



The INSTITUTE for
BIRD POPULATIONS

MAPS Chat

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Embracing the Wolfe-Ryder-Pyle (WRP) Ageing System

by Danielle Kaschube

Do the terms "postnuptial plumage" or "prenuptial plumage" sound familiar? You might recognize them, although they are no longer commonly used in most banding circles. Most banders today learned to describe plumages using the Humphrey-Parkes (H&P) terminology, which takes away much of the anthropomorphic terminology ornithologists and banders used in the past. When Philip Humphrey and Kenneth Parkes created their system in 1959, they expected it to be modified as new knowledge of molts and plumages was acquired. Even then, Humphrey and Parkes recognized the need to discuss avian life cycles grounded in each species' biology, instead of being based on the month of the calendar year; the H&P system describes avian life cycles based on molt and plumage cycles, with each cycle beginning with a complete (or nearly complete) prebasic molt.

H&P terminology was used mostly as originally proposed, until 2003 when Steve Howell and others suggested a modification. In the original H&P terminology, the first fall molt of juveniles was described as the first prebasic molt. However, this molt for most passerine species is not complete (i.e. often, just the body feathers and not the flight feathers are replaced during this molt), and calling the fall molt the first prebasic created a truncated first cycle, ignored the first non-downy feathers acquired in the nest, and broke H&P's own rule that a prebasic molt should be complete or nearly complete. Howell and his collaborators renamed the first fall molt the "preformative" molt and renamed the molt in the nest the first prebasic. This updated terminology is called the modified H&P system.

A lingering problem with the existing terminology is that the term "first prebasic molt" has two different meanings, depending on whether the original H&P terminology or the modified H&P terminology is being used. Because of this ambiguity – and because the first generation of non-downy feathers are distinctly different from subsequent feather generations – many ornithologists, including we at IBP, still call the in-nest molt the prejuvenile, rather than the first prebasic.

The Wolfe-Ryder-Pyle (WRP) system of coding the life stage of birds is the latest iteration of how to describe the age of a bird. The WRP system continues H&P's legacy of using biology, not the calendar, to provide structure.

When we band a bird, we need to know its species, "age", and sex. Determining the age class allows us to assess vital rates including age-specific survivorship, productivity (usually the ratio of young to adults) and recruitment (number of new adults in the breeding population). The traditional age determination for a bird is based on the calendar year in which the individual hatched. This system works well when the individual is a passerine from temperate zones (Figure 1, page 2) where there is generally one well-defined breeding period during the spring and summer. The young birds are from the current

In this issue:

Embracing the Wolfe-Ryder-Pyle (WRP) Ageing System

WRP Examples

Bird Banding Classes for 2019

MAPS Cooperator Profile: Rick Schmid and the MAPS Stations of Eastern Nebraska

MAPS Program Research — Sampling Feathers for the Bird Genoscape Project

Welcome New MAPS Operators

How is Climate Change Affecting Yosemite's Birds?

The Life and Times of Joe Bird – A Poem

MAPS Swag!

(hatch) year, the second year birds hatched last year, and the after-second year birds hatched two or more years ago. Using these "ages" provides enough information for demographic analyses.

This system fails, however, for species whose breeding seasons cross the December 31/January 1 threshold (Figure 2). Using the calendar system, if a bird hatches on December 26th, it is considered an "adult" on Jan 1. If a bird in a nearby nest hatches on January 1, it is considered "young" even though the birds are only 6 days apart in true age. Applying a calendar ageing system to birds breeding across the calendar year split ignores the biology of the species. Clearly, a new system was needed to address this problem – the WRP system; named for the initials of the three scientists that developed it – Jared Wolfe, Thomas Ryder, and IBP's own Peter Pyle. This system fulfills Humphrey and Parkes intention of removing the artificial link between calendar date and the biological age of a bird.

Figure 1

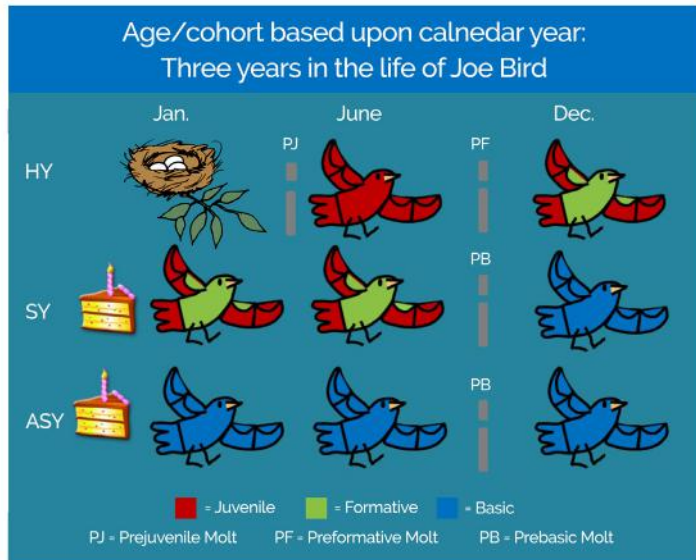
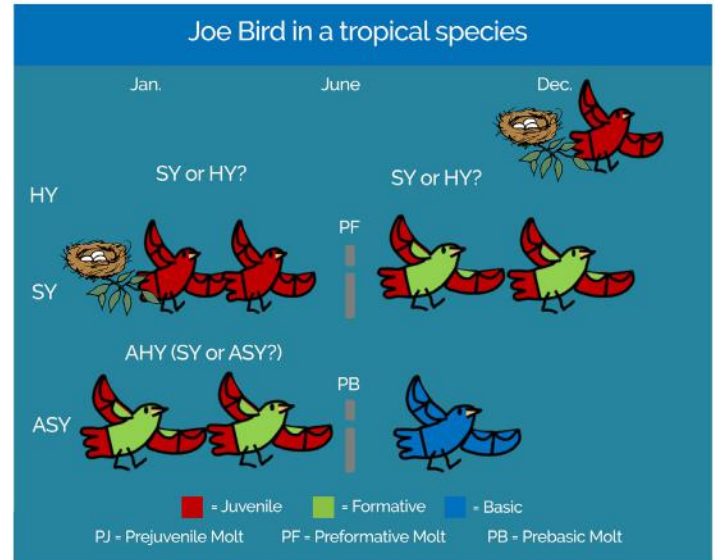


