Bird Biodiversity in the Flathead River Basin:
A Conservation Hotspot in the Yellowstone to Yukon Corridor

Yellowstone to Yukon
CONSERVATION INITIATIVE

Technical Report #5
May 2005

By: Marcy Mahr &
Kingsford Jones

Yellowstone to Yukon
CONSERVATION INITIATIVE

MONTANA
STATE UNIVERSITY
Mountains and Minds

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Cover photograph Willow Ptarmigan *(Lagopus lagopus)*
By John E. Marriott
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PREFACE

This report summarizes a presentation given by Marcy Mahr at the Critical Lands Workshop on March 25, 2004. Based on the enthusiastic response of workshop attendees from the Flathead Lakers, Flathead Chapter of Audubon, Flathead Valley Land Trust, National Parks Conservation Association, and Montana Fish, Wildlife & Parks among others, the authors have compiled the research results and map images into a report with the hope they will contribute to bird conservation in the Flathead River basin. The research conducted by Dr. Andy Hansen and Kingsford Jones at the Landscape Biodiversity Lab at Montana State University was a three-year project funded by Y2Y Conservation Science grants supported by the Wilburforce and Kendall Foundations (Hansen and Jones 2002; Hansen and Jones 2003). Their scientific findings are contributing to the Yellowstone to Yukon Conservation Initiative's understanding of the patterns of bird abundance and habitat requirements in the Yellowstone to Yukon ecoregion. As a result, conservationists, land managers and land trusts have new information on avian biodiversity to inform conservation planning efforts to maintain or restore natural diversity and landscape connectivity throughout the US and Canadian Rockies.

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EXECUTIVE SUMMARY

Research by Dr. Andy Hansen and Kingsford Jones at Montana State University in Bozeman, sponsored by the Yellowstone to Yukon (Y2Y) Conservation Initiative, helps explain why Montana's Flathead River Basin, and in particular its forested river corridors, are bird diversity hotspots in the Y2Y region and western North America. This report summarizes key findings regarding important areas of landbird abundance and diversity, and provides recommendations for local bird conservation.

Key Findings

1. Bird diversity and abundance are strongly associated with productive, lush habitat that is structurally diverse with different canopy levels and various ages and species of trees and shrubs. These habitat characteristics are very common in the Flathead Basin and should be maintained and, where possible, enhanced to benefit bird species dependent upon a variety of plant communities.

2. Hotspots of bird diversity in western Montana occur in the major river valleys of the northwest–North, Middle and South Forks of the Flathead, Swan, Stillwater—with most of the critical valley bottom habitat of western red cedar, western hemlock, western white pine, grand fir, western larch, Douglas-fir, ponderosa pine forests, and black cottonwood occurring primarily in unprotected areas outside of Glacier National Park and surrounding designated Wilderness Areas.

3. Avian diversity is evenly distributed between privately and publicly owned forest land in the Flathead Basin. This finding highlights the importance of coordinating land use and management of habitat across ownership boundaries for the benefit of birds.

Recommendations: Things We Can Do For Birds

Results from Hansen and Jones are useful for coarse-scale conservation planning. They point to places of high conservation value for landbirds. The authors of this report offer the following recommendations to help inform and strengthen local conservation efforts.

1. Identify remaining undeveloped, highly productive areas. Bird hotspot areas in the Flathead occur in the valley bottoms and on private lands that are undergoing some of the highest rates of human development in the state.

2. Assess the importance of these undeveloped areas for resident and migratory birds seeking summer breeding residence or stopover habitat during a critical time in their life cycle.

3. Conserve wetland and riparian areas with the goal of achieving avian habitat networks along valley bottoms. Key building blocks were recently established by the Flathead Critical Land Project partners when several high priority wetlands were protected on private land by conservation easements along the mainstem of the Flathead River, and by Montana Audubon when the 440-acre Owen Sowerwine was leased from the State of Montana to contribute riparian habitat along the confluence of the Stillwater and Flathead Rivers on the outskirts of Kalispell.

4. Analyze existing bird information in the Flathead Basin in terms of the diversity and abundance of migratory birds compared to year-round residential birds to see how different species use different habitats, both spatially and temporally. This information would inform conservation strategies specifically targeting migratory or residential birds. It also could contribute to appraising the conservation value of areas for both types of birds, and assist in prioritizing landscapes for protection and restoration.

5. Design avian conservation and restoration activities to benefit as many bird species as possible. Approaches which emphasize all-bird concepts of species diversity and abundance can complement more traditional management actions oriented towards waterfowl, shorebirds or specific threatened species. For example, increased bird conservation in riparian hotspot areas would benefit suites of species of landbirds, shorebirds and waterbirds, as well as support existing species-specific strategies local conservationists are already pursuing for the common loon and harlequin duck.

6. Before finalizing priority areas for conservation, complete one of the primary information gaps by surveying the Flathead's grassland habitats with methodologies that make results comparable to the Landbird Monitoring Project's approach on US Forest Service lands. Grassland areas should be incorporated into avian conservation planning because they typically contain important habitat and associated priority bird species.

7. Assess whether the Flathead Basin is losing key habitat characteristics–for example, how has the composition and distribution of plant communities, age classes and structural stages of the landscape changed in the last 100 years? What do such changes mean for bird diversity and abundance?

8. More specifically, initiate a study of present day distribution of black cottonwood stands in the Flathead Basin to inform protection and restoration strategies. If possible, add historical information to see how distribution of this habitat type has changed and how much has been lost over time.

9. Establish new North American Breeding Bird Survey (BBS) routes which tie to long-term monitoring objectives in areas not currently sampled in the Flathead Basin to track changes in bird presence and absence, abundance, and population trends.

Part I: The Context

INTRODUCTION

The Flathead River Basin makes an internationally significant contribution to North American bird biodiversity. Avian research supported through the Yellowstone to Yukon (Y2Y) Conservation Initiative's science program has allowed us to glimpse the Flathead Basin from a 'bird's eye view'. Maps of the scientific data combined with satellite imagery help us understand where the Flathead Basin fits into the big picture of avian diversity in North America, and help us see trends indicating where within the Flathead Basin avian diversity values are highest. Throughout this report we refer to areas with high numbers of bird species, and particularly high numbers of conservation priority species, as 'hotspots' of avian diversity.

