Migrants, Mono Lake, Monsoons, and Molt

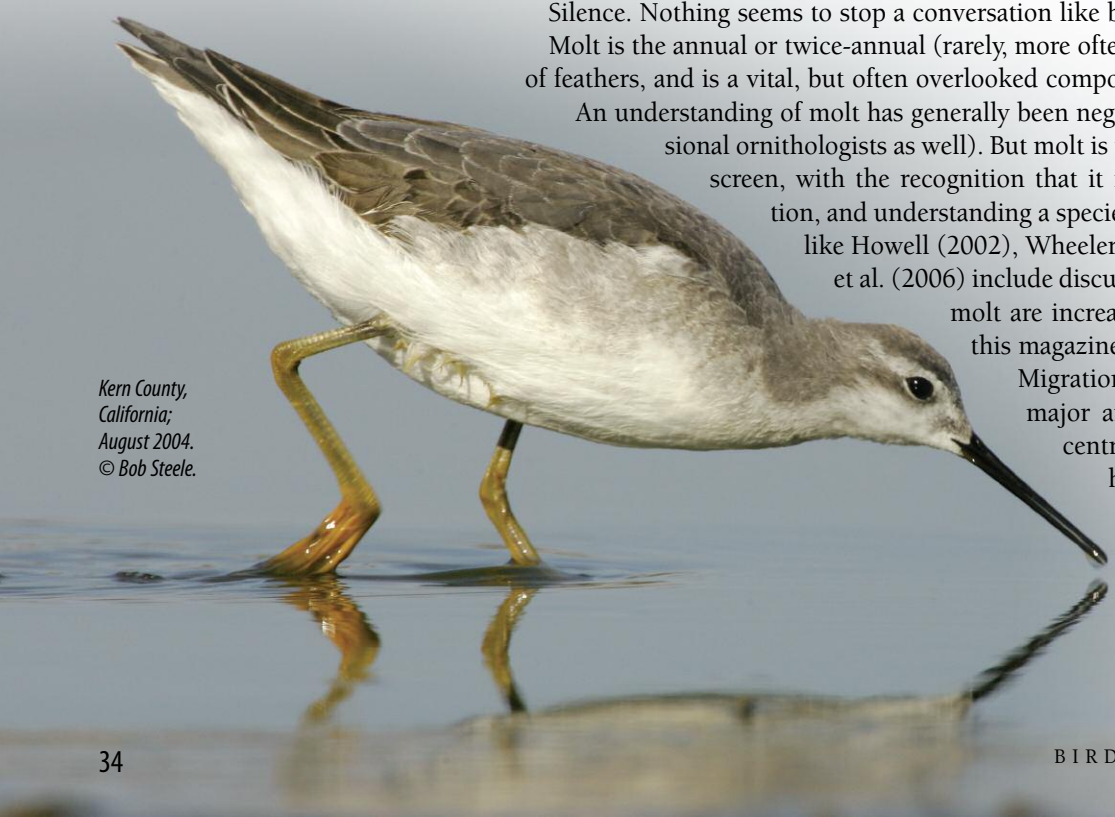
Starting with the long, hot days of July and extending well into November, fall migration is an exciting time to be birding. Most birds are through breeding and are on the move, and we birders are out there watching them. And we love to share our sightings, don't we?

Possible conversation starters: "I heard a flock of Sandhill Cranes flying over yesterday morning." "Hasn't shorebird migration been rather slow this year?" "I saw the first Golden-crowned Sparrows of the fall in my yard yesterday." "Did you notice that the Bushtits are molting?"

Silence. Nothing seems to stop a conversation like bringing up the topic of molt.

Molt is the annual or twice-annual (rarely, more often) shedding and replacement of feathers, and is a vital, but often overlooked component of avian natural history. An understanding of molt has generally been neglected by birders (and professional ornithologists as well). But molt is now showing up on our radar screen, with the recognition that it factors into aging, identification, and understanding a species' biology. Newer field guides like Howell (2002), Wheeler (2003a, 2003b), and O'Brien et al. (2006) include discussions of molt, and articles on molt are increasingly found on the pages of this magazine.

Migration, of course, has long been a major area of avian research and of central interest to birders, and it has been the study of plumage



Kern County, California; August 2004. © Bob Steele.

Mono Lake, California; October 2006. © Joe Fuhrman.