Figure 2



The feather generation of each tract is helpful for ageing.

For over 20 years, the MAPS protocol has encouraged banders to age every adult bird to Second Year (SY) or After Second Year (ASY), whenever possible. In order to do this, banders have been looking at the feather tracts that are helpful for ageing and determining and recording if they are juvenile, formative, basic, or alternate feathers (or a mix of these). And, using that information to determine the plumage, and ultimately, the calendar age of the bird. The WRP ageing process provides a way to record the plumage the bander already had to classified under the H&P system.

Molt Limits & Plumage Codes

J -Juvenile; feather tract comprised entirely of retained juvenile feathers or non-feathered body part shows characteristics indicative of a young bird

L -Molt limit; molt limit between juvenile and formative feathers

F -Formative; feather tract comprised entirely of formative feathers

B -Basic; feather tract entirely of basic feathers or non-feathered body part shows characteristics indicative of an adult bird

R -Retained; both juvenile and basic feathers are present within the tract (typically with woodpeckers only)

M -Mixed; multiple generations of basic feathers are present in the tract (typically with woodpeckers only)

A -Alternate; ALL feathers in the tract are of alternate plumage. Unless a tract is completely composed of alternate feathers, alternate feathers in a tract are ignored.

N -Definitely NOT juvenile feathers, but whether or not they are formative or basic feathers cannot be determined with confidence

U -Unknown; feather tract or non-feathered body part examined, but shows ambiguous characteristics or cannot be coded with confidence

Most commonly used WRP codes			
Plumage/Molt	WRP Age	WRP Code	Typical Calendar age
Prejuvenile/first prebasic molt	First prejuvenile molt	FPJ	Age = 2
Juvenile plumage	First cycle juvenile	FCJ	Age = 2
Preformative molt	First preformative molt	FPF	Age = 2 (Age = 5 for species that molt late)
Formative plumage	First cycle formative	FCF	Age = 2 in fall, Age = 5 after new year
First prealternate molt	First prealternate molt	FPA	Age = 5
First alternate plumage	First cycle alternate	FCA	Age = 5
Second prebasic/first adult prebasic	Second prebasic molt	SPB	Age = 5
Basic plumage	Definitive cycle basic	DCB	Age = 1 in fall, Age = 6 after calendar flip
Definitive prealternate molt	Definitive prealternate molt	DPA	Age = 6
Definitive alternate plumage	Definitive cycle alternate	DCA	Age = 6
Definitive prebasic	Definitive cycle prebasic molt	DPB	Age = 6
Unknown cycle codes			
Prebasic – unknown cycle	Unknown cycle prebasic molt	UPB	Age = 1: used if the individual is molting into basic plumage but it is unknown what the previous plumage was
Unknown plumage	Unknown cycle unknown plumage	UCU	Age = 0
Less common/species specific codes			
Non-juvenile plumage	After first cycle juvenile (this code doesn't translate well)	FAJ	Age = 2 or 1 or 0; used for species that have a complete preformative molt and there are no juvenile feathers remaining on the bird, e.g. House Sparrow

The list at left is not a comprehensive list of all possible WRP codes, but it should cover most birds you will encounter during a MAPS season (a larger list will be included in the 2019 MAPS Manual).

It is highly recommended that you read the original paper (Wolfe et al. 2010) describing the WRP system, and the paper refining the system and suggesting additional codes (Johnson et al. 2011) to help you fully understand the system and codes.

Example – American Goldfinch (pictured)