Dr. Andy Hansen and Kingsford Jones conducted analyses based on the North American Breeding Bird Survey data which monitors birds across North America (Sauer et al. 2003), and data from the US Forest Service Landbird Monitoring Project which collects more intensive bird data at more local scales (Hutto and Young 1999). These analyses help explain why the Flathead, and in particular its forested river corridors, are bird diversity hotspots. Using Geographic Information Systems (GIS) they produced maps that allow us to view this bird data at different landscape scales. The coarser scale maps show that the Flathead Basin lies within a continental-scale hotspot of avian diversity; and local analyses indicate that within the Flathead the productive valley bottoms with forested riparian habitats are local hotspots.

Our goal in this report is to provide scientific information that brings recognition of the importance of bird biodiversity and its conservation in the Flathead Basin. We present results of analyses that indicate how the US portion of the Flathead fits into the bigger picture of biodiversity in the Yellowstone to Yukon ecoregion. We then present information describing some of the general areas within the Flathead that may be particularly important, and discuss some of the considerations and actions that might be important to include in a bird conservation strategy for the Flathead.

The research results and recommendations presented in this report may serve as a useful component for providing scientific support for conservation action. Our focus on bird biodiversity (numbers of native and conservation priority species) rather than examining specific species brings a new component to conservation strategies seeking to be more inclusive and advocate for all-bird conservation. We also make a case for conservation of riparian habitat, calling for increased conservation on private lands, including bird diversity and abundance in conservation planning, and reinforcing existing species-specific strategies local conservationists are already pursuing (e.g., common loon, harlequin duck, black-backed woodpecker, etc.).

We begin by considering the large, continental bird flyways and then progressively zoom into to analyzing bird diversity in western Montana and the Flathead Basin.

A BIRD'S-EYE VIEW OF YELLOWSTONE TO YUKON

To understand how some birds use the expansive Yellowstone to Yukon corridor, one should start with a 'bird's eye view' of the Rockies. Figure 1 shows the two major western migratory routes within Y2Y—the Central and Pacific Flyways. These flyways overlap a myriad of habitat types and jurisdictions. Figure 2 provides a map of protected areas within the Central Flyway in the Y2Y region. This map includes current areas designated for land protection as national parks, wilderness and special management areas. In addition, Figure 3 provides locations of reserves managed for bird conservation such as, Important Bird Areas (sites providing habitat for bird species of concern), RAMSAR sites (internationally important wetlands), as well as Migratory Bird Sanctuaries, World Heritage Sites and Biosphere Reserves. When combined, GIS layers in Figures 2 and 3 provide a picture of what land areas are currently being protected, and in some cases, expressly managed for birds.

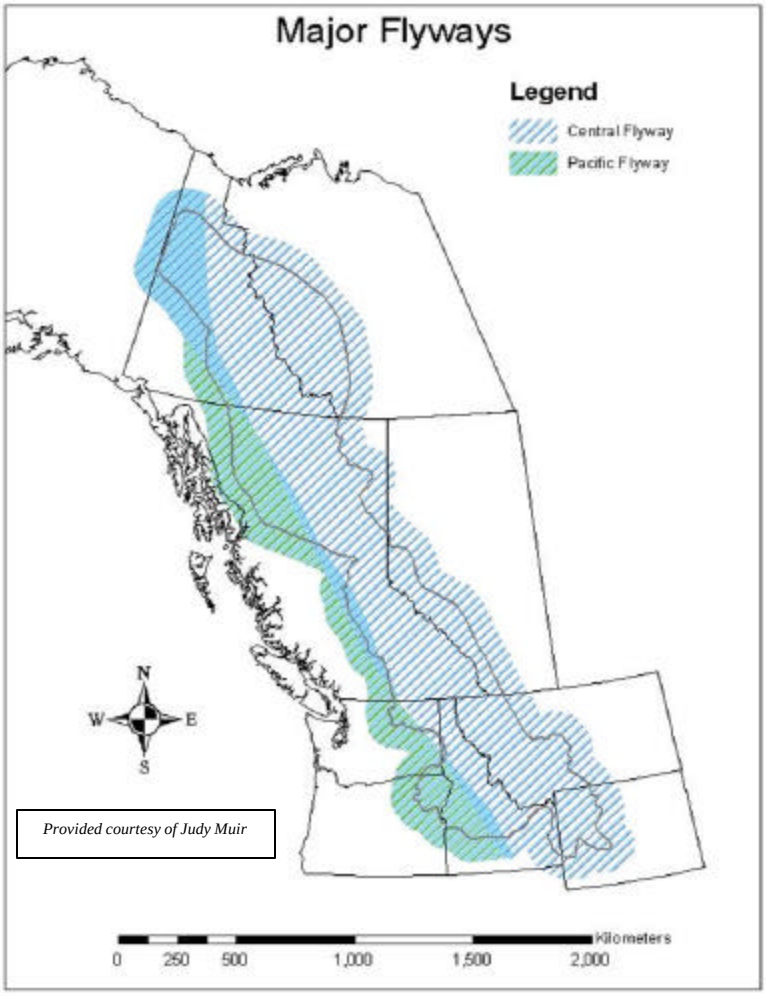


Figure 1. Major bird migratory flyways in the Yellowstone to Yukon ecoregion.

