants (PBDE, Fernie et al. 2017), and organochlorine pesticides (Vorkamp et al. 2017). Gaining insight into the presence of these chemicals not only has implications for peregrine populations but also as long-lived apex predators; predatory birds represent a sentinel species for human health (Heys et al. 2017). We hope to further investigate and consider opportunities to sample contaminants in Maine breeding peregrines.

Table 2. Site specific management for active and potential peregrine falcon nest sites.

Site Name	Location	Management Actions
Bridge		
I-395 Bridge	Bangor/Brewer	Continue partnership with MDOT, discuss 2020 bridge maintenance, options for alternative nest tray locations nearby, continue to discuss trapping and safety issues with Bangor Municipal Airport/USDA Wildlife Services.
Casco Bay Bridge	Portland	Continue partnership with MDOT, potential placement of game camera.
Passagassawaukeag Bridge	Belfast	Continue partnership with MDOT, monitor new nest box (placed in fall 2019).
Piscatequa River Bridge	Kittery/Portsmouth N.H.	Continue partnership with MDOT and NH Audubon.
Building		
Dragon Cement Products	Rockland	Continue partnership, potential placement of game camera or streaming video.
Franco-American Heritage Center	Lewiston	Establish partnership, discuss options for nest tray/box placement.
MERC Incinerator, Biddeford: Saco River	Biddeford	Establish contact with city of Biddeford (who now own the property), discuss options for tray/box placement.
Old Scott Paper Mill	Winslow	Establish contact, discuss options for tray/box placement.
Old Town Mill	Old Town	Establish contact with ND Paper Environmental Manager, consider nest tray placement if nesting activity persists in future seasons (not active in 2019).
Ram Island Ledge Lighthouse: Casco Bay	Portland	Establish contact with landowner, discuss options for tray/box placement.
Rumford Mill	Rumford	Establish contact with ND Paper Environmental Manager to facilitate on-site monitoring and to identify potential eyrie.
Sappi Paper Mill	Westbrook	Establish contact with Sappi Westbrook Mill Environmental Manager to facilitate on-site monitoring and to identify potential eyrie.

Table 2 cont. Site specific management for active and potential peregrine falcon nest sites.

Site Name	Location	Management Actions
Quarry		
Belfast Quarry	Belfast	Continue partnership with Lane Construction to facilitate continued on-site monitoring.
Dragon Fields Quarry	Portland	Site for sale, continue contact with Dragon Cement Products and connect with any new owners to facilitate continued on-site monitoring.
Granite Hill Quarry	Hallowell	Site for sale, maintain contact with current owner and connect with any new owners to facilitate continued on-site monitoring.
Pejepscot Quarry	Topsham	Maintain contact with Crooker Construction, LLC to facilitate continued on-site monitoring.
Westbrook Quarry	Westbrook	Establish contact with Westbrook Quarry Environmental Manager to facilitate on-site monitoring and to identify potential eyrie.
Tower		
Bath Iron Works	Bath	Continue partnership with Environmental Manager, evaluate nest tray placement if osprey nest used in 2019 degrades in 2020.
Transmission line tower: Verso Mill	Prospect	Continue partnership with Central Maine Power Environmental Manager, discuss nest location nest tray/box placement if osprey nest used in 2019 degrades in 2020.

