

SKIPPERS AND BUTTERFLIES OF KANANASKIS PARK, ALBERTA

ROBERT G. KONDLA, Parks Division, Alberta Recreation, Parks & Wildlife, Edmonton, Alberta, and CHARLES D. BIRD, Department of Biology, University of Calgary, Calgary, Alberta.

Situated in the front ranges of the Rocky Mountains, approximately 70 kilometres southwest of Calgary, Kananaskis Provincial Park is the most recent addition to the parks system and was established by an Order-in-Council in the fall of 1977. Much of the current park area of 50,308 ha has been investigated from a natural resource viewpoint as part of the planning and development process. Figure 1 shows the area for which extensive resource information (including butterflies and skippers) is available. This paper essentially deals with the white area rather than the total existing park.

The park is a high elevation environment for butterflies; the lowest point being 1,604 m along the Kananaskis River near the confluence with King Creek while the highest point is 3,344 m on Mt. Sir Douglas. The mountain ranges run in a northwest-southeast direction and generally have summit elevations between 2,432 m and 3,040 m while the intervening valleys have floor elevations between 1,672 m and 1,976 m.

Much of the park has slopes in excess of 30% and most of the typical Cordilleran landforms including cirques, hanging valleys, talus slopes, sheer rock faces, and alluvial fans as well as a variety of ice contact and glacio-fluvial deposits that date from the Wisconsin glaciation. The bedrock of the western portion is predominantly limestone and

dolomite while sandstone and shale is more prevalent in the eastern portion.

Limited climatic data indicates that the park is situated in a relatively cool and moist portion of the front ranges. In consequence the vegetation consists largely of cool, moist spruce-fir forest of the subalpine zone. These forests are opened at irregular intervals by snow avalanches, creating linear patches of young trees, shrubland or meadows; depending on slope, aspect, elevation, and avalanche frequency. Much of this zone is covered by fire-successional lodgepole pine forests. Landslides and bedrock outcrops also provide breaks in the subalpine forest.

Depending on slope exposure, the climatic forestline occurs roughly from 2,098 m to 2,219 m. Above this altitude, forest gives way to isolated clumps of trees, then isolated and depauperate trees, and finally the alpine zone with treeless vegetation consisting of meadows, heaths, and rocklands. Major variation in plant communities is dramatic over short distances due to wind, snow, and microtopography. Increasing altitude leads to open vegetation dominated by rock-dwelling lichens and cushion-forming plants until bare rock, permanent snowbanks, and glaciers comprise the environment.

An interesting aspect of Kananaskis Park is the abundance of wetlands resulting from beaver ac-