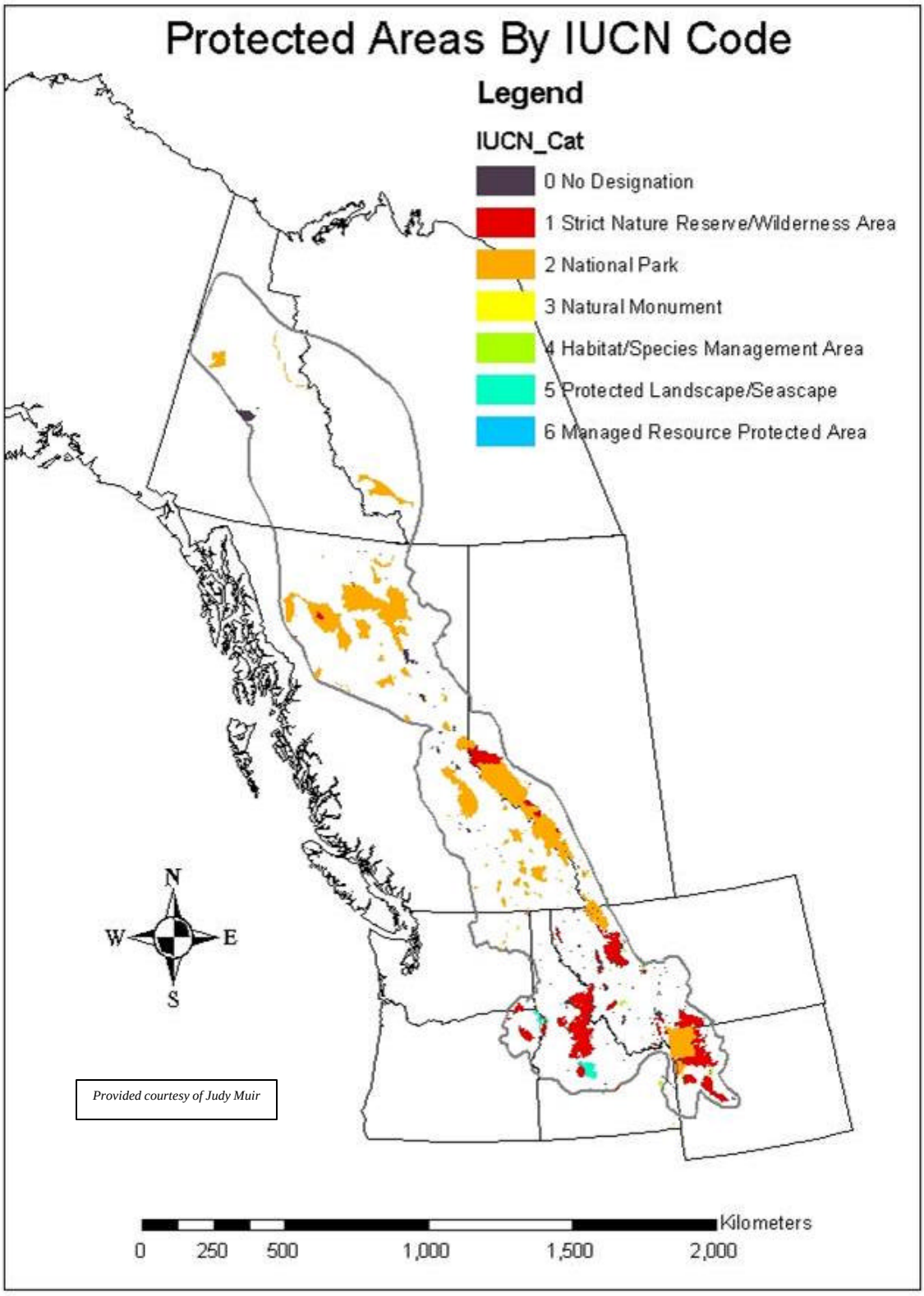


Figure 2. Areas designated for protection that also may be managed for bird conservation

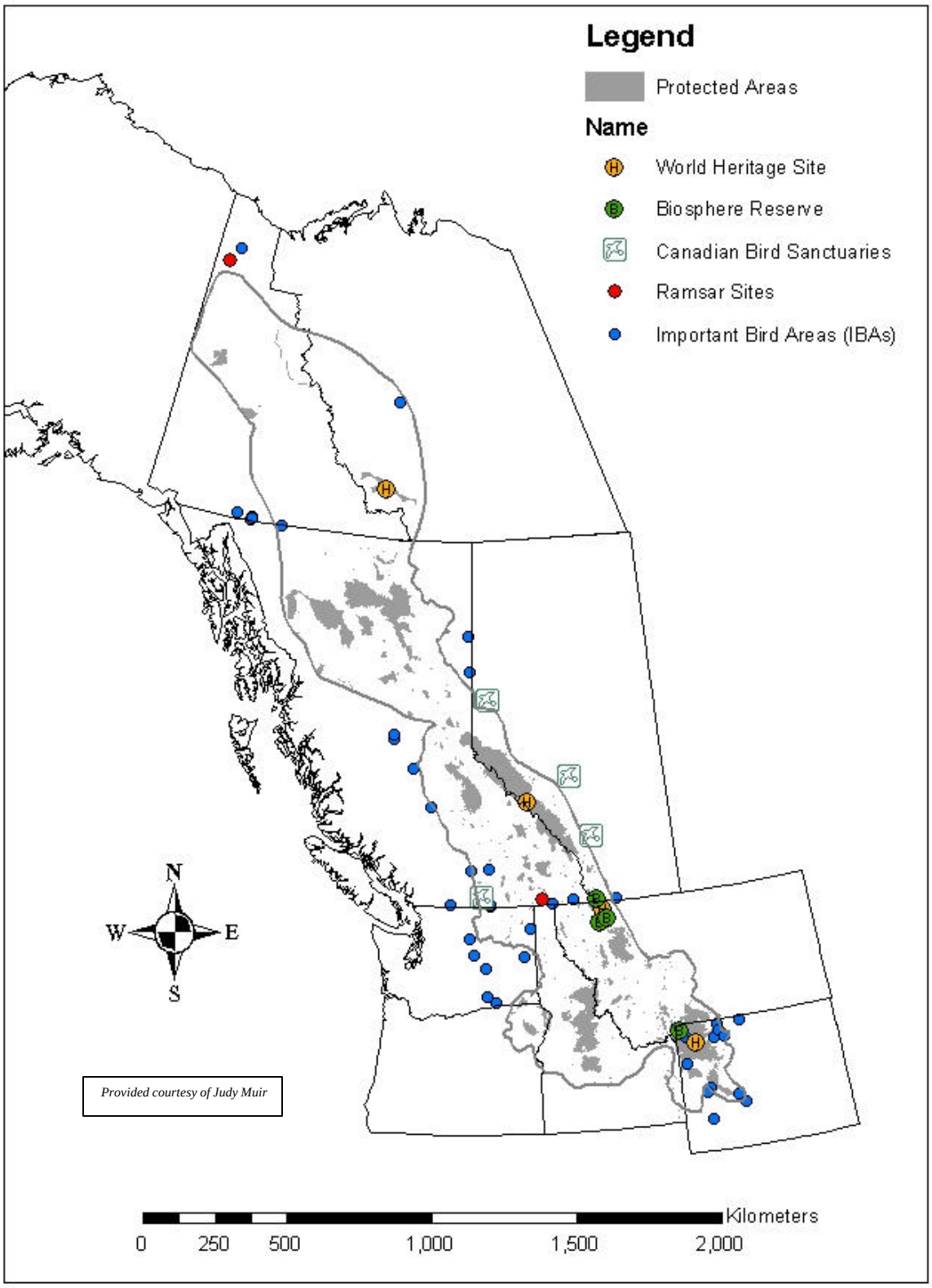


Figure 3. Bird management areas in the Yellowstone to Yukon ecoregion.