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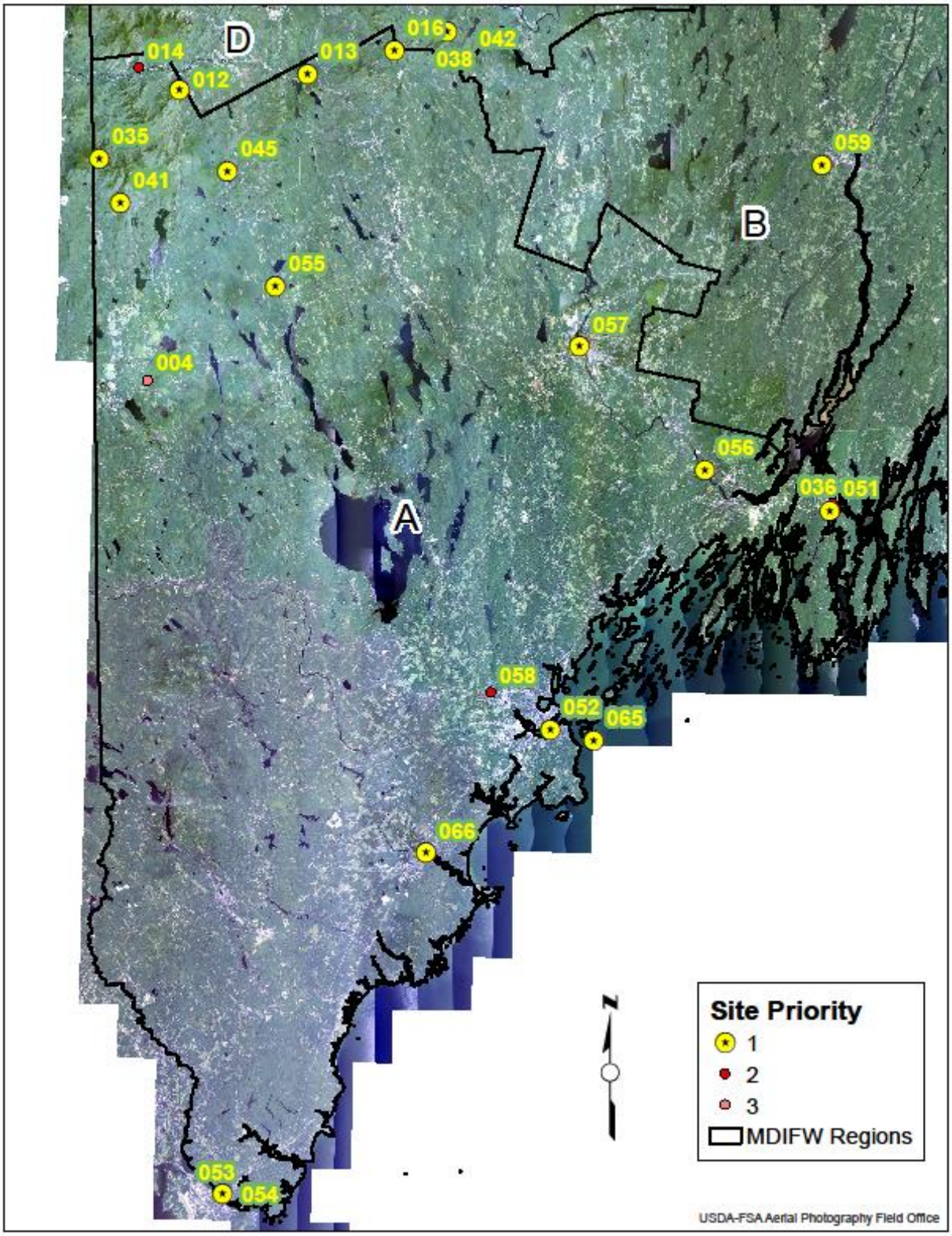
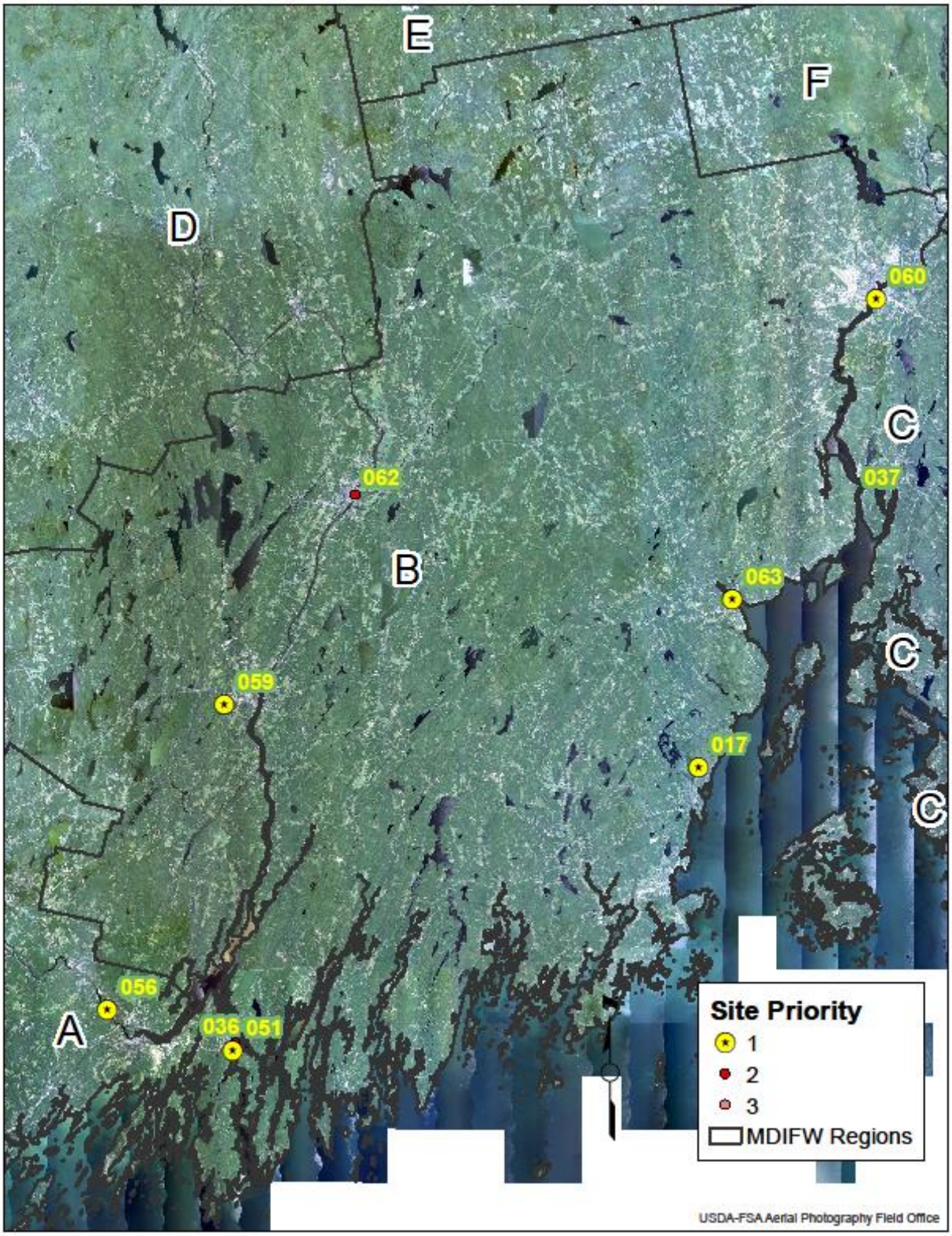
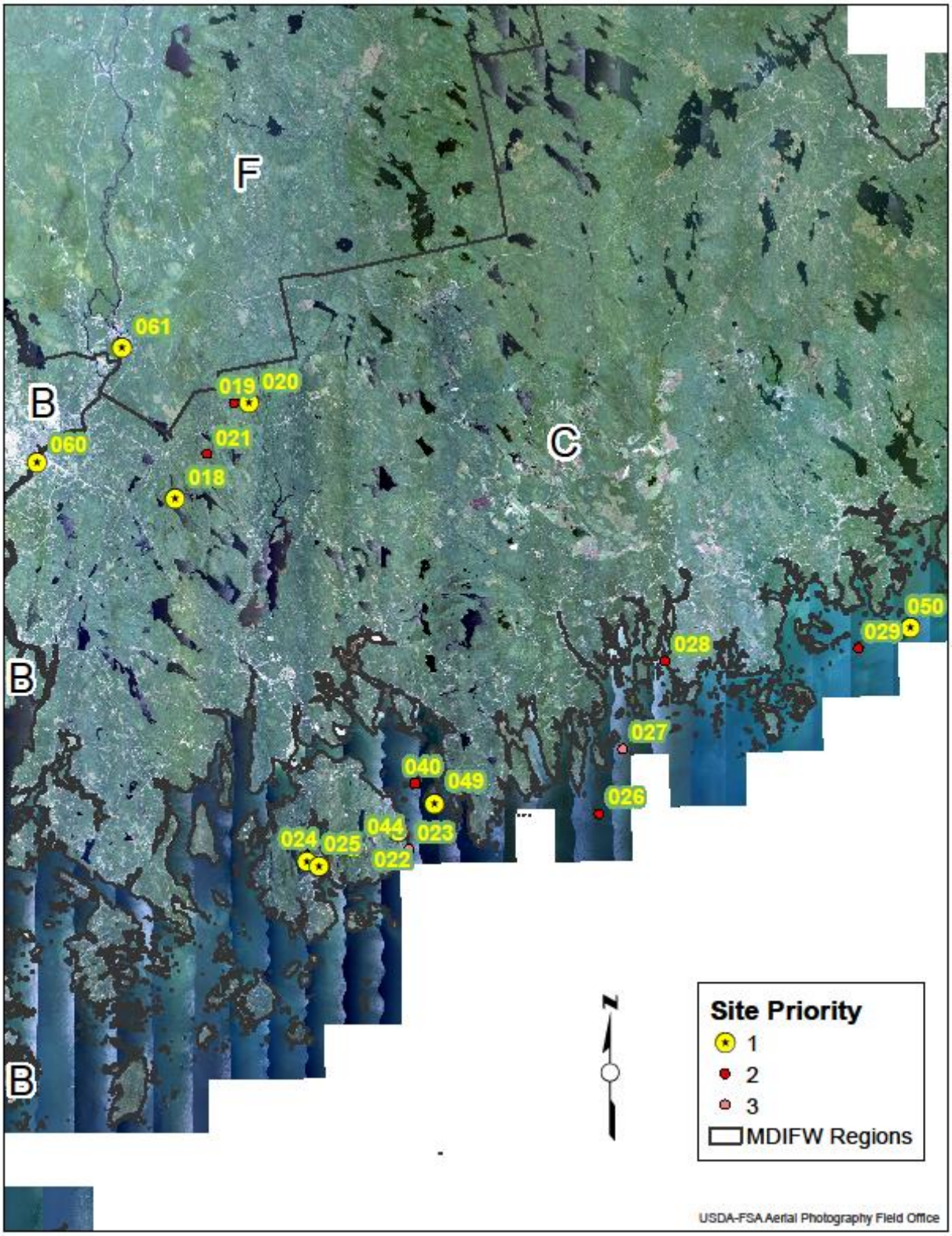
Appendix 1. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