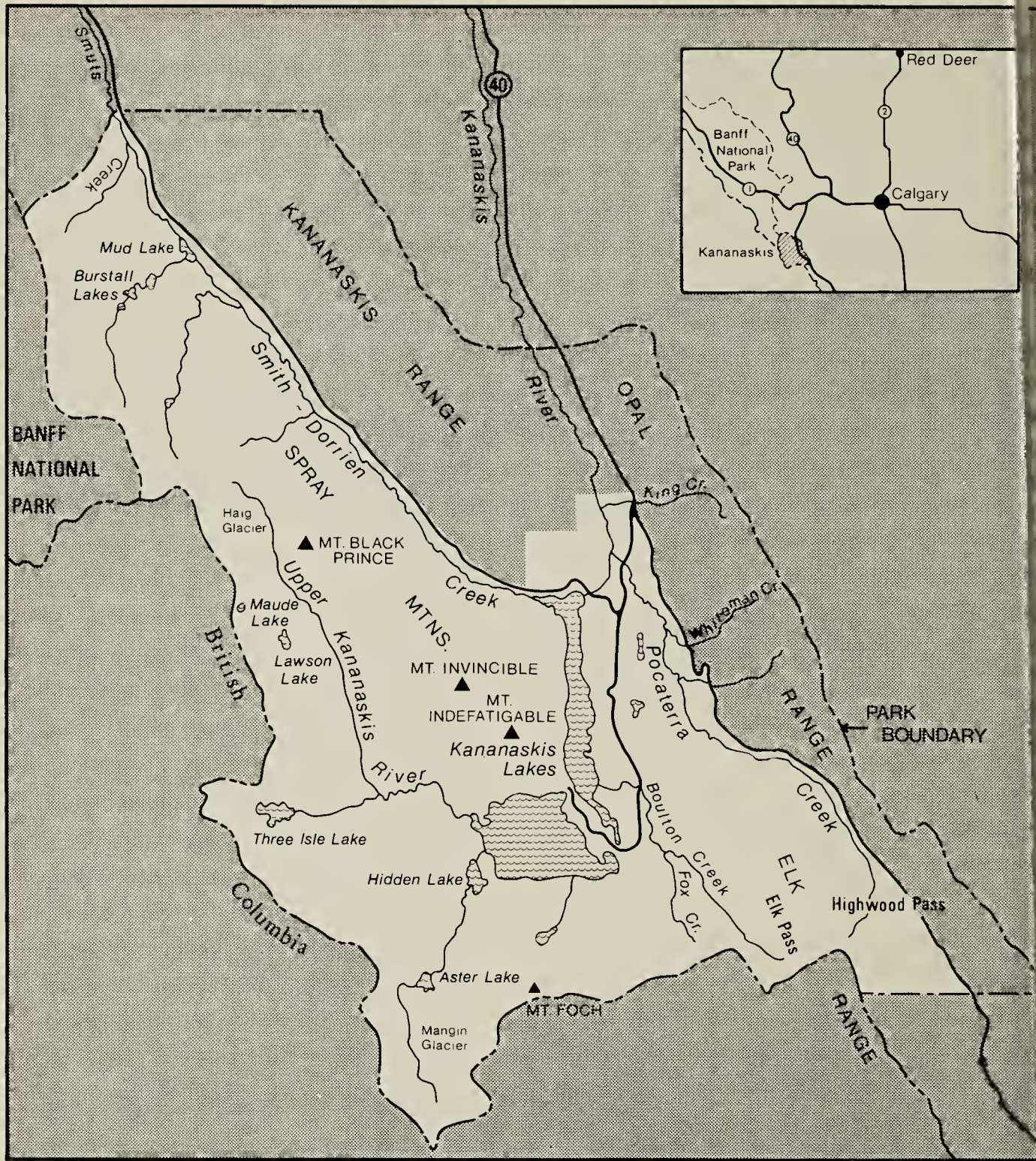


Figure 1 Kananaskis Provincial Park place names used in this paper. Roughly one third of the study area consists of glaciers, permanent snow banks, rock barrens and water; habitat unsuited for butterflies.

tivity and groundwater discharge in the more gently sloping portions of the valleys. These generally linear wetlands support spruce and pine bogs, tall shrub fens, low shrub fens with willows and bog birch, and sedge fens.

Montane habitats are represented

in the park by two stands of Douglas fir forest — along the King Cree gorge and on the lower south slope of Mt. Indefatigable. Meadows and dry grasslands at the lower elevations are restricted to small areas, usually on steep south and west facing slopes.

Major sources of information on the natural resources of the park are provided by Bird⁵, Jaques¹⁰, Kondla¹², Milus Tress Barron¹⁴, Peregrine Research and Documentation¹⁶, and Trottier²¹. Figures 2 to 5 illustrate major butterfly habitats.

Information Base

The first collections were made by B. Sanson in 1922. No other collections are known until 1955 when R. Coyles and J. R. McGillis collected at Highwood Pass. Subsequently the Highwood Pass has been collected by R. L. Anderson in 1958, 1959, 1960, and 1961; J. Legge in 1961, 1962, and 1971; S. Shigematsu in 1968, 1971, and 1972; A. D. Bird in 1975; H. Pinel in 1975 and 1976; A. Wisely in 1976; and N. Kondla and M. R. Lein in 1977. Other areas of the park have had minor collections by R. L. Anderson, A. I. W. MacKenzie, S. Shigematsu, A. D. Bird, and C. D. Bird. Major collections from other areas of the park have been made by A. Wiseley in 1976 during a wildlife inventory for the Parks Division and by N. Kondla during a reconnaissance vegetation survey in 1977, also for the Parks Division. Previous reports on butterflies of this area are an annotated list by Bird⁵ and an annotated list of Wiseley's collections and observations¹⁶.

Thus, this paper is based on collections by 13 people, in 13 different years. All records except the Mourning Cloak are supported by voucher specimens examined by either of the present writers. Records are available from the beginning of the flight season in late May to the end of September.