Large numbers of **Wilson's Phalaropes** (opposite page) and **Eared Grebes** (above) gather in fall at Mono Lake, California. How come? The answer is that the birds use Mono Lake for the purpose of molt-migration. This article provides an overview of the phenomenon of molt-migration, with special focus on molt-migration in western North America.

sequence that has brought another component to the study of migration: molt. Both migrating and molting require a lot of energy (in the form of food), and as a result, these two phenomena frequently do not overlap. However, certain species combine the process of molt and migration in some interesting ways.

In most birds that breed in North America, their prebasic molt (generally including all body and flight feathers) occurs after breeding, on either the breeding grounds or wintering grounds, although some species—such as American Avocet and Stilt Sandpiper—start flight-feather molt, arrest or suspend the molt during migration, and then complete molt on the wintering grounds (O'Brien et al. 2006). However, some species migrate to an intermediate area, an area that is geographically distinct from both the breeding and the wintering grounds. This strategy is called molt-migration.

Molt patterns and timing can vary among populations and age classes. For example, most passerines in their first fall molt only some of their body feathers, whereas adults usually replace both their body and their flight feathers in the fall (Pyle 1997). The discussion of molt-migration in this article refers to adults that are undergoing their prebasic molt (body and flight feathers), typically in fall.

Why Molt-Migration?

Migrant birds have a complicated year. In addition to needing to fuel their migration, they have to breed and molt. Molt patterns and how they fit into the annual cycle is a distillation of a number of different factors: distribution and abundance of food, migration route and conditions along the way (for example, trans-Gulf vs. circum-Gulf), length of time required to raise young, distance to wintering sites, competitors (species with a large breeding range may funnel into a smaller wintering area), and habitat (a water bird can afford to become flightless if it moves to the relative safety of large bodies of water). Moving to productive areas specifically to molt may be the best strategy.

A recent article in *Birding* (Putnam 2005) spotlighted molt-migration in the Long-billed Dowitcher. Long-billeds molt in productive locations across a broad area that

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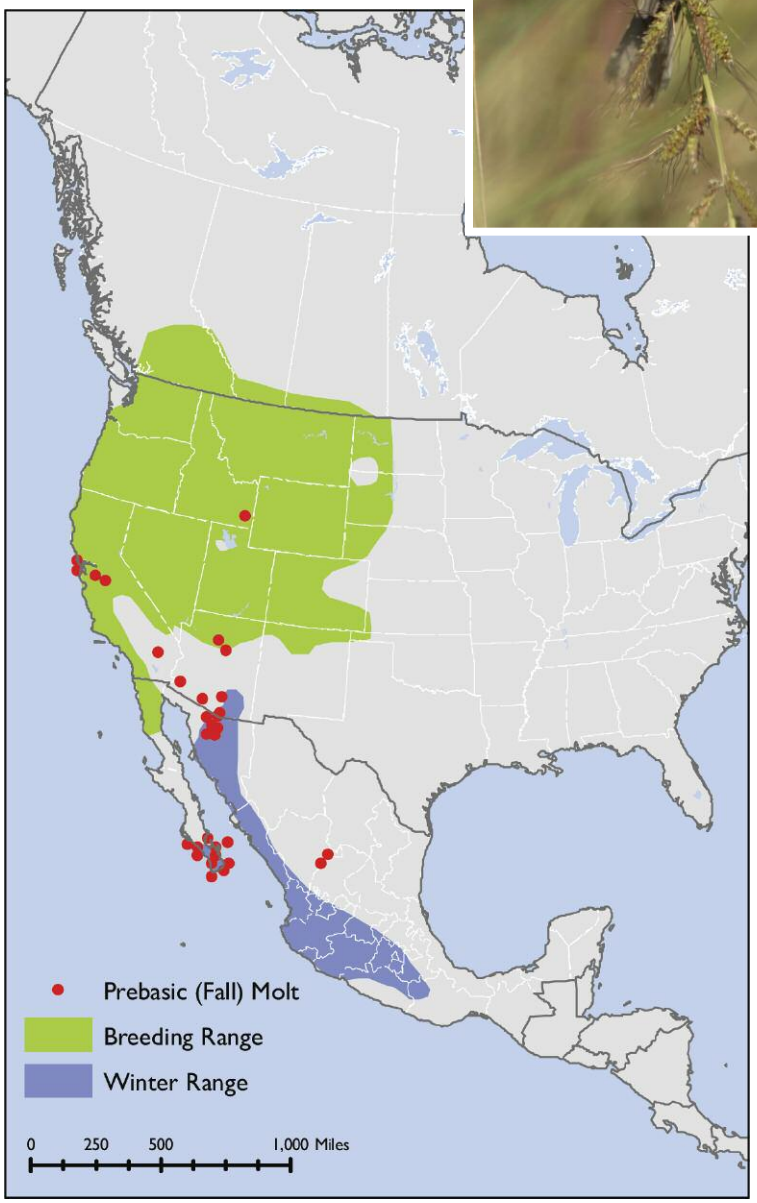
includes the Pacific Coast and much of the interior western U. S. and Canada. Long-billeds also molt in an area around the eastern Great Lakes and in another on the central Atlantic coast.