Part II: Methods & Results

A key question regarding the preservation of biological diversity is, do our existing protected areas provide enough habitat to protect all native species and natural processes? Within Yellowstone to Yukon ecoregion, the generally agreed upon answer is probably not, especially when wide-ranging and migratory species are considered. Our current protected areas are typically too small, too narrow and too isolated to effectively conserve Y2Y's biological diversity and ecological integrity. Especially in the highly fragmented landscapes of the US portion of Y2Y, the solution to these habitat islands is to create *habitat networks* of connected core areas. Many bird biologists agree that providing secure short- and long-distance flight pathways between patches of high quality habitat can help offset some of the short-comings of our current reserve system.

Along with identifying significant areas that provide habitat cores and connectivity for birds, we need a better understanding of how birds use the Y2Y landscape. An important aspect of the process of identifying key areas is determining the locations that support exceptional diversity of avian species. This is what Hansen and Jones's study aims to provide.
It is estimated there are nearly 300 breeding species of birds in Yellowstone to Yukon ecoregion. In examining bird diversity, one of the measures used by Hansen and Jones was *richness*, which is simply a count of the total number of species at a given location. The most general form of richness is provided when all bird species are counted, regardless of their conservation priority.
Figure 4 shows the locations of the Breeding Bird Survey (BBS) routes across all of North America. In this image the BBS routes are color-coded to highlight the routes where exceptionally high numbers of bird species have been detected (observed total species richness averaged over years). The routes with the top 5% of richness values are red. The remarkable thing to notice in this image is that there is only one area within all of western North America that has a large cluster of routes that fall in the top 5%. This hotspot is located in the transboundary region where Montana, Idaho, Washington, British Columbia, and Alberta converge; it falls largely within the boundaries of the Y2Y, and the Flathead River Basin comprises its southeastern corner.

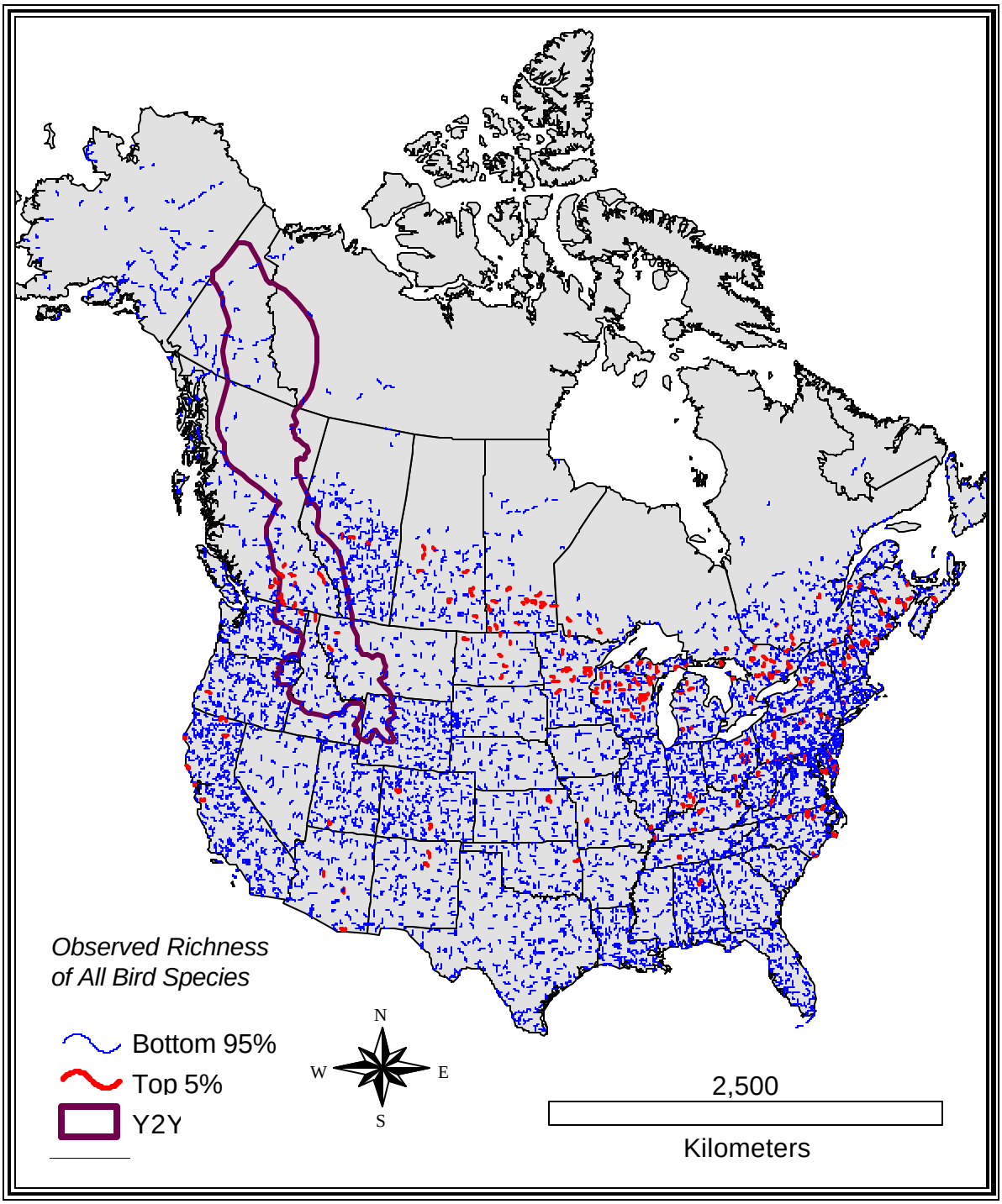
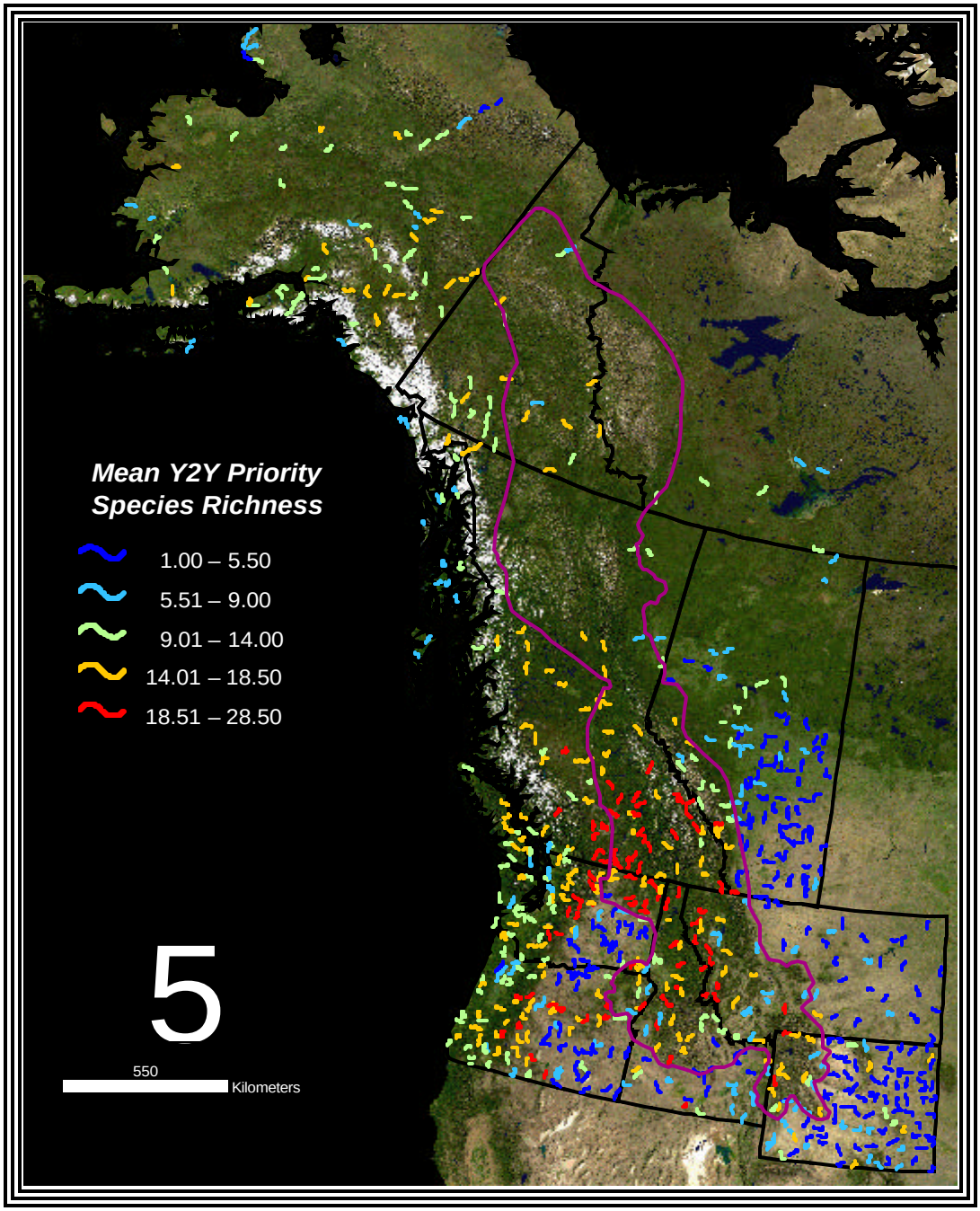