Annotated List

HESPERIIDAE — Skippers

PECK'S SKIPPER (*Polites coras*): Known from one collection by Shigematsu at Highwood Pass on 7 July 1968.

DRACO SKIPPER (*Polites draco*): This insect was found to be abundant in a meadow east of the Lower Kananaskis Lake by Kondla on 25 June and 21 July 1977.

MANITOBA SKIPPER (*Hesperia comma manitoba*): Apparently uncommon and local; known from a few collections by Anderson and Shigematsu at Highwood Pass and by Wiseley near the east side of Lower Kananaskis Lake. This species appears to prefer open, grass-rich habitats and is therefore most likely to be seen at higher elevations in the alpine and upper subalpine zone. Flight records 7 July to 9 August.

ARCTIC SKIPPER (*Carterocephalos palaemon mandan*): Known from a 7 August 1972 collection by Shigematsu and a 24 July collection by Lein at Highwood Pass and a collection by Kondla on 9 June at King Creek fan. Occasional sight records in clearings at lower elevations during 1977.

PERSIUS DUSKY WING (*Erynnis persius*): Specimens collected at Highwood Pass (Shigematsu); King Creek fan (Wiseley and Kondla), and the lower Boulton Creek area (Kondla). Seen regularly on dry open hillsides at lower elevations. Flight records 9 June to 11 July.

PAPILIONIDAE — Swallowtails

CLOUDED PARNASSIAN (*Parnassius phoebus smintheus*): Strangely unreported prior to 1976 despite the many collections in suitable habitat of the Highwood Pass. Reported by Wiseley from a number of locations in 1976 but Kondla found it at only one alpine location just west of Mt. Indefatigable in 1977 despite visits to apparently suitable habitat under ideal weather conditions. Flight records 16 July to 26 September.

GOTHIC SWALLOWTAIL (*Papilio zelicaon gothica*): Known from one collection by Wiseley on 15 July 1976 NE of the Lower Kananaskis Lake.

PIERIDAE — Whites, Sulphurs and Marbles



Figure 2: Aerial view of conifer bog habitat for Jutta Arctic, birch-willow fen habitat for Frigga Fritillary, and lodgepole pine habitat for Purple Lesser Fritillary in the Kananaskis valley.

CALIFORNIA WHITE (*Pieris sisymbrii flavitincta*): Two fresh females were collected by Kondla on 9 June 1977 at King Creek fan and King Creek gorge. Since previous investigators have not been in the field so early, the species may be more abundant here than these records indicate.

WESTERN CHECKERED WHITE (*Pieris protodice occidentalis*): Reported by Coyles, McGillis, Bird and Lein at Highwood Pass. Also reported by Wiseley near the Lower Kananaskis Lake and Kondla at the Upper Kananaskis Lake. Flight records 24 July to 6 September.

MUSTARD WHITE (*Pieris napi*): Found near Fox Creek by Wiseley and at several locations east of Lower Kananaskis Lake by Kondla. Flight records 9 June to 21 July.

CABBAGE BUTTERFLY (*Pieris rapae*): This introduced species was found by Kondla in a willow/sedge fen at East Elk Pass on 7 August 1977 and along the weedy edge of Upper Kananaskis Lake on 23 August 1977.

ORANGE ALFALFA BUTTERFLY (*Colias eurytheme eurytheme*): Known only from one fresh male caught by Kondla 25 July 1977 on King Creek fan. Apparently a stray migrant since the species is not known to overwinter in Alberta.

ELIS SULPHUR (*Colias meadii elis*): Collected at Highwood Pass by Coyle, Anderson, Legge, Shigematsu, Bird, Wiseley, Lein and Kondla. Also found on Mt. Invincible and SE of Lower Kananaskis Lake by Wiseley as well as on Mt. Indefatigable by Kondla. Apparently a fairly common species of alpine and subalpine meadows. Flight records 8 July to 6 September.

YELLOW ALFALFA BUTTERFLY (*Colias philodice eriphyle*): A few scattered collections by McGillis, MacKenzie and Wiseley. Flight records 7 July to 2 August.

PINK-EDGED SULPHUR (*Colias interior interior*): Lein collected 2 fresh males on 24 July 1977 at Highwood Pass.