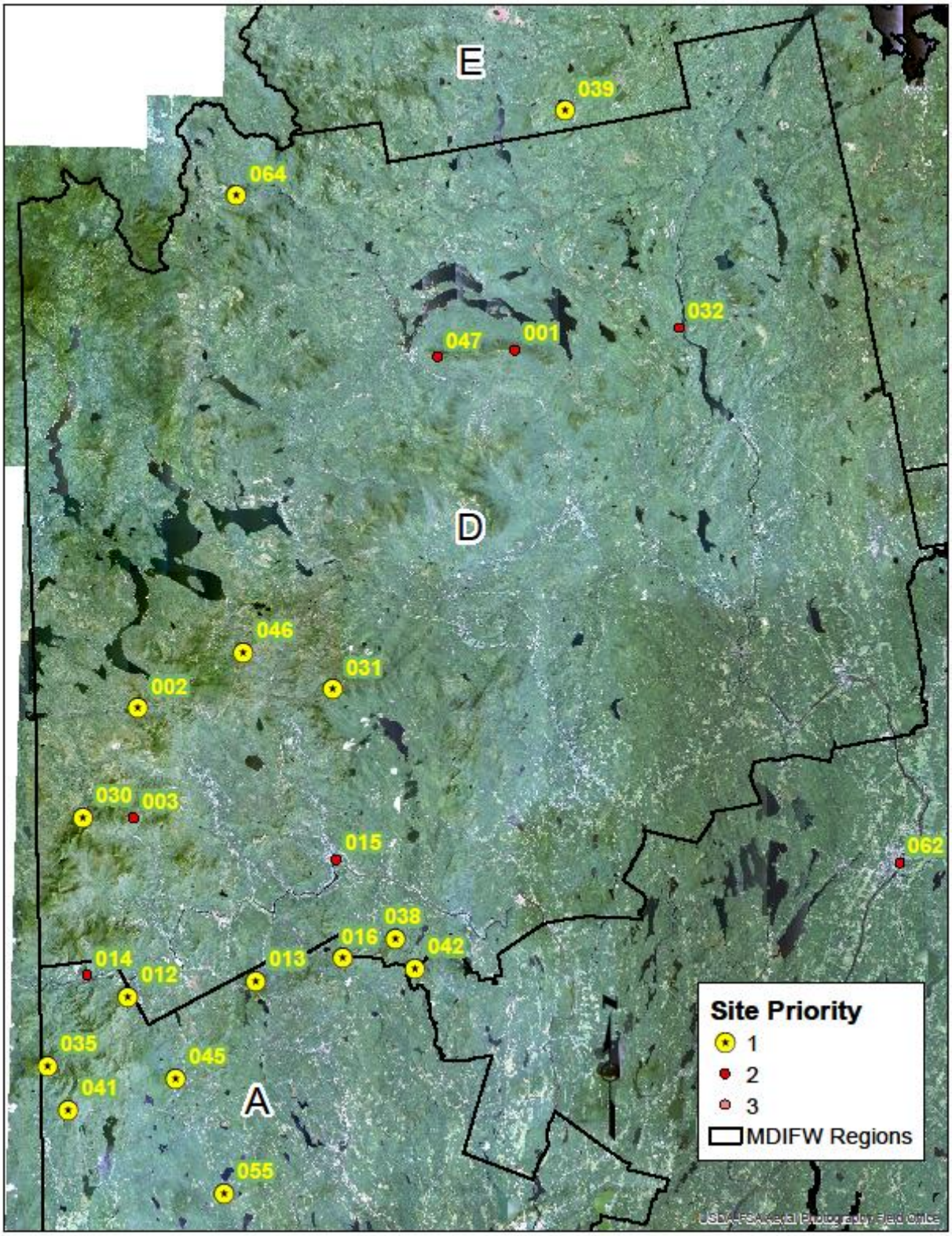
Appendix 1 cont. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