Figure 4. Distribution of observed species richness of Breeding Bird Survey routes in North America. Each red and blue line in this figure depicts a Breeding Bird Survey route (~40 km in length). The red lines represent routes where the average number of bird species detected per year is within the top 5% of values for all of North America. The purple line shows the boundary of the Yellowstone to Yukon ecoregion. The spatial pattern of the red routes suggests northwestern Montana is at the southeastern edge of a continental hotspot of bird species richness.

In Figure 5 we see a different representation of species richness. In this case the values associated with each BBS route represent the average number of Y2Y's 109 priority species counted per survey (see Appendix A for a complete list of Y2Y's priority species). The color scheme in this figure (which is used throughout the remainder of this report) runs the spectrum of colors from blues to yellows to reds, with blues representing locations with low species richness and reds representing high species richness.

The background used in Figure 6 and subsequent images is the NASA true-color composite of MODIS imagery which creates the spectacular "Blue Marble" image of the Earth[1]. From this color coding of routes we note that the distribution of Y2Y priority species richness is not random but concentrated in a region extending along the eastern Cascades, through the Okanagon valley and northern Idaho, to northwestern Montana and the Flathead River Basin.

Trumpeter Swan (*Cygnus buccinator)*
Photo: © John E. Marriott



[1]For more information visit http://visibleearth.nasa.gov/view_rec.php?vev1id=11656.

Figure 5. Distribution of species richness of Y2 Y's priority species in western North America. This map shows the average number of Y2Y priority bird species observed at each BBS route. The routes with the highest values are shown in red, and form a crescent pattern following the eastern Cascades, through the Okanagon valley, and into northern Idaho and northwestern Montana. The background image is the NASA 'Blue Marble' true-color MODIS composite.

Stepping down from this continental scale to a smaller landscape scale to focus on western Montana helps us to view avian biodiversity from yet another perspective. This scale reveals more landscape detail with which to evaluate bird conservation priority areas.