ALEXANDRA SULPHUR (*Colias alexandra christina*): No known records prior to



Figure 3: South half of King Creek fan. Great diversity of habitats at a relatively low elevation makes this one of the most productive areas for butterflies. Some species to be found here are Colorado Orange-tip, Gillett's Checkerspot, and Freija Fritillary.

1976. Collected by Wiseley and by Kondla at a few lower locations east of the lakes. Flight records 25 June to 26 September.

PELIDNE SULPHUR (*Colias pelidne ninisni* Bean): Numerous records from Highwood Pass by Coyles, Anderson, Shigematsu, Legge, and Bird. Also found on Mt. Indefatigable by Kondla. An alpine and upper subalpine zone species. Flight records 20 July to 6 September.

NASTES SULPHUR (*Colias nastes treckeri*): Many records from Highwood Pass by Coyles, Anderson, Shigematsu, Pinel, Wiseley and Lein. A ubiquitous species of alpine meadows. Found on Mt. Indefatigable by Kondla. Flight records 22 July to 29 August.

COLORADO ORANGE-TIP (*Anthocaris gara julia*): Not reported until 1976 when Wiseley found it at King Creek fan, Fox Creek, and lower Boulton Creek. A southern species of montane habitats near the northern limit of its range here. Also found in 1977 by Kondla at King Creek fan. Flight records 9 June to 17 July.

CREUSA MARBLE (*Euchloe creusa*): Reported from Highwood Pass by Anderson, Pinel, Wiseley and Lein. Also located by Wiseley at Fox Creek and by Kondla at King Creek fan and Boulton Creek fan. Flight records 14 June to 24 July.

LYCAENIDAE — Gossamer-winged Butterflies

MARIPOSA COPPER (*Lycaena mariposa mariposa*): Not reported until 1976 when Wiseley found it one mile SE of Lower Kananaskis Lake. Also found in wetlands and clearings in 1977 by Kondla. Flight records 17 July to 22 August.

ARETHUSA COPPER (*Lycaena phlaeas arethusa*): So far known only from one collection by Anderson on 9 August 1958 at Highwood Pass.

SNOW'S COPPER (*Lycaena snowi snowi*): First found by Sanson in Upper Kananaskis Pass in 1922⁴. Subsequently reported by Shigematsu and Lein for Highwood Pass and Kondla in an alpine area just west of Mt. Indefatigable. Flight records 24 July to 11 August.



Western Tailed Blue

C. R. Wersh

SCUDDER'S BLUE (*Lycaeides argyrognomon scudderii*): Reported by Anderson, Kondla, Shigematsu, and Wiseley from Highwood Pass, west of Mt. Indefatigable, lower Smith-Dorrien valley and numerous locations in the Kananaskis valley east of the lakes. Most abundant in open, dry areas at lower elevations. Flight records 22 July to 2 September.

GREENISH BLUE (*Plebejus saepiolus amica*): Known from collections by MacKenzie, Wiseley, and Kondla east of the lakes and by Kondla in an alpine area at Lawson Lake. Flight records 14 June to 18 August.

ACMON BLUE (*Plebejus acmon lutzi*): The only record so far is one fresh male taken by Kondla on 22 July 1977 in an open pine bog near Whiteman Creek.

ARCTIC BLUE (*Plebejus aquilo megaloc*): Found at Highwood Pass by Anderson, Coyles, Kondla and Lein. Also recorded by Kondla and by Wiseley east of the lakes and by Kondla west of Mt. Indefatigable and Elk Pass. Fairly common in the lower alpine and upper subalpine zones although it is present in even the lowest areas of the park. Flight records 2 July to 31 August.

WESTERN TAILED BLUE (*Everes amyrtula albrighti*): Collected by Shigematsu and Lein at Highwood Pass and Wiseley on the north side of the Upper Kananaskis Lake. Flight records 4 July to 24 July.

SILVERY BLUE (*Glaucopsyche lygdamus couperi*): Reported from Highwood Pass by MacKenzie, Pinel, and Shigematsu. Taken at a number of localities east of the lakes by Kondla and by Wiseley as well as

by Wiseley in the Elk Pass and by Kondla on Mt. Indefatigable. Most often seen in early clearings at lower elevations. Flight records 30 May to 31 July.