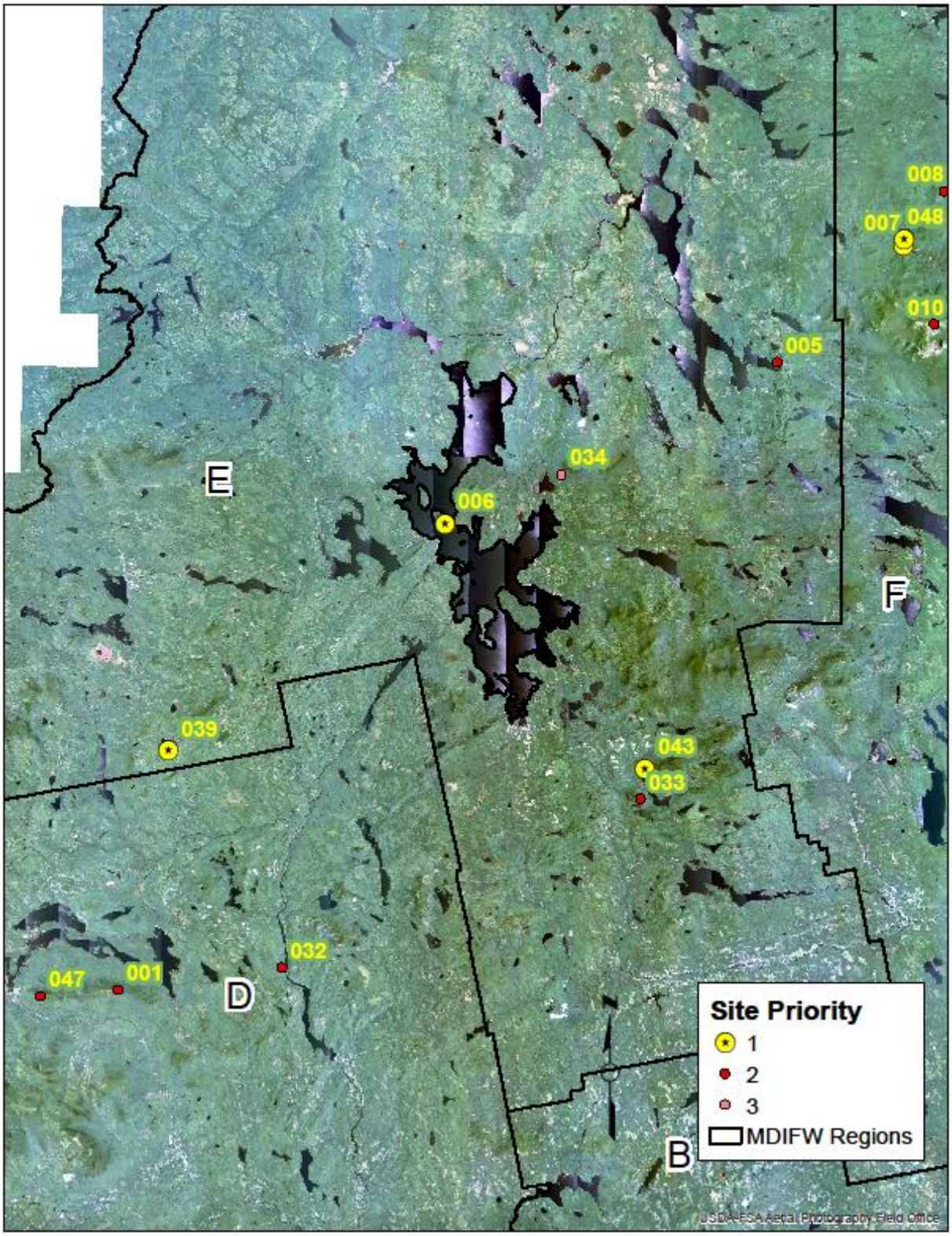
Appendix 1 cont. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