It has been long known that some male waterfowl move to specific areas to molt. Salomonsen (1968) has provided the most comprehensive review of molt-migration in waterfowl, but his work was primarily focused on Eurasian species. From research in North America, we know that males from the eastern population of Barrow's Goldeneye move *north* after breeding (granted, their contribution to the breeding process is not great)—on average 986 kilometers north of the breeding range (Robert et al. 2002). Herter (1989) described how adult males of all three species of scoters move into the Bering Sea to molting areas, and Dau (1987) noted thousands of scoters (primarily Surf) molting in the Yukon-Kuskokwim Delta in Alaska. These waterfowl examples refer to remote, relatively inaccessible areas in North America, but there are examples of molt-migration much closer to home. In particular, we shall see that certain habitats in western North America provide an excellent venue for studying and understanding molt-migration.

Kern County, California; 10 September 2006. © Bob Steele.

Many **Lazuli Buntings** undergo their fall molt largely away from the breeding grounds, both along the migratory routes and within the wintering range.



Map by Kei Sochi; molt data from Young 1991.

Mono Lake, California

Mono Lake is a large, hypersaline lake located in east-central California, near the Nevada border. Too saline to support a fish population, invertebrate prey (primarily brine flies and brine shrimp) are abundant at Mono Lake.

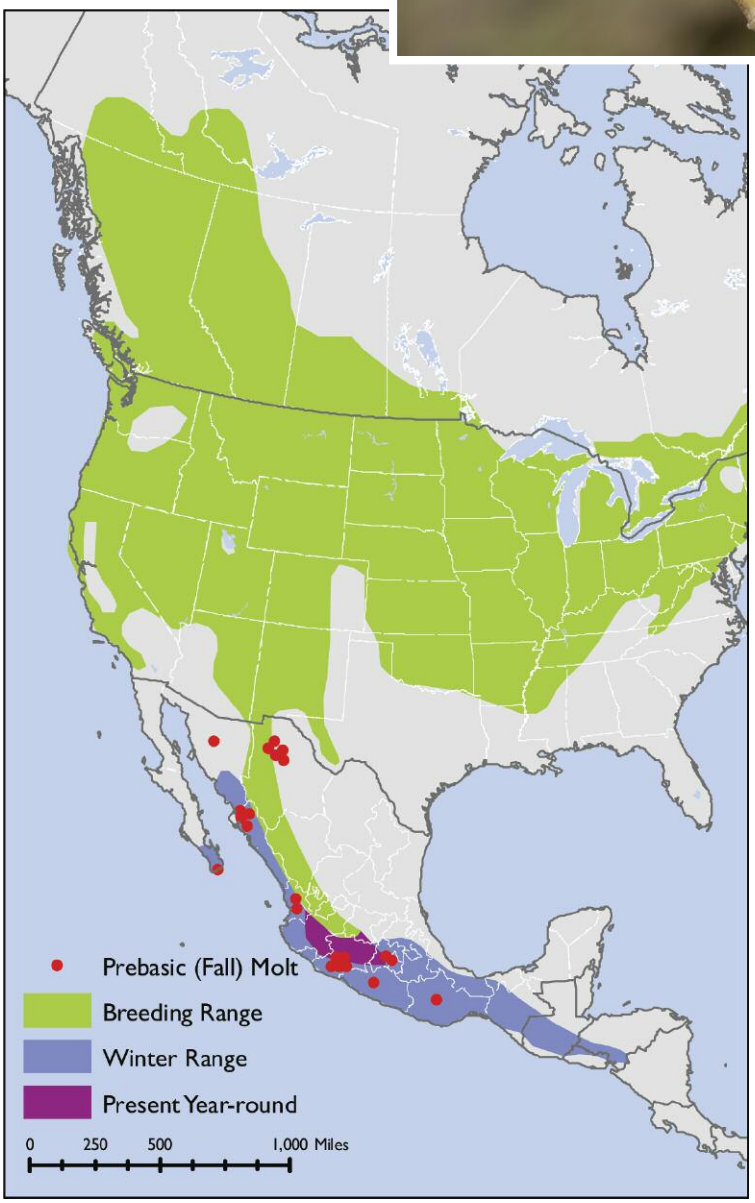
Eared Grebes begin to arrive in July and August, and become flightless due to the loss of all their flight feathers at one time. The rich food source at Mono Lake fuels the grebes' molt and subsequent migration to wintering areas. It is estimated that the grebes eat 60–100 *tons* of brine shrimp daily (Jehl 1988)! Tens of thousands of grebes have arrived by late July, and by early October several million may be present (Boyd and Jehl 1998).