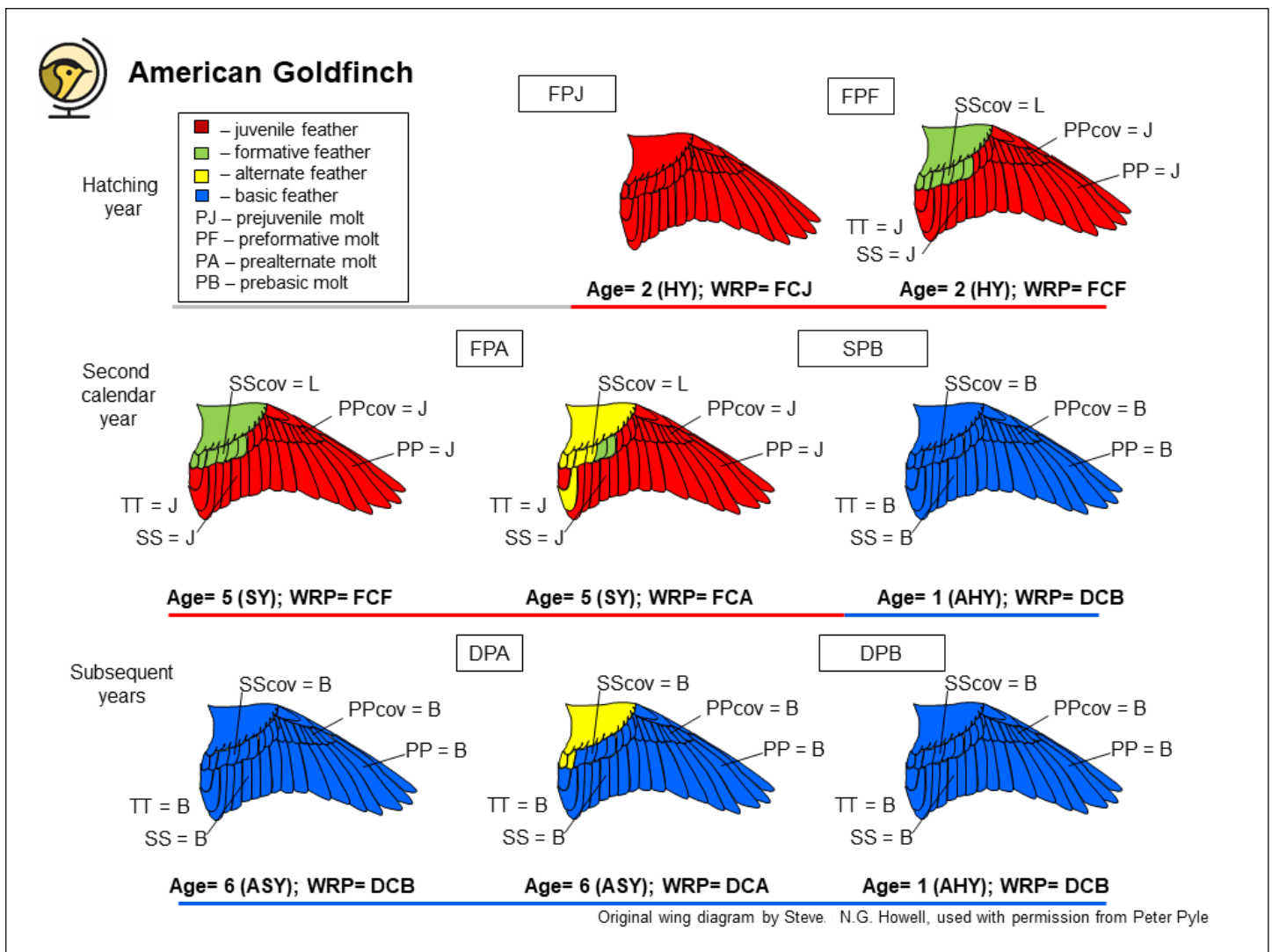
If you are a long-time MAPS contributor, you may remember Figure 3 (on page 4) from the spring 2014 MAPS Chat (a larger copy is available via PDF by clicking [here](#)), which highlights WRP codes. Each of the feather tracts has been coded based on the feather generations within it. This figure has been updated to include a red bar beneath the first cycle and a blue bar beneath the second/definitive cycle (first cycle passerines have juvenile or formative feathers in the tracts, but no definitive/adult basic feathers).

The first letter of the WRP code indicates the cycle. All passerines after the first prebasic/prejuvenile molt but before the first adult/definitive prebasic molt belong to the first cycle have an F as the first letter of the WRP code. If the bird is molting, the second letter is P (for the pre in the molt name). If the bird is not molting, the second letter is C for cycle. The third letter indicates which plumage the bird is in or is molting into. In Figure 3 on page 4, between each wing stage diagram there is a box indicating the WRP code for a bird in active molt.



Alain Daigle 14

Figure 3



Note: In passerines, the only time the second cycle designation can be used is during the second prebasic. Prior to the molt, the bird is in its first cycle. After the molt, all feathers are prebasic feathers and it is not possible to determine if the bird is in its second or subsequent cycle.

I hope that you will work through some of the provided examples to strengthen your WRP assessment skills and that you will use the system in the upcoming MAPS season. Please send questions about the system to me at dkaschube@birdpop.org, and maybe a photo or two I can share on Facebook to provide real-life examples.

References

Howell, S.N.G., C. Corben, P. Pyle, and D.I. Rogers. 2003. The first basic problem: a review of molt and plumage homologies. *Condor* 105:635-653.

Humphrey, P.S. and K.C. Parkes. 1959. An approach to the study of molts and plumages. *Auk* 76:1-31.

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Wolfe, J. D., T. B. Ryder, and P. Pyle. 2010. Using molt cycles to categorize the age of tropical birds: an integrative new system. *Journal of Field Ornithology* 81:186-194.