NYMPHALIDAE — Brush-footed Butterflies

RED ADMIRAL (*Vanessa atalanta rubria*): Only record to date is one worn specimen by Kondla in a large meadow east of the Lower Kananaskis Lake on 25 June 1977.

MILBERT'S TORTOISE-SHELL (*Nymphalis milberti furcillata*): Found in almost all habitats by Coyles, Bird, Anderson, Wiseley, Kondla, and Lein at Highwood Pass, Mt. Invincible, Mud Lake, Smith-Dorrien valley, King Creek fan, and east of the lakes. Flight records 23 May to 25 September.

MOURNING CLOAK (*Nymphalis antiopa antiopa*): The only report is a sight record by Kondla on 7 June 1977 on King Creek fan.

SATYR ANGLE-WING (*Polygonia satyrus satyrus*): Only two records; Wiseley found this species on the east side of Lower Kananaskis Lake on 31 August 1976 and Kondla found it in subalpine forest near Maude Lake on 10 August 1977.

CEPHYR ANGLE-WING (*Polygonia cephyrus*): Found by Bird at Highwood Pass on 6 September 1975 and by Kondla from 23 May to 10 June 1977 at upper Smith-Dorrien valley, King Creek gorge, and Upper Kananaskis Lake.

DAMOETAS CHECKERSPOT (*Chlosyne damoetas*): This local and rare species has so far only been found by Shigematsu at Highwood Pass on 21 July 1971.

ROCKY MOUNTAIN CHECKERSPOT (*Chlosyne palla calydon*): Only two records available. Anderson found it 26 July 1959 at Highwood Pass and MacKenzie found it at the lakes on 6 July 1963.

PEARL CRESCENT (*Phyciodes tharos tharos*): The only known occurrence comes from a report by Wiseley, 1 July 1976 at Fox Creek.

MEADOW CRESCENT (*Phyciodes campestris campestris*): Collected at Highwood Pass by Shigematsu and Lein. Found at numerous places east of the

lakes by A. D. Bird, Shigematsu, Wiseley, and Kondla. Also recorded west of Mt. Indefatigable and upper Smuts Creek by Kondla. Flight records 25 June to 19 August.

ANICIA CHECKERSPOT (*Euphydryas anicia anicia*): Reported by MacKenzie, Shigematsu, Pinel, and Kondla at Highwood Pass. Also found at a number of sites east of the lakes by Wiseley and by Kondla. Flight records 25 June to 18 August.

BEAN'S CHECKERSPOT (*Euphydryas editha beani*): This alpine species has only been reported from Highwood Pass by Pinel on 24 July 1976.

GILLETT'S CHECKERSPOT (*Euphydryas gilletti*): Relatively few records of this local species are available. It has been found at Highwood Pass by Legge and at a few locations east of the lakes by Mackenzie, Wiseley, and Kondla. Flight records 25 June to 22 July.

SILVER-BORDERED FRITILLARY (*Boloria selene*): Reported from three locations east of the lakes by Wiseley and by Kondla. Apparently a species of low shrub fens in this area. Flight records 17 July to 21 August. The Alberta populations of this species have been most frequently referred to the subspecies *atrocostalis*¹⁸ but Kohler¹¹ presents information to indicate that Alberta material represents a wide band of intergradation between the subspecies *tollandensis* and *atrocostalis*.

MEADOW FRITILLARY (*Boloria bellona jenistai*): Reported by MacKenzie on 6 July 1963 east of the lakes.

FRIGGA FRITILLARY (*Boloria frigga saga*): Found by MacKenzie and by Kondla in wetlands east of the lake. Very abundant in low shrub fens dominated by bog birch. Flight records 9 June to 6 July.

FREIJA FRITILLARY (*Boloria freija freija*): This early flying species was found by Kondla in most open habitats at King Creek fan on 9 June 1977.

PURPLE LESSER FRITILLARY (*Boloria titania grandis*): Specimen and sight records too numerous to detail. Present abundantly in almost all forested portions of the park. Flight records 15 July to 29 August.



Figure 4: Barren rock cliffs above ridge with alpine and upper subalpine habitats. Ridge is habitat for such species as Clouded Parnassian, Nastes Sulphur, Snow's Copper, and Arctic Blue.

EDWARD'S FRITILLARY (*Speyeria edwardsii*): Only known from one specimen by MacKenzie on 6 July 1963 east of the lakes.