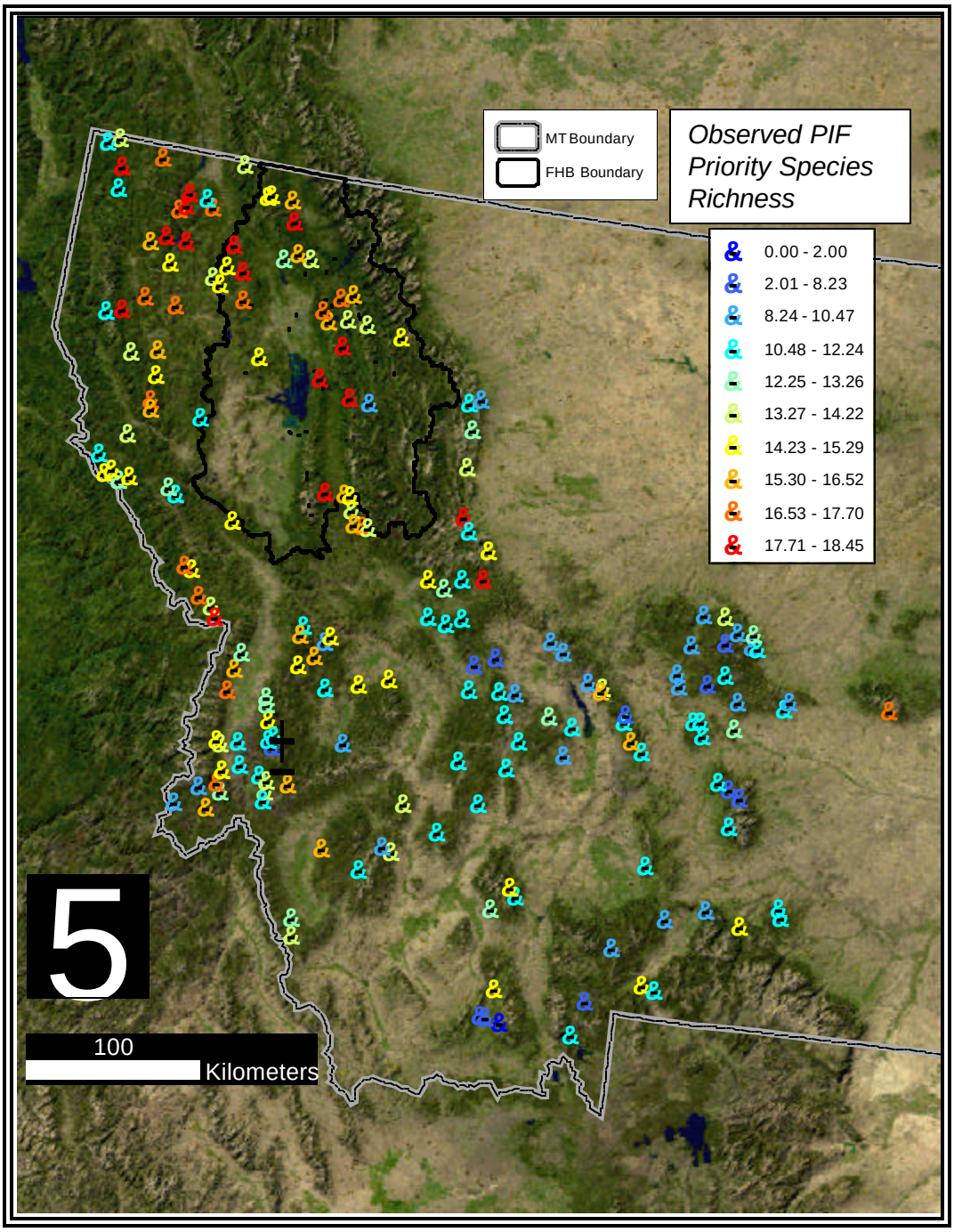


Figure 6. Mean species richness of Montana Partners in Flight priority bird species at US Forest Service Landbird Monitoring Project survey transects across western MT. The black line indicates the boundary for the Flathead River Basin in the US. The background image is the NASA 'Blue Marble' true-color MODIS composite.

A map for western Montana (Figure 6) shows locations of transects for the US Forest Service Northern Region Landbird Monitoring Project. Transects consist of 10 observations, referred to as *point-counts*, located 300 meters apart and randomly located on a 7.5 minute topographic map (Hutto and Young 1999). The map depicts the average number of Montana Partners in Flight priority landbird species (the top 3 tiers) recorded on each transect. Priority birds for conservation action and monitoring in Montana that occur in the Flathead include Olive-sided Flycatcher, Brown Creeper, Common Loon, Harlequin Duck, Black-backed Woodpecker, Bald Eagle, Northern Goshawk, Long-billed Curlew and Calliope Hummingbird, among many others.[2] As shown in Figure 5, red indicates the highest number of species detected (in this case Partners in Flight priority species), and blue represents the fewest. Clearly, the red transects are clustered in northwestern Montana, particularly around the Flathead River Basin.

It should be noted that all of these bird surveys are limited in the species they can adequately monitor. The results presented represent those species that can be monitored well by point-counts and leave out such groups as waterbirds and raptors, as well as nocturnal and colonial species. Censusing and monitoring programs may exist in the Flathead for these other types of birds, which when combined with the Landbird Monitoring data would provide a more accurate measure of "all-bird" conservation value.

Based on the Landbird Monitoring Project point-count survey data, Hansen and Jones built predictive statistical models that relate the number of priority bird species to various measures of the environment. For example, they considered temperature, precipitation, topography, and measures of plant life, as well as distances from important features such as lakes and streams. They used these predictive models within a GIS to create maps that extrapolate richness across the landscape (Figure 7). This map clearly illustrates two important trends in the predicted priority bird species richness. The first is an increasing trend of richness from the Greater Yellowstone Ecosystem to the Flathead; the second trend is bird richness occurs primarily in valley bottoms that have a significant forest component. This becomes more apparent as we zoom in closer, as in Figure 8.

Red Crossbill (*Loxia curvirostra)*
Photo: © Daniel Casey

[2] For more information on MT Partners in Flight visit http://biology.dbs.umt.edu/landbird/mbcp/mtpif/mtpif.htm

