

north-facing slopes in both higher and lower elevations of the park (Table 1; Figs. 1 and 2).

4. In the lower elevations, south-facing slopes are characterized by *Eriogonum microthecum*, *E. strictum*, *E. thymoides*, and *Salvia dorrii*.

North-facing slopes in the lower elevations show the following species increasing in importance: *A. tridentata*, *Eriogonum sphaerocephalum*, and *Chrysothamnus nauseosus*.

5. In the higher elevations, south-facing slopes are characterized by *A. arbuscula*, *Eriogonum sphaerocephalum*, *E. thymoides*, and *Phlox kelseyii*. On these higher sites, *Eriogonum strictum* is important, but a decrease in importance is noted when compared to south-facing slopes in lower areas. *E. thymoides*, however, shows increased importance on south-facing slopes of the higher elevations when compared with those in the lower sites of the park.

North-facing slopes in the higher elevations are dominated by *Artemisia tridentata*, particularly where the soil is deeper and finer textured.

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The Frog Genus *Rana* in Montana

The frog genus *Rana* presents a large number of herpetological problems in the Pacific Northwest. Dumas (1964, 1966) discussed the *Rana* species complex in the Pacific Northwest with some references to Montana. The purpose of this paper is to clarify the distributional patterns of three *Rana* sp. in Montana. On the basis of two regions, based on vegetation and physiography, their distribution will be discussed. Distribution maps are based on numerous observations and over 500 collection records from 1965 to 1968.

The distribution of *Rana pretiosa* and *Rana pipiens* in Montana has been shown differently by Wright and Wright (1949), Stebbins (1966), and Dumas (1964, 1966). The occurrence of *Rana catesbeiana* in Montana was reported by Black and Bragg (1968). *Rana sylvatica* is often shown to occur in Montana, but these records require confirmation (Stebbins, 1966). Only *R. pretiosa*, *R. pipiens*, and *R. catesbeiana* will be discussed in this paper.

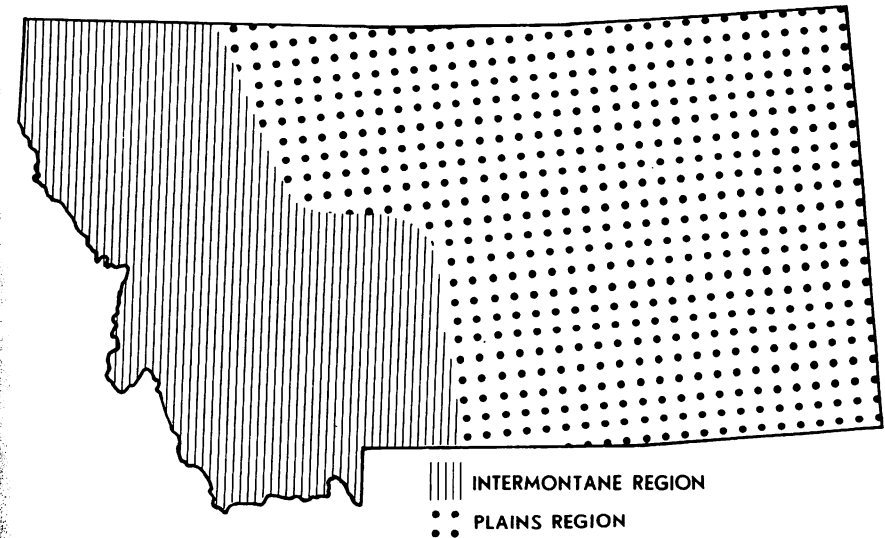


Figure 1. Regional classification of Montana based on vegetation and physiography.

Regional Classification

In the simplest classification, Montana can be divided into two regions based on vegetation and physiography. The intermontane region (Fig. 1), including much of the

western third is dominated by forests and mountains, while the plains region (Fig. 1), including the eastern two-thirds, is dominated by grassland with a few isolated mountain ranges.

The intermontane region is characterized by many mountain ranges and valleys or basins up to 10-15 miles wide. The Rocky Mountain front which includes the Continental Divide separates the intermontane region from the plains region in some places and, in general, rises abruptly from the short grass prairie of the plains region. West of the Rocky Mountain front, peaks rise to elevations of 9,000 to 10,000 feet in Glacier National Park and to 13,000 or more feet in the rugged region north and east of Yellowstone National Park. The lowest passes in the Continental Divide are above 5,000 feet. Coniferous forests cover large areas on the mountain slopes. In the valleys, pines and firs share the wet valley floors with meadows and the deciduous trees of the riparian forests. In the intermontane region there are few intermittent streams.

The plains region is characterized by rolling short grass prairie dissected by several large rivers and small intermittent streams. The plains region is largely non-forested except for riparian forests on the floodplains and slopes of the major drainages. North of the Missouri River, glaciation has smoothed the surface leaving glacial potholes and swales which may contain water. Isolated groups of low mountains in this region stand in sharp contrast to the flat and rolling plains.