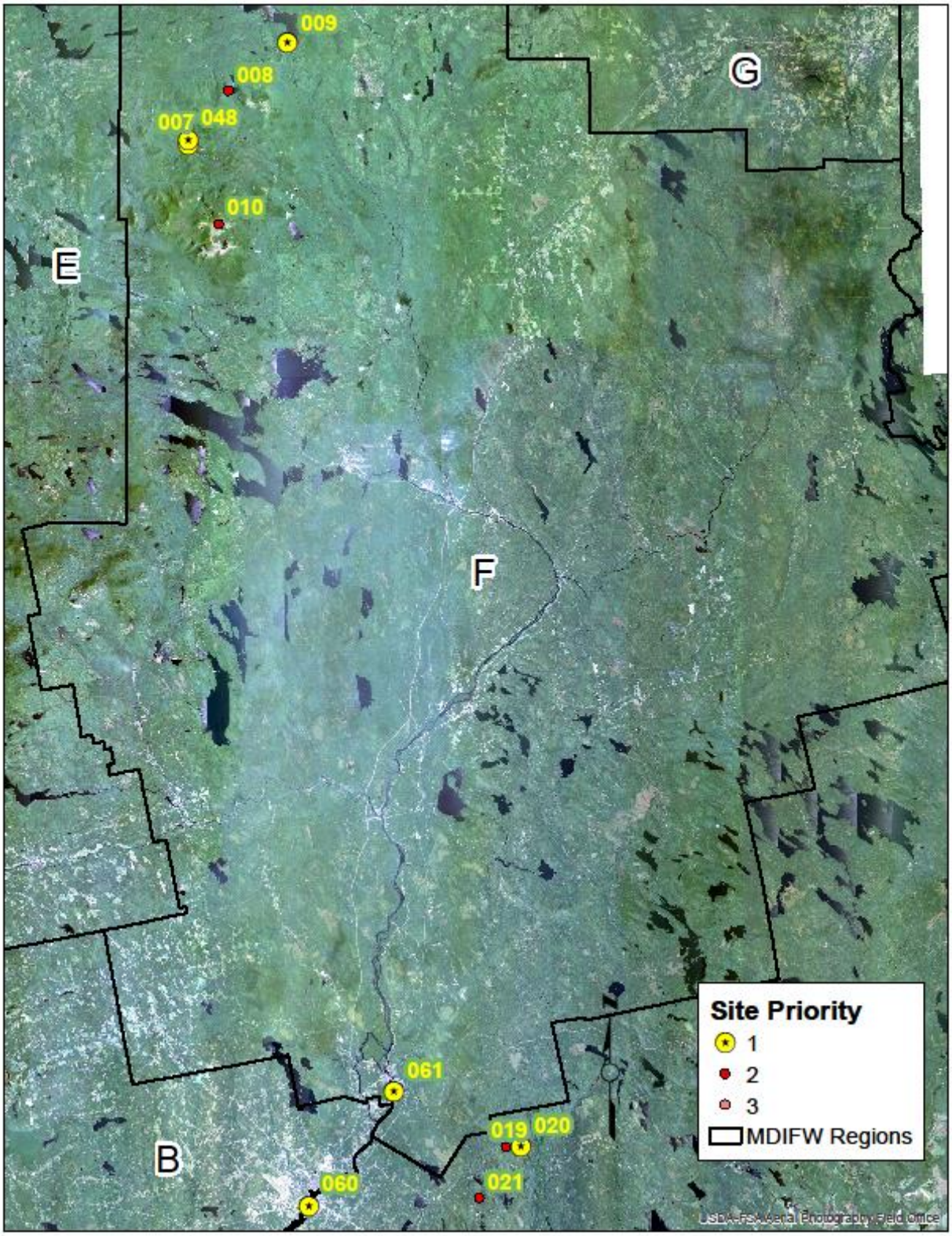
Appendix 1 cont. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



Appendix 1 cont. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



Appendix 1 cont. Maine peregrine falcon survey sites within each Maine Department of Inland Fisheries and Wildlife management region, 2019.



Appendix 2. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
1	Bigelow Mtn - Old Man's Head	2	Dead River Twp	D	0	0	240	1	5/12	5/12
2	C Bluff Mtn	1	C Surplus	D	2	2	420	3	5/21	7/3
3	Lightning Ledge	2	Andover W Surplus	D	No survey	NA	0	0	NA	NA
4	Mt Tom	3	Fryeburg	A	No survey	NA	0	0	NA	NA
5	Ripogenus Dam	2	T3 R11 WELS	E	0	0	142	2	6/17	7/3
6	Mt Kineo	1	Kineo Twp	E	2	4	915	5	3/20	6/24
7	Wassataquoik Mtn	1	T4 R10 WELS	F	No survey	NA	0	0	NA	NA
8	S Branch Mtn	2	T5 R9 WELS	F	No survey	NA	0	0	NA	NA
9	Horse Mtn	1	T6 R8 WELS	F	2	0	615	3	4/25	7/9
10	Howe Peaks, Mt Katahdin	2	Mt Katahdin Twp	F	No survey	NA	0	0	NA	NA
11	Deboullie Mtn	2	T15 R9 WELS	G	0	0	150	1	5/28	5/28
12	Pine Mtn	1	Mason Twp	A	2	0	624	7	3/19	7/4
13	Buck's Ledge	1	Woodstock	A	0	0	566	4	3/19	7/3
14	Tumbledown Dick Mtn	2	Gilead	D	0	0	120	1	6/4	6/4
15	Rumford Mill	2	Rumford	D	2	0	436	8	3/20	7/24
16	Bald Mtn	1	Woodstock	A	2	0	703	5	4/25	7/18
17	Mt Megunticook	1	Camden	B	2	2	405	4	4/2	7/3
18	Eagle Bluff (Mtny Pond)	1	Dedham	C	2	2	362	4	4/17	7/16