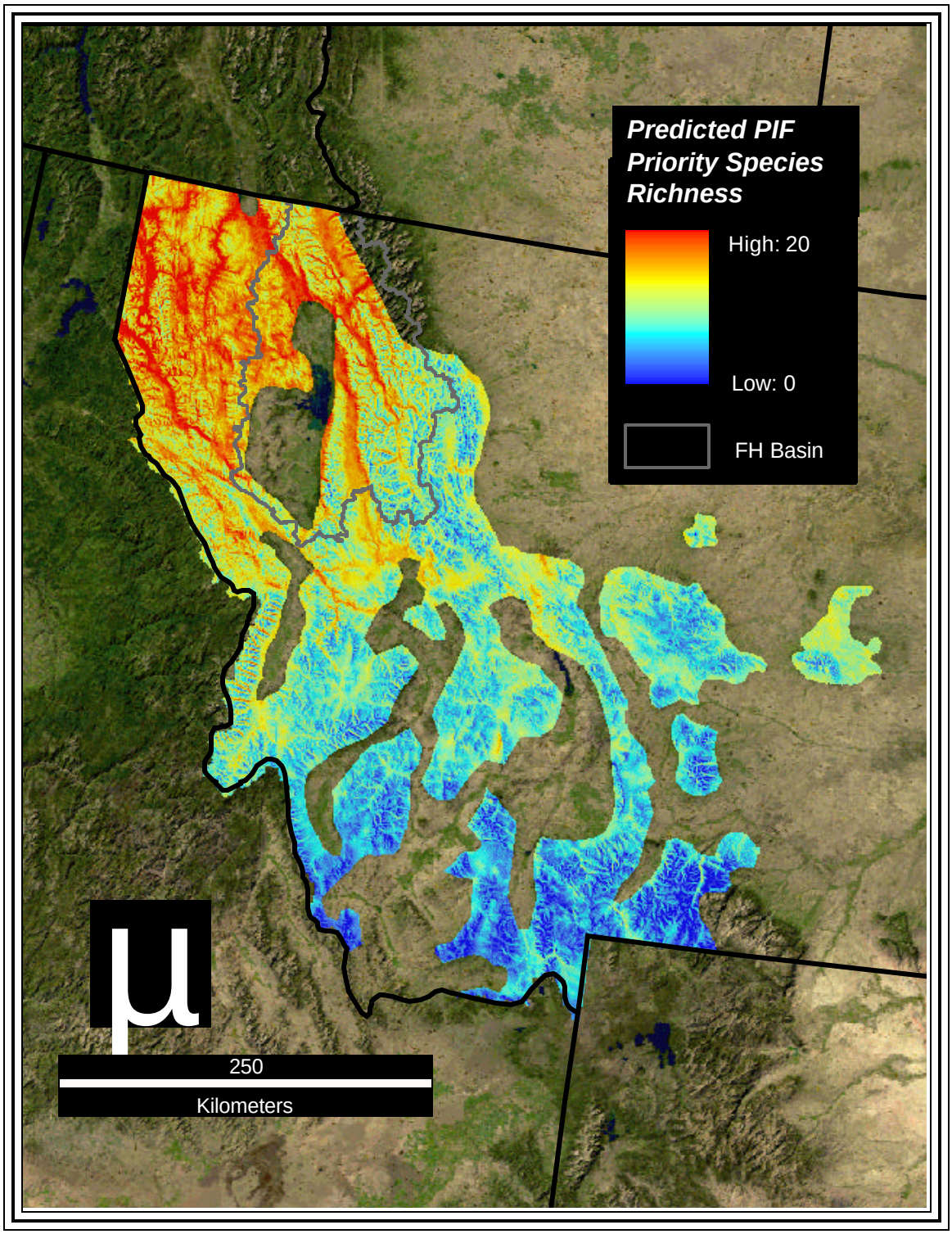


Figure 7. Partners in Flight priority bird species richness in western Montana based on data from the US Forest Service Northern Region Landbird Monitoring Project. The brightly colored portion of this map represents predicted Partners in Flight priority bird species richness, with red being high predicted richness and blue low predicted richness. Predictions are based on statistical models describing the relationship between measured bird richness (at the Landbird Monitoring Project transects shown in Figure 6) and environmental variables. The background image is the NASA 'Blue Marble' true-color MODIS composite.

The Flathead River Basin has higher precipitation, higher growing degree days, more soil nutrients and more plant species and habitat types than other areas of Montana. In other areas in western Montana, such as the Bighole and Beaverhead river valleys, the Yellowstone plateau, the Bridger Range and Belt Mountains, these favorable biophysical characteristics do not occur together to such a degree as in the Flathead. The result is that this area supports many life forms, and many bird species make their homes here. In fact in the Montana portion of Y2Y, only the Yaak River valley has higher bird richness than the Flathead.

Figure 8 focuses into the Flathead River Basin. Basin-level analyses show that bird species richness tracks along the river valley bottoms, especially the North, Middle and South Forks of the Flathead River, as well as the Stillwater River and Swift Creek in the upper northwestern portion of the basin, and the Swan River in the lower central area. Unlike elsewhere in western Montana, valley bottoms in the Flathead Basin (as in the Yaak) are dominated by conifer forests. These moist forest types are typical of the western red cedar, western hemlock, western white pine, grand fir, western larch, Douglas-fir, and ponderosa pine forests of the Cascade and Coast ranges. Large stands of deciduous riparian forests of black cottonwood also contribute important habitat for nesting and feeding for cavity-nesting species like woodpeckers and owls, as well as for great blue herons, bald eagles, and red-tail hawks. Thus, the Flathead is a very special place for birds in Montana, and for the U.S. portion of the Yellowstone to Yukon corridor, because of high quality habitat that supports a very high diversity of landbird species.