ZERENE FRITILLARY (*Speyeria zerene garretti*): Shigematsu found one at Highwood Pass on 7 July 1968.

BEANS'S FRITILLARY (*Speyeria atlantis beani*): Found at many lower elevation sites in the Kananaskis valley by McKenzie, Shigematsu, Wiseley, and Kondla. Flight records 25 June to 31 August.

HYDASPE FRITILLARY (*Speyeria hydaspes sakuntala*): This distinctive fritillary was discovered by Kondla on 5 August 1977 north west of the Upper Kananaskis Lake and at King Creek fan on 19 August 1977.

MORMONIA FRITILLARY (*Speyeria mormonia eurynome*): Reported by Sanson, MacKenzie, Pinel, Wiseley, and Kondla from most parts of the park up to timberline. Flight records 15 July to 22 August.

VARIEGATED FRITILLARY (*Euptoieta*

***claudia*):** One report by MacKenzie on July 1963 near the lakes.

SATYRIDAE — Meadow Browns

SMALL WOOD NYMPH (*Cercyonis oetucharon*): Reported by Anderson for Highwood Pass on 9 August 1958 and Kondla on 19 August on King Creek fan.

MACOUN'S ARCTIC (*Oeneis macounii*): Reported by MacKenzie on 6 July 1963 east of the Lower Kananaskis Lake.

CHRYXUS ARCTIC (*Oeneis chryxus chryxus*): Found at Highwood Pass by Coyles, Wiseley, Kondla and Lein as well as at a number of sites in the Kananaskis valley by MacKenzie, Wiseley, and Kondla. Flight records 14 June to 9 August.

JUTTA ARCTIC (*Oeneis jutta chermocki*): This very dark subspecies was located by Kondla in fens and bogs of the area east of the Lower Kananaskis Lake. Most frequently seen in open pine and spruce bog margins of the linear wetlands. Flight records 9 June to 22 July.

BEAN'S ARCTIC (*Oeneis melissa beani*): Only found by Pinel at Highwood Pass on 24 July 1976.

BRUCE'S ARCTIC (*Oeneis polixenes brucei*): The only report so far is by Wiseley at Highwood Pass on 8 July 1976.

COMMON ALPINE (*Erebia epipsodea epipsodea*): Reported from Highwood Pass by Coyles, Pinel, Wiseley, and Lein. Found at a number of locations in the Kananaskis valley by Wiseley and by Kondla. Flight records 14 June to 9 August.

Discussion

As reported in the annotated list, the known Rhopaloceran fauna of the park consists of 59 species in 6 of the 7 families reported for Alberta. In terms of the number of species per family, the Alberta fauna is representative of the ranking of families for Canada and the U.S.A. The only difference is that in the continental fauna the Lycaenidae contains more species than the Nymphalidae.

As shown in Table 1, the situation in the park is substantially different. In the park fauna, the families Pieridae, Nymphalidae, and Satyridae form a significantly larger portion of the fauna than they do in the provincial fauna. In contrast, the Hesperidae and Lycaenidae are proportionally less represented in the park fauna.

A preliminary analysis of reported butterfly faunas of mountain areas in western North America^{1 2 6 7 15 20} shows a consistently greater percentage of Nymphalidae and a lesser percentage of Hesperidae and Lycaenidae in the more northerly mountain areas as compared with the more southerly areas.

Table 2 compares the elevation and butterfly phenology of the park with Banff National Park², Plateau Mountain¹, and Calgary³. The data show a clear and dramatic short-

ening of the flight period as well as a pronounced seasonal shift in the peak flight period in relation to increasing altitude. The peak number of species decreases noticeably with increasing altitude when the three mountain areas are compared but there is no significant difference between Banff and Calgary. The peak Calgary flight period is substantially earlier than the mountain areas.

These differences may be attributed to the greater climatic, habitat, and faunal differences between Calgary and mountain areas. In contrast, Kananaskis butterfly phenology parameters are consistently intermediate in comparison to Banff and Plateau Mountain; a situation that is expected due to the intermediate environmental and geographic position of Kananaskis.