WRP Coding Examples

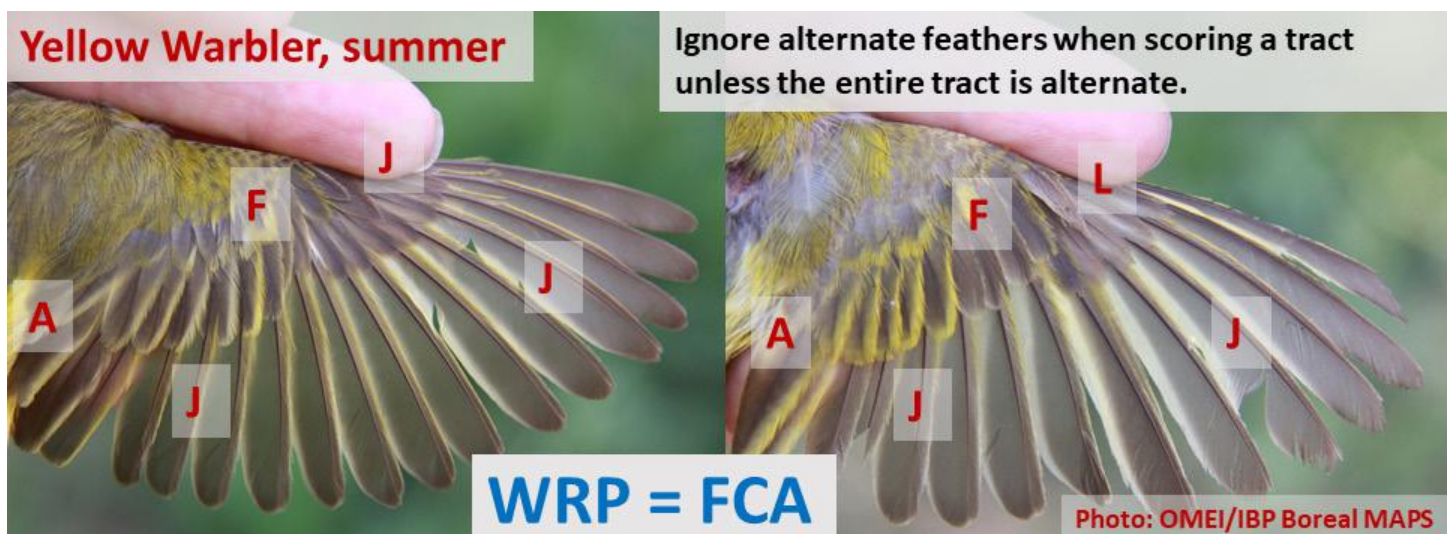
by Danielle Kaschube

This section provides some photographic examples of five species commonly captured by MAPS banders. There are a variety of molt strategies and ages represented. This issue of *MAPS Chat* contains only one photo for each species with the feather tracts labeled and the WRP code given. This [WRP example link](#) will take you to a slide show that contains a diagram of the molt strategy of the species, a diagram with no labelling, a diagram with the feather tracts scored, and a diagram with the WRP code provided. The diagram may not exactly match the photograph because both are just examples of the species. The slide show will be very helpful if you want to practice your coding. See pages 2 and 3 of this edition for the codes used in this example.

Gray Catbird –The primary coverts are brownish (therefore juvenile), the eight inner greater coverts are gray and the outer two are brownish (a molt limit between juvenile and formative), the top two tertials (s8 & s9) are gray and the outermost (s7) is brownish (molt limit), the primaries and remaining secondaries are brownish (juvenile). Because this bird retains juvenile feathers, it is still in its first cycle. This individual is not molting, so the middle letter of the WRP code will be C. The presence of formative feathers indicates it is in its formative plumage. Therefore, its WRP code is FCF and, using the calendar ageing system, it is a SY (second year) bird.



Yellow Warbler –The individuals pictured below are of the same plumage class, but the individual on the right has much more wear on its feathers. The primary coverts are brownish with no edging (juvenile) though the wing on right appears to have had the innermost primary covert molted, so the tract has been coded as a molt limit. The outer greater coverts have relatively dark centers but the edging has worn away suggesting they are formative feathers and the remainder of the greater coverts are alternate. For MAPS scoring purposes, alternate feathers are ignored when scoring a tract (unless the entire tract is alternate) so the tract is scored as formative. The tertials all appear to be fresh with bright yellow edging and are alternate. Because both birds still retain juvenile feathers, they are in their first cycle and the presence of alternate feathers indicate it is in its alternate plumage. They are not molting so the middle letter of the WRP code will be C. Therefore, their WRP code is FCA and, using the calendar ageing system, they are SY (second year) birds.





Common Yellowthroat –The primary coverts are brownish with very little edging (juvenile), all the greater coverts have buffy-cinnamon tips (juvenile), and all primaries, secondaries and tertials are uniform and fresh. Because this bird has juvenile feathers, it is still in its first cycle. This individual is not molting so the middle letter of the WRP code will be C. The feather tracts, including the body, are uniformly juvenile; therefore, its WRP code is FCJ. Using the calendar ageing system, it is a HY (hatch year) bird.



Song Sparrow –The primary coverts have dusky brown centers that don't contrast markedly with the greater coverts (both tracts are basic) and all primaries, secondaries and tertials are uniform. Because this bird has uniformly basic feathers it is in its definitive basic cycle. This individual is not molting so the middle letter of the WRP code will be C. Therefore, its WRP code is DCB and, using the traditional calendar ageing system, it is a ASY (after-second year) bird. However, I have a confession to make: when I looked through the OMEI/IBP Boreal MAPS library of SOSP photos, I mis-aged about half of the photos I looked at. The second time through I did significantly better but still didn't feel confident in my determinations. Because I coded the tracts basic, but was uncertain, as I was in several of these cases, I would use the WRP code UAJ indicating this is unknown cycle but it is after juvenile plumage and the traditional calendar age would be AHY (after hatch year). When in doubt, always go with the more general coding that you know is correct.