Tens of thousands of Wilson's Phalaropes also molt at Mono Lake in summer and early fall. There are slight differences in the extent of molt between males and females, but both sexes molt between two and five inner primaries, plus a variable number of rectrices and body feathers, before suspending molt to complete their migration to South America, where they complete their molt.

The scientific literature is often rather dry and lacking in superlatives, but descriptions such as "windrows of feathers line the shores" and of molt being so heavy that "phalaropes almost appear to be becoming unglued" (Jehl 1987) capture the character of Mono Lake in late summer.

Inyo County, California; 3 September 2006. © Bob Steele.

Many western **Warbling Vireos** (subspecies *swainsoni*) undergo molt of their flight feathers in a region of Mexico that lies largely between the breeding and wintering ranges. Most eastern Warbling Vireos (subspecies *gilvus*) complete molt on the breeding grounds, before fall migration. Note: Map does not indicate molt locations for subspecies *gilvus*.



Map by Kei Sochi; molt data from Voelker and Rohwer 1998.

Other important molt-migration locations for Wilson's Phalaropes include Great Salt Lake in Utah, the Lahontan Valley of western Nevada, Oregon's Abert Lake, and the commercial salt ponds at San Francisco Bay, California (Colwell and Jehl 1994).

Given how important Mono Lake is to these two species, it is amazing that it wasn't even recognized as a major molting area until the 1980s.

Monsoons

A key chapter in the molt-migration story began rather serendipitously during a museum study of molt and delayed plumage maturation in Bullock's and Baltimore Orioles. At the time of that particular study, discussed below, eastern passerine species were the ones that had been primarily studied. Most eastern passerines molt on their breeding grounds, and it was assumed that western passerines either molt on the breeding grounds or after arriving at the wintering grounds.

Sievert Rohwer and Jo Manning at the University of Washington found that Baltimore Orioles molt on the breeding grounds, but that Bullock's Orioles migrate to the southwestern U. S. and northern Mexico, molt there, and then continue on to their wintering grounds (Rohwer and Manning 1990). They hypothesized that orioles were taking advantage of the food flush (i.e., insects) provided by the mid-summer, or monsoon, rains.