Killdeer (*Charadrius vociferous)*
Photo: © John E. Marriott

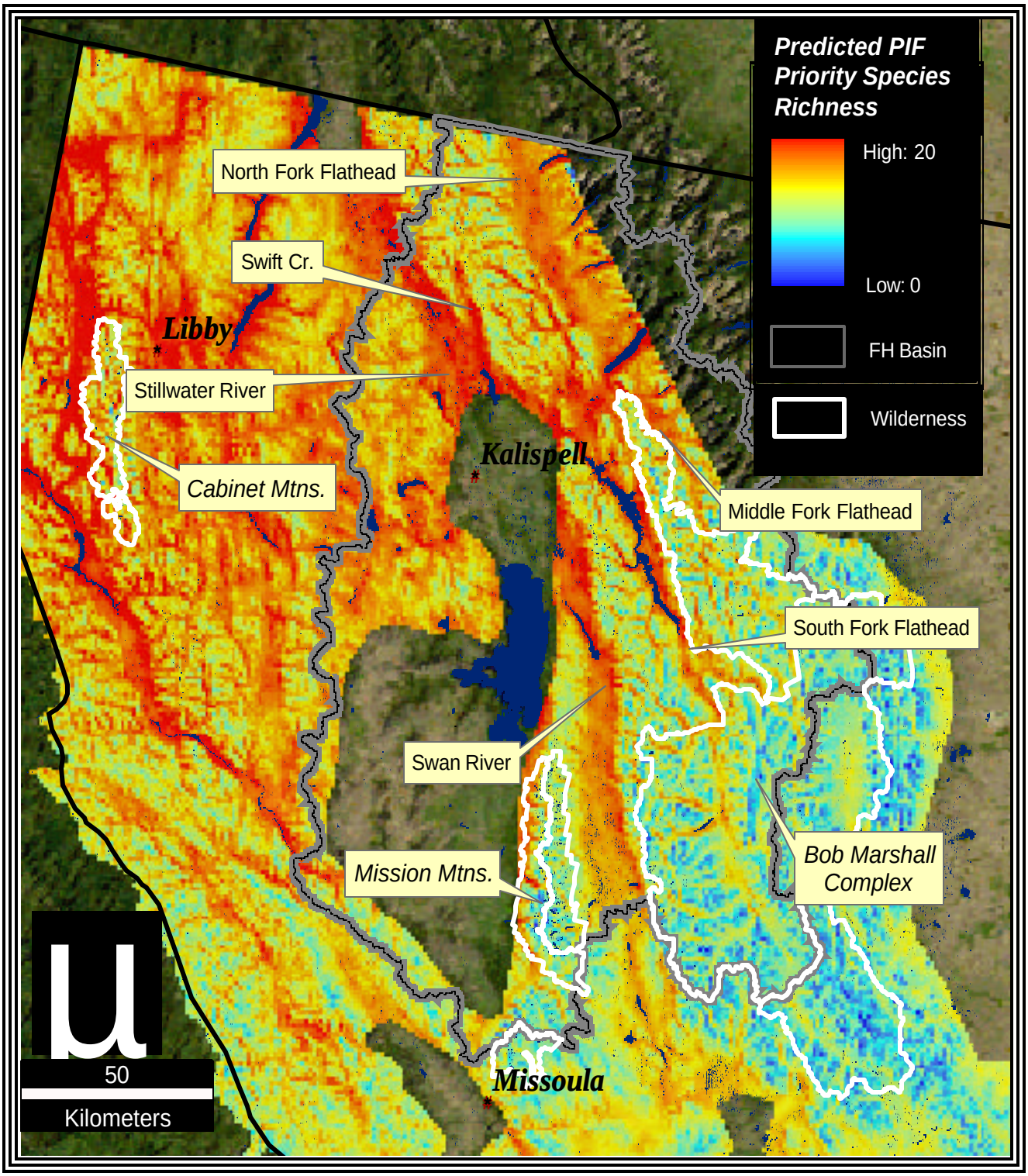


Figure 8. Bird species richness in the Flathead River Basin, MT. This 'zoomed in' image of Figure 7 provides a closer view of the Flathead River Basin (outlined in gray). Regions that are predominately non-forested are outside the range of the model used to make the predictions, and are clipped from the image. It is apparent from this map that the large river valley bottoms have the highest predicted richness, while wilderness areas are located in the less productive areas with low predicted richness.

Part III: Summary

Key Findings

1. Bird diversity and abundance are strongly associated with productive, lush habitat that is structurally diverse with different canopy levels and various ages and species of trees and shrubs. These habitat characteristics are very common in the Flathead Basin and should be maintained and, where possible, enhanced to benefit bird species dependent upon a variety of plant communities.

2. Hotspots of bird diversity in western Montana occur in the major river valleys of the northwest–North, Middle and South Forks of the Flathead, Swan, Stillwater—with most of the critical valley bottom habitat of western red cedar, western hemlock, western white pine, grand fir, western larch, Douglas-fir, ponderosa pine forests, and black cottonwood occurring primarily in unprotected areas outside of Glacier National Park and surrounding designated Wilderness Areas.

3. Avian diversity is evenly distributed between privately and publicly owned forest land in the Flathead Basin. This finding highlights the importance of coordinating land use and management of habitat across ownership boundaries for the benefit of birds.

Recommendations: Things We Can Do For Birds

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9. Establish new North American Breeding Bird Survey (BBS) routes which tie to long-term monitoring objectives in areas not currently sampled in the Flathead Basin to track changes in bird presence and absence, abundance, and population trends.

Appendix I

109 Y2Y CONSERVATION PRIORITY BIRD SPECIES

Alder Flycatcher	Golden Eagle	Rufous Hummingbird
American Avocet	Golden-crowned sparrow	Rusty Blackbird
American Bittern	Grasshopper sparrow	Sage Grouse
American Dipper	Gray Jay	Sandhill Crane
American Golden-Plover	Gray-cheeked Thrush	Short-eared owl
American Pipit	Gray-crowned Rosy Finch	Smith's Longspur
American Tree Sparrow	Green-tailed Towhee	Solitary Sandpiper
American White Pelican	Gyrfalcon	Spotted Sandpiper
American Wigeon	Hammond's Flycatcher	Spruce Grouse
Bald Eagle	Harlequin duck	Surfbird
Bank Swallow	Killdeer	Swainson's Hawk
Barrow's Goldeneye	Lazuli Bunting	Swainson's Thrush
Belted Kingfisher	Lesser yellowlegs	Three-toed Woodpecker
Black Rosy-Finch	Lewis' Woodpecker	Timberline Sparrow
Black Swift	Loggerhead Shrike	Townsend's Solitaire
Black Tern	Long-billed Curlew	Townsend's Warbler
Black-backed Woodpecker	MacGillivray's Warbler	Trumpeter Swan
Blackpoll Warbler	Mountain Bluebird	Tundra Swan
Blue Grouse	Mountain Chickadee	Varied Thrush
Bobolink	Northern Goshawk	Vaux's swift
Bohemian Waxwing	Northern Hawk-Owl	Veery
Boreal Chickadee	Northern Pygmy-Owl	Warbling Vireo
Boreal Owl	Northern Rough-winged Swallow	Western Screech Owl
Brewer's sparrow	Northern Shrike	Western Tanager
Brown Creeper	Northern Waterthrush	Western Wood-Pewee
Burrowing Owl	Olive-sided Flycatcher	White-crowned sparrow
Calliope Hummingbird	Peregrine Falcon	White-headed Woodpecker
Cassin's Finch	Pine Grosbeak	White-tailed Ptarmigan
Cassin's vireo	Plumbeous Vireo	White-winged crossbill
Clark's nutcracker	Prairie Falcon	Williamson's Sapsucker
Columbian Sharp-tailed Grouse	Red Crossbill	Willow Flycatcher
Common loon	Red-breasted Nuthatch	Willow Ptarmigan
Dark-eyed Junco	Redhead	Wilson's Phalarope
Dusky Flycatcher	Red-naped sapsucker	Wilson's Warbler
Ferruginous hawk	Rock Ptarmigan	Wood Duck
Flammulated Owl	Ruffed Grouse	Yellow Warbler
Forster's Tern		

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