The absence of certain species is as interesting as is the presence of others. For example, a number of widespread and generally abundant species have not been reported in the park. These include the Tiger Swallowtail (*Papilio glaucus*), Spring Azure (*Celastrina argiolus*), White Admiral (*Limenitis arthemis*), Hoary Elfin (*Callophrys polios*), Brown Elfin (*Callophrys augustinus*), Western Pine Elfin (*Callophrys eryphon*), Ringlet (*Coenonympha tullia*), and Dreamy Dusky Wing (*Erynnis icelus*). Sufficient field research was undertaken by Kondla at suitable times and habitats to indicate that these species must be very local if they are indeed present in the park.

The absence of the Tiger Swallowtail, Spring Azure, White Admiral, and Dreamy Dusky Wing can be explained by the effective absence of poplar forest habitat with its associated larval food plants. Poplars are present only in scattered small stands and isolated trees. Similarly the lack of grasslands,



Figure 5: View from the east cirque of Highwood Pass. Alpine meadows, willow thickets, avalanched alpine fir, and spruce-alpine-fir larch forests provide a variety of butterfly habitats. Typical species of this area are Chryxus Arctic, Milbert's Tortoise-shell, Pelidne Sulphur, and Elis Sulphur.

TABLE 1: Comparison of Kananaskis Provincial Park and total provincial Rhopaloceran fauna.

FAMILY	PARK		PROVINCE	
	No. of Species	Percent of Fauna	No. of Species	Percent of Fauna
Hesperiidae	5	8%	27	17%
Papilionidae	2	3%	8	5%
Pieridae	13	22%	19	13%
Lycaenidae	9	15%	36	24%
Nymphalidae	23	39%	46	30%
Dandaidae	0	0	1	0.6%
Satyridae	7	12%	15	10%

other than isolated patches, can be used to explain the absence of Ringlets.

The elfins represent a more difficult problem. Apparently suitable patches of bearberry (*Arctostaphylos uva-ursi*) are widespread in the lower elevation lodgepole pine forests and should theoretically support Hoary Elfins and Brown Elfins. Caterpillars of the Western Pine Elfin have a limitless food supply in the large forests of lodgepole pine. Although admittedly conjectural, the absence of these species may be attributed to climate. The climatic climax forests of the areas currently occupied by lodgepole pine, are spruce-fir forests which are indicative of cool, moist conditions. Similarly the predominant understory plant of the pine forest is grouseberry (*Vaccinium scoparium*) — a plant usually associated with high elevations and indicative of cool, moist conditions.

Available information, although unbalanced, indicates greater variety and abundance of alpine butterflies on the shales of the Highwood Pass when compared with the limestones and dolomites that predominate in the more westerly portions of the park. However, this trend is supported by observations elsewhere in the mountains of Alberta.

The park has a relatively poor representation of the arctic-alpine tundra butterfly fauna recently studied by Pike¹⁷. This may be merely an artifact of the amount of research which has been conducted in the alpine zone. However, when one considers the amount and distribution of alpine tundra in the park, this may be a real situation. At best, the alpine tundra butterfly fauna of the park will be local in the small patches of such habitat which is available. Excessively steep slopes prevent establishment of rich alpine tundra vegetation which is required by some species and also severely constrains research. The highly calcareous bedrock which predominates in the park is not conducive to good growths of dark lichens and other plants which are a characteristic feature of fellfields that support good populations of species such as *Boloria alberta*, *Oeneis melissa*, and *Euphydryas editha*.

A large volume of recent research has shown that many ecosystems are dependent on or subject to relatively frequent fires. This is certainly true for the mountains of southwestern Alberta^{9 13 19}. Butterflies are essentially herbivorous insects and insofar as fire determines the distribution of food plants in space and time, fire

TABLE 2: Butterfly phenology and elevations of four Alberta Areas.

AREA	Flight Period (days)	Peak No. of Species	Peak Flight Period	Approximate Elevation (m)
Calgary	200	45	mid-June	919 to 1,067
Banff National Park	165	46	mid-July	1,341 and up
Kananaskis Provincial Park	122	34	late July	1,615 and up
Plateau Mountain	85	28	early August	2,438

must be an important factor in butterfly ecology. A recent literature review of butterfly ecology by Gilbert and Singer⁸ indicates that this concept has not been explored by lepidopterists. In Kananaskis Provincial Park, forest fires are especially important in creating the sunny, open habitats which support the greatest variety and most concentrated populations of butterflies. Fire also depresses treeline for a substantial time, thus providing additional alpine habitat for a number of species.