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
19	Fletcher Bluff	2	Amherst	C	0	0	240	1	5/1	5/1
20	Half Mile Pond	1	Amherst	C	2	3	685	3	5/1	6/28
21	Eagle Bluff	2	Clifton	C	No survey	NA	0	0	NA	NA
22	The Precipice	1	Bar Harbor	C	2	4	1520	10	1/31	6/27
23	Great Head	3	Bar Harbor	C	No survey	NA	0	0	NA	NA
24	Beech Cliff	1	Mt Desert	C	1	0	601	3	4/7	5/6
25	Valley Cove	1	Mt Desert	C	2	2	510	5	3/20	7/1
26	Petit Manan Island	2	Milbridge	C	0	0	240	1	4/11	4/11
27	Jordan's Delight	3	Milbridge	C	0	0	40	1	5/4	5/4
28	Tumbledown Dick Head	2	Addison	C	No survey	NA	0	0	NA	NA
29	The Brothers	2	Jonesport	C	0	0	240	1	4/12	4/12
30	Grafton Notch	1	Grafton Twp	D	2	1	773	7	3/20	7/19
31	Tumbledown Mtn	1	Twp 6 North of Weld	D	2	2	502	3	5/8	8/1
32	Henhawk Ledge	2	Carrying Place Twp	D	0	0	240	1	5/30	5/30
33	Borestone Mtn Summit	2	Elliottsville Twp	E	No survey	NA	0	0	NA	NA
34	Little Spencer Mtn	3	East Middlesex Canal Grant Twp	E	No survey	NA	0	0	NA	NA

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
35	East Royce Mtn: Evans Notch	1	Batchelders Grant Twp	A	2	4	585	6	4/3	7/2
36	Carleton Bridge Rte 1: Kennebec River	2	Woolwich; Bath	A / B	0	0	300	2	3/21	3/27
38	Tumbledown Dick Mtn	1	Peru	D	1	0	540	3	4/22	7/13
39	Shutdown Mtn	1	Upper Enchanted Twp	E	0	0	420	2	5/22	7/5
40	Long Porcupine Island	2	Gouldsboro	C	0	0	48	2	4/14	5/5
41	Rattlesnake Mtn: Shell Pond	1	Stoneham	A	1	0	722	3	4/24	5/31
42	Ragged Jack Mtn	1	Hartford	B	2	0	726	5	4/22	7/18
43	Barren Mtn	1	Elliottsville Twp	E	2	0	484	3	4/30	7/31
44	Jordan Pond	1	Mt Desert	C	2	3	770	8	2/28	7/3
45	Squaredock Mtn	1	Albany Twp	A	2	2	585	8	4/14	7/13
46	Brimstone Mtn	1	Twp D	D	2	1	730	5	5/8	7/19
47	Bigelow Mtn - Cranberry Peak	2	Wyman Twp	D	No survey	NA	135	1	6/26	6/26
48	Lord Mtn	1	T4 R10 WELS	F	No survey	NA	0	0	NA	NA
49	Ironbound Island	1	Winter Harbor	C	2	0	33	1	4/14	4/14
50	Big Libby Island	1	Machiasport	C	0	0	240	1	4/12	4/12

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
51	Bath Iron Works	1	Bath	A	2	2	332	5	4/19	7/29
52	Casco Bay Bridge	1	South Portland	A	2	0	227	3	3/26	7/10
53	Piscataqua River Bridge (I-95)	1	Kittery; Portsmouth NH	A / NH	2	0	721	6	4/17	5/16
54	Portsmouth Naval Shipyard	0	Kittery	A	No survey	NA	0	0	NA	NA
55	Bear Mtn	1	Waterford	A	2	0	608	5	4/18	7/29
56	Pejepscot Quarry	1	Topsham	A	2	4	105	3	4/4	6/5
57	Franco-American Heritage Center	1	Lewiston	A	2	0	344	5	3/20	7/2
60	I-395 Bridge	1	Brewer/ Bangor	C / B	2	2	442	26	3/14	7/25
61	Old Town Mill	1	Old Town	F	2	0	715	8	3/3	6/12
62	Old Scott Paper Mill	2	Winslow	B	2	0	916	7	2/26	7/29
64	Indian Stream Mtn	1	Chain of Ponds Twp	D	2	2	308	3	4/17	7/25
65	Ram Island Ledge Lighthouse: Casco Bay	1	Portland	A	2	0	104	3	4/10	6/14
66	MERC Incinerator, Biddeford: Saco River	1	Biddeford	A	2	0	264	5	3/28	7/8
67	Transmission line tower: Verso Mill	1	Prospect	B	2	1	461	10	3/2	6/21
68	Bold Coast	2	Cutler	C	0	0	240	1	5/2	5/2
69	Dragon Fields Quarry: Portland landfill	1	Portland	A	2	0	547	7	3/26	7/29