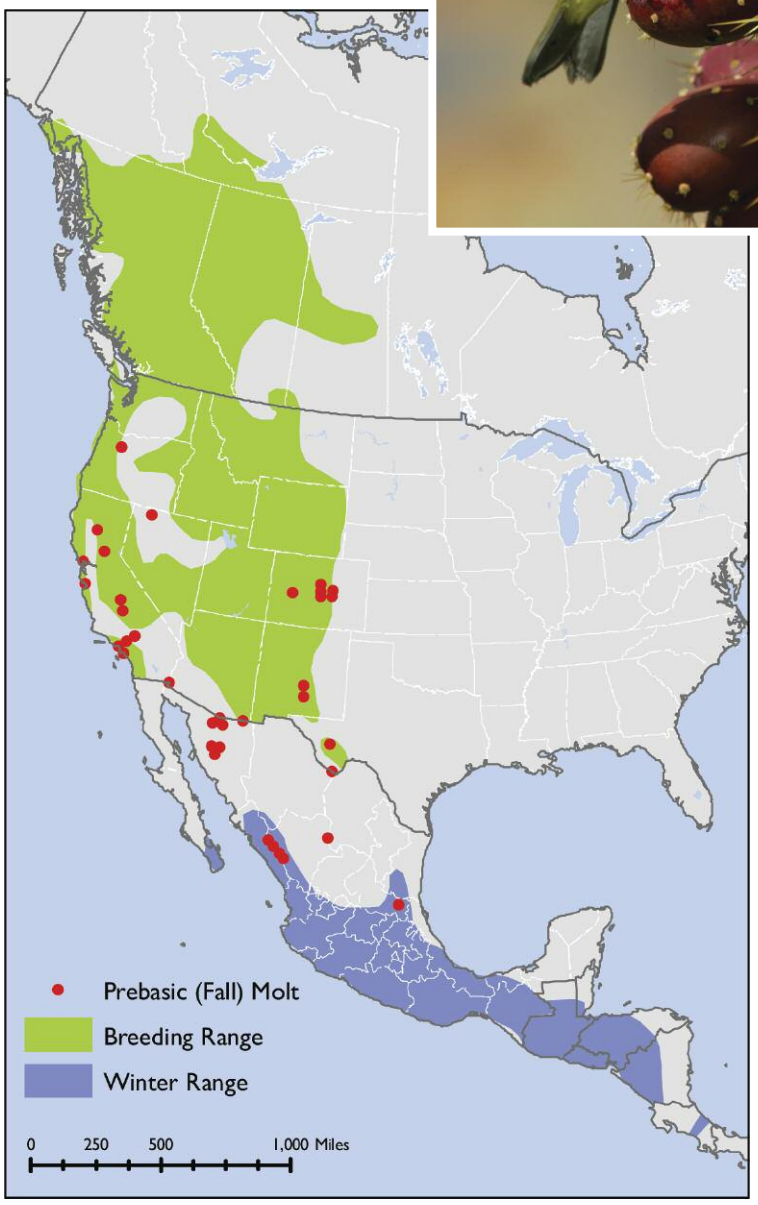
Birders know that the summer monsoon season is a great time to be birding in Southeast Arizona. The onset of summer rains initiates the breeding season for Montezuma Quail and some of the desert sparrows, and other birds begin work on second broods, so as to take advantage of the increased food supply.

Subsequent museum studies on delayed plumage

maturation in Lazuli and Painted Buntings found that Lazulis also molt in the Southwest (Young 1991) and that the two populations of Painted have different strategies: The western population molts in the Southwest, whereas the eastern population molts on the breeding grounds (Thompson 1991).

Kern County, California; 1 September 2004. © Bob Steele.

Western Tanagers breed widely in conifer forests of western North America, but the species completes its fall molt mainly in the southern portion of the breeding range, as well as south of the breeding range.



Map by Kei Sochi; molt data from Butler et al. 2002.

How extensive, then, is molt-migration among Western passerines? Until recently, few species had been studied, and we are now learning it's not a simple matter. Townsend's and Hermit Warblers complete molt on their breeding grounds (Jackson et al. 1992), as do Hammond's (but not Dusky) Flycatchers (Johnson 1963). What is behind this difference?

Birders in the Intermountain West know that it is hot and very dry by midsummer. Most precipitation comes in the winter and early spring, unlike in the Southwest where precipitation comes primarily later in the summer. As a result, many lowland riparian areas in the Intermountain West—where Bullock's Oriole and Lazuli Bunting breed—become dry and unproductive. Both of the warblers, along with Hammond's Flycatcher, breed in wetter, more montane habitats that likely remain more productive than lower-elevation riparian habitats.

Eager to explore and better characterize this idea, students of Sievert Rohwer at the University of Washington Burke Museum initiated several other studies. Voelker and Rohwer (1998) found that western populations of the Warbling Vireo migrate to the Southwest to molt, whereas the eastern population molts on the breeding grounds. When my colleagues and I initiated a study of Western Tanagers, we predicted that they would leave breeding habitats to molt. Although a montane species like Hammond's Flycatchers and Hermit and Townsend's Warblers, Western Tanager occurs in drier montane forests than those three species. These drier montane forests likely face the same dry and unproductive conditions as lower-elevation riparian areas in the West. Most adult Western Tanagers do indeed migrate to the Southwest to molt (Butler et al. 2002). Further work has supported and helped refine this hypothesis; see Rohwer et al. (2005) for a complete summary of work to date.

As highlighted with the eastern vs. western populations of Painted Buntings and Warbling Vireos, molt strategies can vary within populations. Some Semipalmated Sandpipers migrating through the

prairies begin primary molt at stopover sites, whereas migrants that make a long flight over water off the Atlantic coast begin primary molt when they reach their wintering grounds (O'Brien et al. 2006).

Conservation

In recognition of its importance to Wilson's Phalaropes, Mono Lake has been designated as a site in the Western Hemisphere Shorebird Reserve Network, but many other areas that may be important molt stopovers are not thus designated. Such sites receive little if any protection.