Results and Discussion

The spotted frog (*R. pretiosa*) is common throughout the intermontane region (Fig. 2). This species is closely restricted to water and is the only *Rana* found throughout Glacier National Park and the other high mountains of the intermontane region. It does not enter the drier short grass prairie in the plains region. The Highwood Mountains, an isolated range of peaks in central Montana, contain populations of *R. pretiosa* in habitats ecologically similar to the normal *pretiosa* habitat in the intermontane region (Fig. 2).

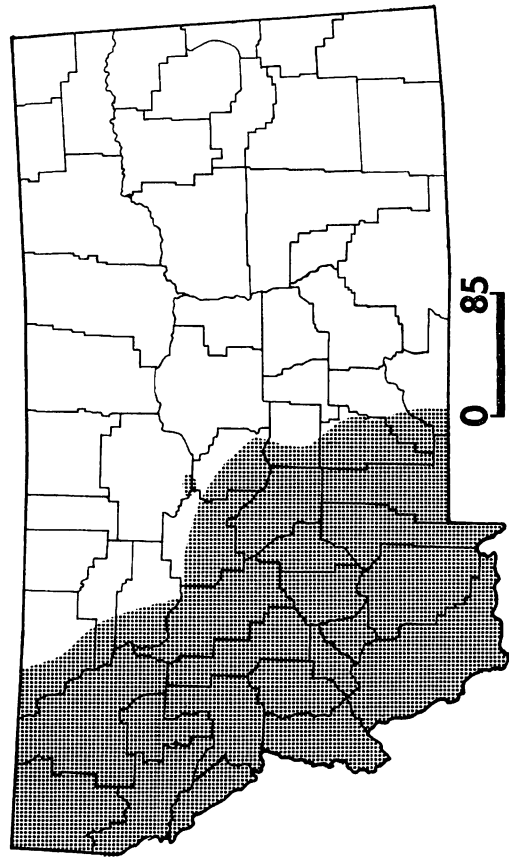


Figure 2. Shaded area shows the general range of *Rana pretiosa* in Montana. Scale in miles.

The leopard frog (*R. pipiens*) has been collected in practically every county (Fig. 3). It appears to be absent only in parts of Glacier National Park and other high mountains of the intermontane region. Leopard frogs are found in many parts of the intermontane region, but are primarily limited to the lower valleys and not commonly above 5,000 feet of elevation where *R. pretiosa* is common. The leopard frog is not as closely restricted to water as are *R. pretiosa* and *R. catesbeiana*. In the plains region it is the most plentiful frog near any permanent water from farm reservoirs to the banks of the Missouri River.

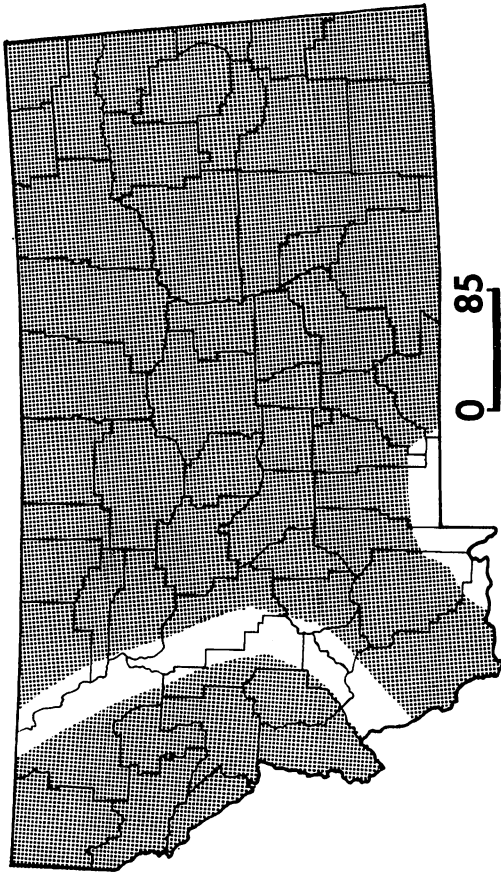


Figure 3. Shaded areas show the general range of *Rana pipiens* in Montana. Scale in miles.

The bullfrog (*R. catesbeiana*) was introduced into the Bitterroot Valley of western Montana about 1920. It is unconfirmed, but possible, that the leopard frog was also introduced at the same time. The bullfrog is restricted to ponds along the Bitterroot River from south of Hamilton, Ravalli County, north to Florence, Ravalli County (Fig. 4). Eggs of *R. catesbeiana* were also collected in a large pond, four miles south of Plains, Sanders County, Montana (Fig. 4).