Downy Woodpecker –The primary coverts are brown except for the outermost two (only one visible) and the innermost one. We ignore the innermost one for ageing because it is just molting in. A mix of juvenile and basic primary coverts indicate this bird has gone through at least two prebasic molts and it is in the midst its third prebasic, so this bird is beginning its third cycle. This individual is molting the primaries so the middle letter of the WRP code will be P. Therefore, its WRP code is TPB and, using the calendar ageing system, it is a TY (third year) bird.

The OMEI/IBP Boreal MAPS photographs are courtesy of Boreal MAPS, a joint project of Owl Moon Environmental, Inc. and The Institute for Bird Populations.

North American Bird Bander Seeks Content for Upcoming Issues

The quarterly journal *North American Bird Bander*, published by the Eastern, Inland, and Western Bird Banding Associations, is seeking content for upcoming issues. Banders are encouraged to consider submitting content. The journal publishes peer-reviewed science derived from banding studies, including:

- Descriptions of special techniques useful to bird banders, i.e., aging and sexing of birds.
- Analysis of data or observations that demonstrate changes in population sizes or species assemblages over time, or after a disturbance or a change in management.
- Descriptions of interesting molts or plumages.
- Unique or interesting behavioral or other ecological observations.
- "How to" articles on making and using banding equipment.
- Reviews of current books in the fields of bird ecology and behavior relevant to banding.

For publication guidelines and instructions, go to:

<http://www.westernbirdbanding.org/AuthorsGuidelines.pdf>



IBP Bird Banding Classes for 2019!

IBP is pleased to announce we will once again be offering several bander training classes in 2019, in conjunction with local host organizations. Both beginning and advanced classes are available. Classes often fill quickly, so if you are interested, we recommend signing up soon. Live links are below in [blue](#).

An advanced banding class will be held April 10-13, 2019 at the [Rob & Bessie Welder Wildlife Foundation](#) in southern Texas, near Stinton. Additional information is available on the [class information sheet](#). Please contact the class host, [Angie Arredondo](#) (phone: 361-364-2643), or visit the Welder Foundation website to register.

A beginner banding class will be held April 20-26, 2019 at the [Opossum Creek Retreat](#) in south central West Virginia, near the New River Gorge National River. Please contact the class host, [Keith Richardson](#) (phone: 888-488-4836), to register or for more information about the class.

Three banding classes will be held at the [Wolf Ridge Environmental Learning Center](#) in northeastern Minnesota: a beginner class June 23-30, 2019; an advanced class July 2-6, 2019; and a Youth Ornithology Camp (for kids entering grades 10-12) July 7-13, 2019. Please contact the class host, [Peter Harris](#), or check out the [banding class page](#) for the beginner and [advanced classes](#) or for the [Youth Ornithology Camp](#) on Wolf Ridge's website for more information, including how to register.

A beginner banding class will be held July 7-13, 2019 at the [Hurricane Island Center for Science and Leadership](#) off the coast of central Maine. Please contact the class host, [Teddy Simpson](#) (phone: 207-867-6050), or see the [banding class registration page](#) on Hurricane Island's website for more information, including how to register. Additional information is also available on the [class information sheet](#).

An advanced banding class will be held September 15-19, 2019 at [The Clifton Institute](#) near Warrenton, Virginia. Please [contact the staff](#) of The Clifton Institute for more information, including how to register.

Classes are often added throughout the year so please visit [IBP's banding class page](#) for more information. If you would like to host a class at your facility, information for doing so is available there.



Yellow-bellied Flycatcher

MAPS in Eastern Nebraska

by Rick Schmid

My MAPS story is not so much the story of a MAPS station as a "MAPS Legacy." It begins with our "MAPS Matriarch," Elizabeth (Betty) Grenon. As a long-time birder, bander, and general conservationist, Betty felt strongly that she wanted to make a contribution to science with her banding efforts. When MAPS began in 1989, it provided her an excellent opportunity to accomplish this goal. She started her first MAPS station in 1990 on the Missouri River floodplain of Fontenelle Forest, a 2,000-acre nature preserve south of Omaha in Sarpy County, Nebraska.



*Betty Grenon
(our MAPS Matriarch)
with Traill's Flycatcher
Photo: Rick Schmid*

This first site was heavily populated with cottonwood, sycamore, hackberry, wood nettle, garlic mustard, stickseed and MOSQUITOS. Back then, Betty banded during all ten MAPS periods. She ran the station almost entirely by herself, carrying her banding equipment with her during net runs, and banding/releasing the birds at the nets. The term "molt limit" was not widely used back then and most ageing was done by looking at primary coverts.

Betty ran this site from 1990-1998, until the mud, mosquitos and nettles got the best of her. During the last couple of years, she was joined by a passionate naturalist named Craig Hensley, who brought a youthful enthusiasm to Betty's banding program. As a sub-permittee on Betty's permit, Craig gained valuable experience doing educational banding for the public. By 2001, Craig and Betty were ready to get back into MAPS, this time at Boyer Chute National Wildlife Refuge in Fort Calhoun, Washington County, Nebraska (north of the Omaha metro). The Boyer Chute station was on a grassy island surrounded on three sides by the Missouri River and one side by Boyer Chute. The habitat was cottonwood, mulberry and brome/prairie grasses.