In the West, riparian areas are often degraded by cattle and invasive plants, and these habitats, as we have seen, may be important sites for molt-migration. Wetlands and estuaries that may be important as molt stopovers may be popular for recreation, irrigation, and hydropower, and they may be prime real estate for development.

We know that Delaware Bay and San Francisco Bay are important stopovers for refueling during the often-frantic spring migration, but what about fall stopovers? Some areas dubbed "staging areas" may in fact be important molting areas.

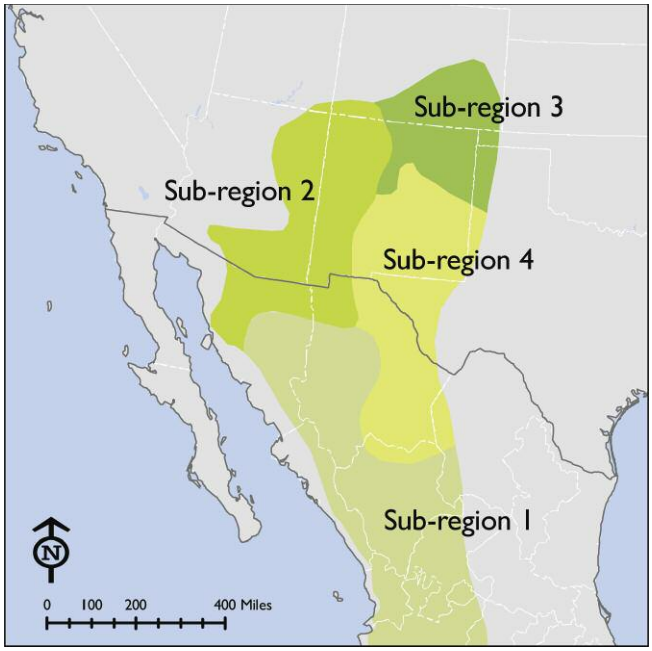
How to Observe

Studies of molt have typically used museum specimens and, increasingly, banding data and observations of marked birds. There is much that birders can discover in the field. For example, Wood et al. (2005) reported a large flock of Mountain Plovers in southeastern Colorado in late July 2005, with all the adults undergoing primary molt. The number of plovers was well in excess of local breeders, hinting that this species migrates to specific areas to molt.

Learning to recognize molting birds in the field takes practice. But it doesn't hurt to consult the recent literature, either. The following contain discussions of molt along with photographs: Howell (2002, 2003a, 2003b), Putnam (2005), Dittmann and Demcheck (2006), O'Brien et al. (2006), and Floyd (2007).

Watching aquatic species is a good place to start. Shorebirds, for example, may move to more productive estuaries and wetland complexes, where they are often easily observed. Many species of waterfowl, grebes, loons, and alcids molt all their flight feathers at once, a strategy that does not work for birds that require flight to escape predators. If flightlessness is a species' strategy, it may elect to move to larger and deeper bodies of water for safety.

Pay attention to behavior. Male waterfowl may congregate together. Eared Grebes at Mono Lake move farther offshore and are more wary once they become flightless. They spend much less time foraging than one might expect (5–10% of the day), probably because food is so abundant (Jehl 1988).



A central influence on molt-migration is availability of resources. Much of the Intermountain West—extending well north into Canada—becomes arid by midsummer. At the same time, the Desert Southwest begins to receive its annual monsoon rains—and begins to offer significant food resources. Many bird species appear to have evolved so as to exploit this large-scale variation in resources: They leave the breeding grounds as early as possible, and complete molt in the comparatively resource-rich environment of the Southwest. *Map by Kei Sochi; data from Comrie and Glenn 1998.*

Some passerine species may move upslope, and others may move downslope to riparian corridors. We know very little about passerine behavior during molt, except for the fact that many individuals become secretive—which makes them hard to study. A study of radio-tagged Wood Thrushes provides a glimpse of a passerine's life during molt: For a period of at least 10 days, individuals can barely fly; and during the heaviest stages of molt, they are very difficult to observe (Vega Rivera et al. 1998).

Along with behavior, note the number of individuals, age classes, stage of molt, dates, localities, and any local movement among wetland sites and habitat corridors. Even if you do not come across birds that are in active molt, finding migrants that appear to have started their molt can help us understand molt in relation to migration.

Molt happens, and we can be there to watch.

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