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
73	Mosquito Mtn: S Branch Marsh River	2	Frankfort	B	No survey	NA	0	0	NA	NA
74	Schoodic Head: Schoodic Harbor	2	Winter Harbor	C	No survey	NA	0	0	NA	NA
75	Maiden Cliff: Megunticook Lake	2	Camden	B	No survey	NA	0	0	NA	NA
76	Little Bear Mtn: Whites Brook	2	Gilead	A	No survey	NA	0	0	NA	NA
77	Ledge Ridge: Magalloway River valley	2	Parmacheenee Twp	D	0	0	210	1	6/6	6/6
81	Parks Pond	2	Clifton	C	0	0	345	2	4/16	7/2
82	Fourth Debsconeag Lake	2	Rainbow Twp	E	No survey	NA	0	0	NA	NA
83	Trout Brook Mtn: Fowler Brook area	2	Trout Brook Twp	F	No survey	NA	0	0	NA	NA
84	Coburn Mtn: Enchanted Pond	2	Upper Enchanted Twp	E	No survey	NA	0	0	NA	NA
85	Memorial Bridge Rte 1: Piscataqua River	2	Kittery, Portsmouth NH	A / NH	No survey	NA	0	0	NA	NA
86	SAPPI Paper Mill: Kennebec River	2	Skowhegan	D	0	0	60	1	4/22	4/22
87	Black Mtn: Deboullie Pond	3	T15 R9 W.E.L.S.	G	No survey	NA	0	0	NA	NA
88	Stubbs Mtn: Sandy River	3	Avon	D	0	0	30	1	5/27	5/27

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
89	Sisk Mtn: Lower Pond	3	Chain of Ponds Twp	D	0	0	150	2	4/22	6/10
90	Moosehorn bluff: Arnold Pond	3	Coburn Gore	D	0	0	45	2	4/17	6/10
91	Big Hill: Second Pond	3	Dedham	C	No survey	NA	0	0	NA	NA
92	Bald Porcupine Island: Frenchman Bay	3	Gouldsboro	C	0	0	219	2	4/11	4/14
93	Stone Mtn: Stone Pond	3	Brownfield	A	No survey	NA	0	0	NA	NA
94	Old Turk Mtn: Little Ellis Pond	3	Byron	D	No survey	NA	0	0	NA	NA
95	Oversett Mtn	3	Greenwood	D	No survey	NA	0	0	NA	NA
96	Payne Ledge: Twitchell Pond	3	Greenwood	D	0	0	30	1	5/23	5/23
97	Mt Dimmock: Ellis river valley	3	Hanover	D	0	0	90	1	6/3	6/3
98	Mt Dimmock: Howard Pond	3	Hanover	D	No survey	NA	0	0	NA	NA
99	Bear Mtn: Little Bear Pond	3	Hartford	B	No survey	NA	0	0	NA	NA
100	Sabattus Mtn: Kezar River	3	Lovell	A	0	0	90	1	6/5	6/5
101	Speckled Mtn: Abbotts Pond	3	Peru	A	No survey	NA	0	0	NA	NA
102	Glass Face Mtn: Androscoggin River	3	Rumford	D	No survey	NA	0	0	NA	NA
103	Whitecap Mtn: Ellis River	3	Rumford	D	No survey	NA	0	0	NA	NA

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
104	Twin Peaks: McKie Fork of Second E Branch of Magalloway River	3	Bowmantown Twp	D	No survey	NA	0	0	NA	NA
105	Emery's Misery: Aziscohos Lake	3	Lincoln Plantation	D	No survey	NA	0	0	NA	NA
106	Hemmingway Mtn: Concord River	3	Milton Twp	A	No survey	NA	0	0	NA	NA
107	Rump Mtn: Magalloway River	3	Parmacheenee Twp	D	No survey	NA	0	0	NA	NA
109	Little Peaked Mtn: Bradbury Brook Valley	3	Clifton	C	No survey	NA	0	0	NA	NA
110	Peaked Mtn: Debec Pond	3	Clifton	C	No survey	NA	0	0	NA	NA
111	Peaked Mtn: Seboeis River	3	T4 R7 W.E.L.S.	F	No survey	NA	0	0	NA	NA
112	Borestone Mtn saddle: Sunset Pond	3	Elliottsville Plantation	E	No survey	NA	0	0	NA	NA
113	Little Kineo Mtn: Cowan Brook	3	Days Academy Grant Twp	E	No survey	NA	0	0	NA	NA
114	Eagle Mtn: Big Duck Cove - Moosehead Lake	3	East Middlesex Canal Grant Twp	E	No survey	NA	0	0	NA	NA
115	Turtle Ridge: Leavitt Pond	3	T1 R11 W.E.L.S.	F	No survey	NA	0	0	NA	NA
116	South Pogy Mtn: Wassataquoik Lake	3	T4 R9 W.E.L.S.	F	No survey	NA	0	0	NA	NA

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
117	Sobunge Mtn: Soper Brook	3	T4 R11 W.E.L.S.	E	0	0	327	3	6/3	7/3
118	Bald Mtn: E Branch of Penobscot River	3	T5 R9 W.E.L.S.	F	No survey	NA	0	0	NA	NA
119	Billfish Mtn: Middle Fowler Pond	3	T5 R9 W.E.L.S.	F	No survey	NA	0	0	NA	NA
120	Number 6 Mtn: Rock Pond	3	Appleton Twp	D	No survey	NA	0	0	NA	NA
121	Hedgehog Mtn: Spencer Lake	3	Hobbstown Twp	D	No survey	NA	0	0	NA	NA
122	Granny's Cap: Enchanted Stream Valley	3	Lower Enchanted Twp	D	No survey	NA	0	0	NA	NA
123	Heald Mtn: Heald Pond	3	Lower Enchanted Twp	D	No survey	NA	0	0	NA	NA
124	Slidedown Mtn: West Branch of Sandy Stream	3	Sandy Bay Twp	E	No survey	NA	0	0	NA	NA
125	Three Slide Mtn: Rock Pond	3	T5 R6 B.K.P. W.K.R.	D	No survey	NA	0	0	NA	NA
126	Shipstern Isl: Narraguagus Bay	3	Harrington	C	No survey	NA	0	0	NA	NA
127	Sally Mtn: Attean Lake	3	Attean Twp	E	No survey	NA	0	0	NA	NA
128	Sols Cliff	3	Bar Harbor	C	No survey	NA	0	0	NA	NA
129	Little Bigelow Mtn	3	Dead River Twp	D	0	0	240	1	6/26	6/26
130	Dragon Cement Products	1	Rockland	B	2	4	99	4	4/2	6/20