By this time, Craig and Betty had asked me to help them at the Boyer Chute site. With assistance from numerous volunteers, the three of us operated the

station until 2003, when Craig moved to Texas, where he still operates a MAPS station...or two. Betty and I continued to operate the station, and by the time our site was flooded out in 2010, I was leading the project with Betty's help.



*Craig Hensley with
Clay-colored Sparrow
Photographer unknown*

I was first introduced to bird banding as a teenager by Mrs. Evelyn Dabbs in Sumter, South Carolina, but I had little opportunity to pursue banding until I met Craig and Betty in the 1990s. They were excellent mentors during our numerous MAPS sessions and public banding programs. By the time we left Boyer Chute, I was ready to take full responsibility for our MAPS station. At Betty's suggestion, she and I swapped places on our permit. I became the Master Bander, and she became a sub-permittee. In 2011, I moved our MAPS station to Neale Woods Nature Center, north of Omaha, in Douglas County.

The station at Neale Woods was in a restored tall-grass prairie on loess hills bordered by bur oak, mulberry, and linden woodland. We were there from 2011-2016, but Betty's ability to help was hampered the last two years by the side effects from chemo treatments, and she succumbed to cancer on November 11, 2016, just a day before her 80th birthday.



*Rick Schmid with
HY Eastern Phoebe
Photo: Kris Hammond*

For various reasons, I left the Neale Woods site after the 2016 season and moved our MAPS station to Turkey Creek Preserve, south of Fort Calhoun, Nebraska. We have completed two MAPS seasons at Turkey Creek, and it may prove to be our best site yet. I have a team of talented, dedicated, and experienced volunteers who provide invaluable help. I am sure one of them will be the next "Betty" who carries the MAPS legacy forward in eastern Nebraska.

Over the years, it has been interesting to conduct MAPS projects at various sites and note the differences/similarities in the variety and number of species banded. Here is a snapshot of our findings from our sites:

Site	Yrs	Birds Banded	Species Banded	Birds Per 10 Net-hrs	Percent HY	Most Unusual Species
Fontenelle	9	1,008	46	2.5	19%	Yellow-throated Warbler
Boyer Chute	9	1,928	47	5.4	22%	Northern Bobwhite, Sharp-shinned Hawk
Neale Woods	6	829	39	3.5	*52%	Tennessee Warbler, Blue-headed Vireo

* Periodical cicada emergence in 2015 raised this number significantly.

Bird Genoscape Project Update

by Jasmine Rajbhandary

The Bird Genoscape Project had another successful year in 2018 thanks in great part to the continued support of many MAPS station operators throughout North America. Collecting blood samples from individuals on the breeding grounds is the vital first step needed to construct a genoscape (a map of genetic variation) for each of our target species, and we would like to thank all those who contributed to the project.

Using blood samples collected between 2016 and 2018, we successfully completed constructing genscapes for American Kestrel, Willow Flycatcher, Burrowing Owl, Common Yellowthroat and Yellow Warbler. As a result of your contributions, the first in our series of papers on Yellow Warblers and Willow Flycatcher were published last year in the journals, *Science and Ecology Letters* (see citations on following page)! In these two studies, we used the DNA from feathers to investigate how these species were adapted to climate and which populations will be most vulnerable to future climate change. Please let us know if you would like us to send you a copy of these papers. We are also actively working on building genscapes for American Redstart, American Robin, Canada Warbler, Kentucky Warbler and Painted Bunting using blood samples collected in 2018. Over the next few years we will continue to genotype feather samples from throughout the range of our target taxa in order to build complete flyway maps for each species.



In addition to our work on the breeding grounds, we have also increased our collection efforts on the wintering grounds. In November, we held a workshop in Mexico City, Mexico to build collaboration between the Bird Genoscape Project, the Institute for Bird Populations (IBP), Universidad Nacional Autónoma de México (UNAM) and Comisión Nacional para el Conocimiento y Uso de la Biodiversidad (CONABIO) along with field station operators and scientists across Mexico. Through this workshop, we developed partnerships with many new

continued

collaborators who expressed interest in collecting feather samples for the genoscape project. Finally, Senior Research Fellow, Rafael Rueda-Hernandez, has been working hard in the field to collect feathers from across Mexico as well as continuing to spread the word about the Bird Genoscape Project in presentations to universities and research institutes across the country. Go, Rafa, go!

If you would like to learn more about any of our target species, please contact Jasmine Rajbhandary (jasminerb@ucla.edu) or visit our website (www.birdgenoscape.org).

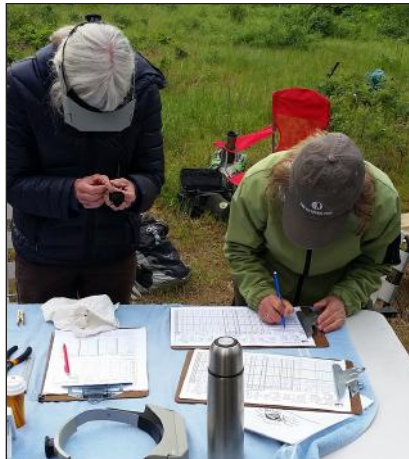
Ruegg, K. C., R. A. Bay, E. C. Anderson, J. Saracco, R. J. Harrigan, M. Whitefield, E. H. Paxton, T. B. Smith. 2018. Ecological genomics predicts climate vulnerability in an endangered southwestern songbird. *Ecology Letters* 21:1085-1096.