Dumas (1964) has shown that *R. pipiens* is competitively dominant over *R. pretiosa* and replaces it whenever they occur together. Field observations during the past three years indicate that *R. pipiens* appears to be taking over much of the habitat of *R. pretiosa* at lower and warmer elevations, but that *R. pretiosa* is still dominant at higher and cooler elevations within the intermontane region.

R. pretiosa and *R. pipiens* are occasionally found together in the intermontane region. Mixed populations have been found three miles north of Rexford, Lincoln County, eight miles southeast of Hamilton, Ravalli County; two miles north of Noxon, Sanders County, and 500 yards north of Whitefish Lake, Flathead County. The populations in northwestern Montana (Lincoln, Sanders, and Flathead Counties) are predominantly *R. pipiens*, while the Ravalli County population is predominantly *R. pretiosa*. The pond near Whitefish Lake contained a large population of both species and is the only pond where members of the two species seemed ecologically separated. *R. pretiosa*

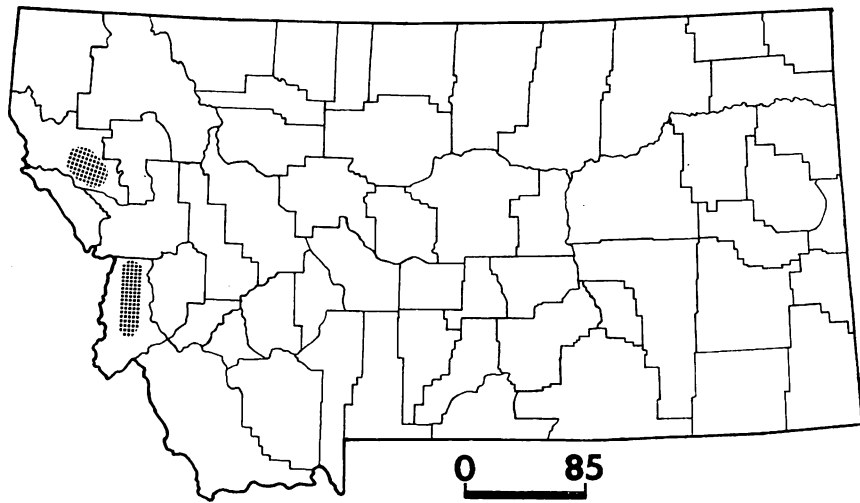


Figure 4. Shaded areas show the general range of *Rana catesbeiana* in Montana. Scale in miles. was found on the level swampy areas on the north and west sides of the pond, while *R. pipiens* occupied the steep grassy banks near deep water on the south and east sides of the pond. These are the types of ecological preferences shown by both species in other dispecific and monospecific populations.

Dumas (1966) reported that the most important recent development was the invasion across the low passes of the Rocky Mountain front by *R. pipiens*. The only frog now common near these passes in Montana is *R. pretiosa*. Yet the occurrence of *R. pipiens* in intermontane Montana suggests that members of this species either have crossed the Rocky Mountain front and/or have been introduced by man.

The apparent absence of the leopard frog in the higher mountains of the intermontane region raises the question about the direction of invasion by *R. pipiens*. Dumas (pers. comm., 1967) found that in Idaho, the longer the leopard frog had been in a particular area, the farther it had invaded the surrounding mountain ranges. He suggested that altitudinal records could be used as a general guide to determine the direction of invasion. West of the Rocky Mountain front in northwestern Montana, the leopard frog is found commonly at higher elevations than in southwestern Montana. This may indicate *R. pipiens* has not crossed directly from eastern Montana into western Montana via the Rocky Mountain front, but has entered western Montana from the north, perhaps through Waterton Lake National Park in Alberta, Canada, where an overlap zone in an apparent state of flux, occurs between *R. pipiens* and *R. pretiosa*.

R. catesbeiana appears to be having an effect on populations of *R. pipiens* and *R. pretiosa* in the Bitterroot Valley. Nearly all suitable ponds are occupied solely by the bullfrog and only once has *R. pipiens* been observed in the same pond with the bullfrog. Mild winters may have enabled the bullfrog to extend its range and occupy the habitats of *R. pipiens* and *R. pretiosa*. Because of this competition in parts of the valley, *R. pipiens* seems to be disappearing, while *R. pretiosa* is still occupying permanent water at higher elevations.

Summary

1. The spotted frog (*Rana pretiosa*) is common throughout the intermontane region of Montana.
2. The leopard frog (*Rana pipiens*) is common throughout Montana. It appears to be absent only in the high mountains of the intermontane region.
3. The bullfrog (*Rana catesbeiana*) is found in the Bitterroot Valley of Ravalli County and also in Sanders County, Montana.
4. Mixed populations of *R. pretiosa* and *R. pipiens* are occasionally found in the intermontane region.
5. The leopard frog has probably entered western Montana from the north, perhaps via Waterton Lake National Park, Canada.
6. The bullfrog is competitively dominant over both *R. pipiens* and *R. pretiosa* in the Bitterroot Valley of Ravalli County, Montana.

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