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
131	Deer Isle Bridge	2	Deer Isle	C	0	0	61	2	7/1	7/20
132	Lincoln Mill	3	Lincoln Plantation	D	1	0	339	2	4/12	4/29
133	Riverside Scrap/Old Intl. Paper mill	3	Livermore	B	0	0	20	1	5/4	5/4
134	Verso Paper Androscoggin Mill	3	Jay	B	0	0	150	2	5/4	5/19
135	Mansell Mtn	3	Southwest Harbor	C	0	0	90	1	5/18	5/18
136	Madison Mill	3	Anson	D	0	0	60	1	5/20	5/20
137	Miles Knob/ Mason Hill	3	N. Lovell	A	0	0	240	1	5/31	5/31
138	Mt Christopher: Bryant Pond	3	Bryant Pond	A	0	0	90	1	6/3	6/3
139	Rumford/Andover Quarry	3	Rumford	D	0	0	10	1	6/3	6/3
140	Bigelow Mtn - The Horns Pond	3	Wyman	D	0	0	180	1	6/26	6/26
141	Old Millinocket Mill	3	Millinocket	F	0	0	36	1	6/17	6/17
41B	Blueberry Mtn	3	Stow	A	0	0	23	1	5/31	5/31
58A	Sappi Paper Mill	1	Westbrook	A	2	1	231	3	3/27	8/5
58B	Westbrook Quarry	1	Westbrook	A	0	0	91	2	3/28	6/15
59A	Granite Hill Quarry	1	Hallowell	B	2	0	430	8	4/4	7/15
60A	All Soul's Church	2	Bangor	B	No survey	NA	0	0	NA	NA

Appendix 2 cont. List of 2019 peregrine falcon sites and nest status.

Site Label	Site Name	Priority	Town	MDIFW Region	# Adults	# Fledged	Total effort (min)	# Surveys	First Date	Last Date
60B	Northern Lights	2	Bangor	B	No survey	NA	0	0	NA	NA
60C	Saint John's Church	2	Bangor	B	No survey	NA	0	0	NA	NA
63A	Passagassawaukeag Bridge	2	Belfast	B	0	0	117	3	3/21	5/1
63B	Belfast Quarry	1	Belfast	B	2	1	345	13	3/26	6/27
69A	City Hall	2	Lewiston	A	No survey	NA	0	0	NA	NA
69B	St Patrick's Church	2	Lewiston	A	No survey	NA	0	0	NA	NA
69C	St Peter and Paul's Basilica	2	Lewiston	A	No survey	NA	0	0	NA	NA

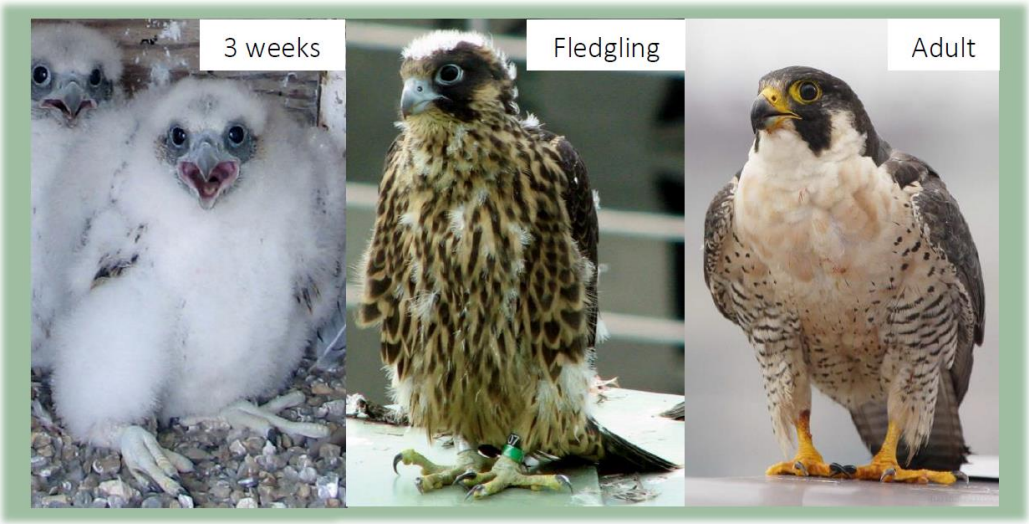
Valley Cove, Acadia National Park, photo by Erynn Call

Appendix 3. What to do if you find an injured peregrine falcon (contact MDIFW for pdf).

WHAT TO DO IF YOU FIND AN INJURED PEREGRINE FALCON

Urban peregrine falcons can get injured through collision with buildings, wires, or vehicles. During the summer in Maine, fledgling peregrines often find themselves on the ground when learning how to fly. If you find a peregrine falcon, please follow the guidelines below:

1. When recovering the bird, wear gloves and be careful of sharp talons and beak. Place it in a cardboard box with padding on the bottom, like an old towel. The box should be ventilated and set in a quiet, temperature controlled area. Do not provide food or water.

2. Contact the following:
   - Between 8:30 am – 5:30 pm, Mon - Sun, Avian Haven, 207.382.6761. Leave a message after hours and then call the appropriate number listed below.

   - Between 5:30 pm – 8:30 am, closest MDIFW Warden Service Dispatch Center:
     - Gray Dispatch: 1.800.228.0857
     - Augusta Dispatch: 1.800.452.4664
     - Bangor Dispatch: 1.800.432.7381