Bay, R. A., R. J. Harrigan, V. L. Underwood, H. L. Gibbs, T. B. Smith, and K. C. Ruegg. 2018. Genomic signals of selection predict climate-driven population declines. *Science* 359:83-86.

New MAPS Operators Join the Flock – Welcome!

The following operators joined MAPS in 2018-19. Most are beginning operations at new stations but others have inherited a previously operated station or are starting a new station after being away for a while. We look forward to including them as part of the MAPS family for many years to come!

Abigail Arfman Fort Polk, LA
Tyler Christensen Pennington, NJ
Ryan Dudragne Saskatoon, SK
Caroline Ellison Paducah, TX
Michael Fargione Millbrook, NY
Scott Findholt Cove, OR
Jenyva Fox Fountain, CO
Emily Gaydos Camp Lejeune, NC
Ashli Gorbet Oak Harbor, OH
Audrey Heagy St. Williams, ON
Ryan Jacob Oak Harbor, OH



Sarah Ludlow Regina, SK
Kyler McKee Fort Polk, LA
Shannon Mendia San Diego, CA
Michael Morrison La Verne, CA
Rheanna Neidinger Running Springs, CA
M. Cathy Nowak La Grande, OR
Beckie Prange Ely, MN
Anthony Squitieri Asheville, NC
Brandi Van Roo Framingham, MA
Walter Wehtje Fort Collins, CO

Used Nets Needed to Support Latin American Banders

We asked and you delivered – but we're not done yet! Over the past 5 years, MAPS banders have donated hundreds of used nets to support their fellow bird banders in the Monitoreo de Sobrevivencia Invernal (MoSI) program, the IBP-administered network of banding stations in the Neotropics. Thank you!

The MoSI program has grown enormously in the past few years, adding dozens of stations from northern Mexico to Argentina, and many places in between, including Cuba, Venezuela, Nicaragua, Belize, Jamaica, and elsewhere. As you know, nets are expensive, and this and other equipment can sometimes mean the difference between a station operating or not. With a grant from the March Conservation Fund, we are able to purchase banding pliers, scales, and other equipment, but we rely on nets supplied by MAPS banders as an essential part of the program.

If you have any lightly used nets, please consider donating them. For our purposes, lightly used means a net that can be repaired with 2 hours or less of work – for example, up to a dozen golf ball-sized holes, a few baseball-sized holes, or 1-2 basketball-sized holes. Please don't send anything in worse shape than that. We sincerely appreciate anything you can send. Donations can be sent to: Steve Albert, IBP, PO Box 633, 17 McNiel St, Ramah, NM 87321.

IBP is a non-profit organization. Your donation may be tax deductible – please consult your tax advisor.

How Is Climate Change Affecting Yosemite's Birds?

by Steve Albert

New IBP study examines 25 years of data from Yosemite National Park's MAPS stations

One of the great strengths of the MAPS program is its longevity. Some stations in the network have been operating for nearly three decades. Yosemite National Park is home to five of the longest-operating stations, with Hodgdon Meadow established in 1990. IBP scientists and collaborators from the National Park Service (NPS) recently took advantage of these stations' long tenure to publish a ground-breaking paper about the effects of climate and elevation on the breeding ecology of 25 species of landbirds. The paper was published online in January in the journal *Global Change Biology*.

Climate change has been linked to shifts in distributions, population trends, and other aspects of the life history of many species of birds. These shifts often happen through the influences of climate change on the demographic processes, including productivity, that drive populations.

For this study, IBP and NPS scientists examined trends in annual snowfall and spring temperature, along with the timing of breeding and the number of young produced at six Yosemite MAPS stations between 1993 and 2017. The stations were located in montane habitat at elevations ranging from 1,311 to 2,402 meters (4,300 to 7,880 feet) above sea level.

Key questions included:

- How has the climate changed in Yosemite during the study years?
- Are birds adapting to climate change by adjusting the seasonal timing of breeding?
- Is the changing climate affecting birds' ability to produce young?

Over the study period, annual snowfall showed a decline that ranged from 10 mm (0.4 inches) per year at the highest station to 2 mm (0.08 inches) at the lowest station. At the same time, spring temperature increased by more than 1°C (2°F). Overall, species shifted their nesting season earlier during the study period. First capture date of juvenile birds advanced by about 5 days over the 25 years of the study. Warmer temperatures and less snow were correlated with a slight increase in annual productivity.

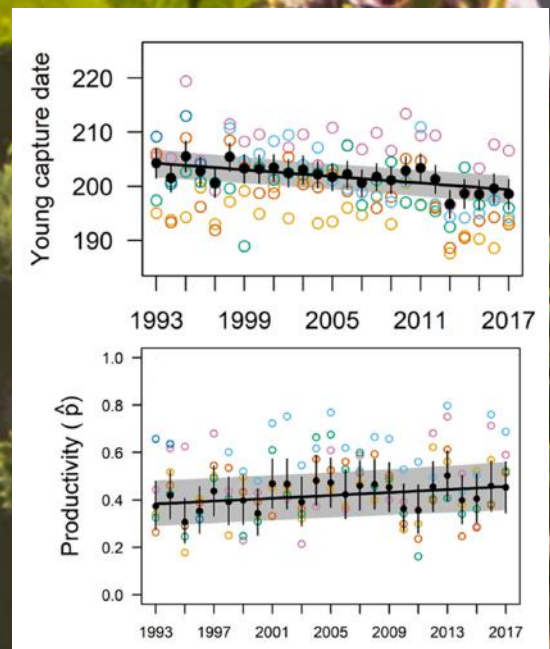
These results, along with others detailed in the published paper, suggest that nesting birds have tracked variation in climatic conditions at Yosemite, and, perhaps contrary to expectations, benefited from a trend toward warmer, drier springs. However, continued warming and multiyear drought or extreme weather years may alter these relationships in the future. Multispecies demographic modeling can provide an important tool for guiding bird conservation strategies under global change.

Saracco, J.F., R.B. Siegel, L. Helton, S.L. Stock, and D.F. DeSante. 2019. Phenology and productivity in a montane bird assemblage: Trends and responses to elevation and climate variation. *Global Change Biology* 2019:1-12. [Read the full paper here!](#)

Top graph: Across species, breeding phenology (mean first capture date of juvenile birds) at Yosemite's MAPS stations advanced by 0.2 day/year, or 5 days over the 25-year study. The vertical axis refers to the day in the calendar year (e.g., capture date 200 is July 19). In both graphs, open, colored circles represent six distinct MAPS stations; black circles are the mean estimates for all stations combined.

Bottom graph: Annual productivity (defined here as the probability of a captured bird being a juvenile) was highly variable across years and stations, but tended to increase during the 1993-2017 study period, as climatic conditions generally become warmer and drier (climate change data are provided in the full paper).

Populations of Lazuli Bunting and many other songbirds monitored by IBP's MAPS stations in Yosemite are breeding earlier each year, but continuing to thrive.



The Life and Times of Joe Bird

by Cathy Nowak, Elk Trap MAPS station in Oregon

From egg to bird with down and bone
 Joe Bird's in the nest he knows as home
 It's feathers he needs to be on his own
 His first molt accomplished he now can roam

In juvenile plumage he's fresh and new
 His flight may be clumsy, his landings are, too
 With resources scarce, feathers look a dull hue
 They may wear out fast but Joe won't be blue

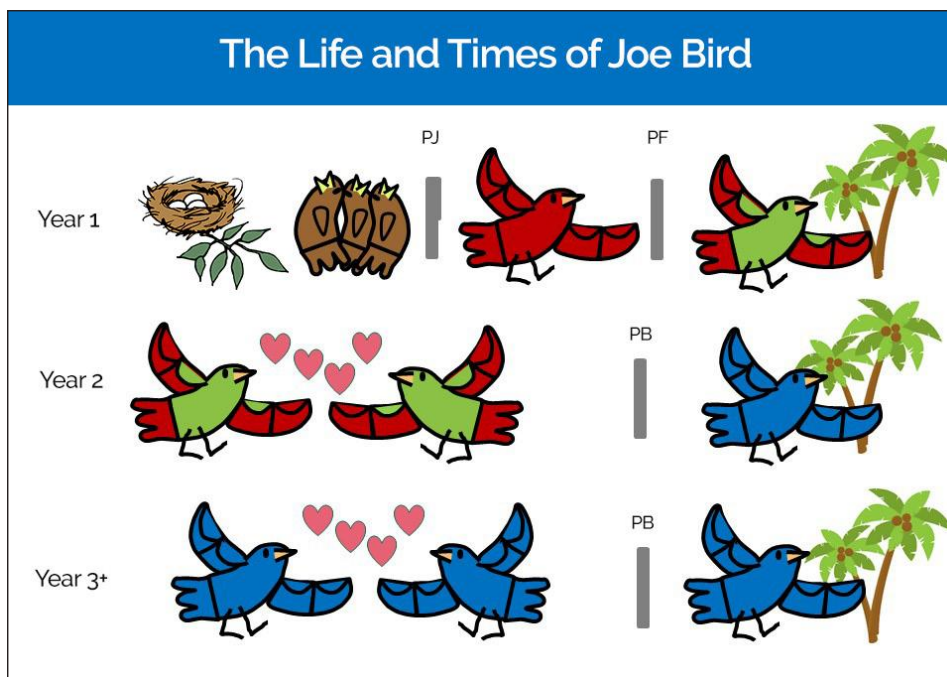
In heat of late summer he's in formative stage
 Plumes of two generations are now all the rage
 When he flies south to winter, he'll be on a new stage
 When the calendar page turns, only date tells his age

Joe isn't yet stylin' but a mate he may find
 He'll breed, he'll nest, to his chicks he'll be kind
 He may help his mate feed them if he's so inclined
 When offspring are fledged, their bond will unbind

At last! Second summer, new wardrobe he'll try
 His plumage, while basic, makes Joe feel quite spry
 He's got one generation of feathers to fly
 South for the winter. That Joe's quite a guy.

In Joe's third year and all the years after
 Attempts to define age are met with much laughter
 Of migration and molt Joe now is a master
 An adult, basic plumage we'll call him hereafter

Joe will be Joe no matter how we may see him
 What he can teach us, we'll do no more than skim
 We hope that his future and others' won't dim
 For the truth is Joe needs us less than we surely need him



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The order deadline is March 31st so get your order in soon!

T-shirts: <https://www.customink.com/g/gae0-00br-brne>

Hats: <https://www.customink.com/g/gae0-00br-cwfx>

Sweatshirts: <https://www.customink.com/g/gae0-00br-cwpd>

Fleece vests: <https://www.customink.com/g/gae0-00br-cw7z>