Other major influences on the park butterfly fauna are beaver activity, groundwater discharge, colluvial action, snow avalanches. All these factors, singly or in conjunction with fire provide a variety of non-forest habitats. With the exception of increased water levels in the Kananaskis Lakes, man has had relatively little widespread influence on the butterfly fauna. Linear clearings that result from powerline right-of-ways, trails, and old roads are actually superior places to observe butterflies since the insects apparently treat them as natural openings in the forest canopy.

In general, the park is poor butterfly habitat, similar to the situation reported by Tilden and Huntzinger²⁰ for Crater Lake National Park. Much of the park supports habitats foreign to good butterfly populations and

variety: extensive coniferous forest with low plant species diversity and cool, moist microclimate; rock barrens; water; glaciers; and perennial snowbanks. Certain alpine areas such as Highwood Pass support relatively rich butterfly populations. At lower elevations, the most productive habitats are open meadows, shrublands, and sparsely treed to non-treed wetlands.

¹BIRD, C. D. 1975a. A calendar of butterflies and skippers of the alpine area of Plateau Mountain. *Alberta Naturalist* 5:26-28.

²BIRD, C. D. 1975b. A calendar of the skippers and butterflies of Banff National Park. *Alberta Naturalist* 5:71-75.

³BIRD, C. D. 1975c. A revised calendar of the butterflies and skippers of Calgary. *Calgary Field Naturalist* 6:312-314.

⁴BIRD, C. D. 1976. *Rhopalocera* in the N. B. Sanson Collection. *Journal of the Lepidopterists' Society* 30:201-206.

⁵BIRD, C. D. 1977. The lichens, bryophytes, and butterflies of the proposed park in the Kananaskis Lakes area. Unpublished report for Parks Planning and Design Branch; Alberta Recreation, Parks and Wildlife. 76 pp.

⁶EMMEL, T. C. 1964. The ecology and distribution of butterflies in a montane community near Florissant,

Colorado. American Midland Naturalist 72:358-73.

⁷EMMEL, T. C. and J. F. EMMEL. 1962. Ecological studies of Rhopalocera in a high Sierran community — Donner Pass, California. I. Butterfly associations and distributional factors. Journal of the Lepidopterists' Society 16:23-44.

⁸GILBERT L. E. and M. C. SINGER. 1975. Butterfly ecology. Annual Review of Ecology and Systematics 6:365-397.

⁹HABECK, J. R. and R. W. MUTCH. 1973. Fire dependent forests in the northern Rocky Mountains. Journal of Quaternary Research 3:408-424.

¹⁰JAQUES, D. 1977. A preliminary checklist of vascular plants in the Kananaskis Lakes Provincial Park with special reference to rare or disjunct species and plant associations. Unpublished report for Parks Planning and Design Branch, Alberta Recreation, Parks and Wildlife. 59 pp.

¹¹KOHLER, S. 1977. Revision of North American *Boloria selene* (Nymphalidae) with description of a new subspecies. Journal of the Lepidopterists' Society 31:243-268.

²KONDLA, N. G. 1978. An overview vegetation survey of Kananaskis Provincial Park. Unpublished report for Parks Planning and Design Branch; Alberta Recreation, Parks and Wildlife. 123 pp.

³MacKENZIE, G. A. 1973. The fire ecology of the forests of Waterton Lakes National Park. M.Sc. Thesis, University of Calgary. 199 pp.

⁴MILUS TRESS BARRON LTD. 1976. Geology, soils, surficial deposits, and landform inventory and mapping: Kananaskis Provincial Park. Unpublished report for Parks Planning and Design Branch; Alberta Recreation, Parks and Wildlife. 162 pp.

⁵OPLER, P. A. and R. L. LANGSTON. 1968. A distributional analysis of the butterflies of Contra Costa County, California. Journal of the Lepidopterists' Society 22:89-107.

¹⁶PEREGRINE RESEARCH AND DOCUMENTATION LTD. 1977. Report on the vertebrate fauna of Kananaskis Provincial Park Unpublished report for Parks Planning and Design Branch; Alberta Recreation Parks and Wildlife. (Volume 1-322 pp, Volume 2-405 pp).

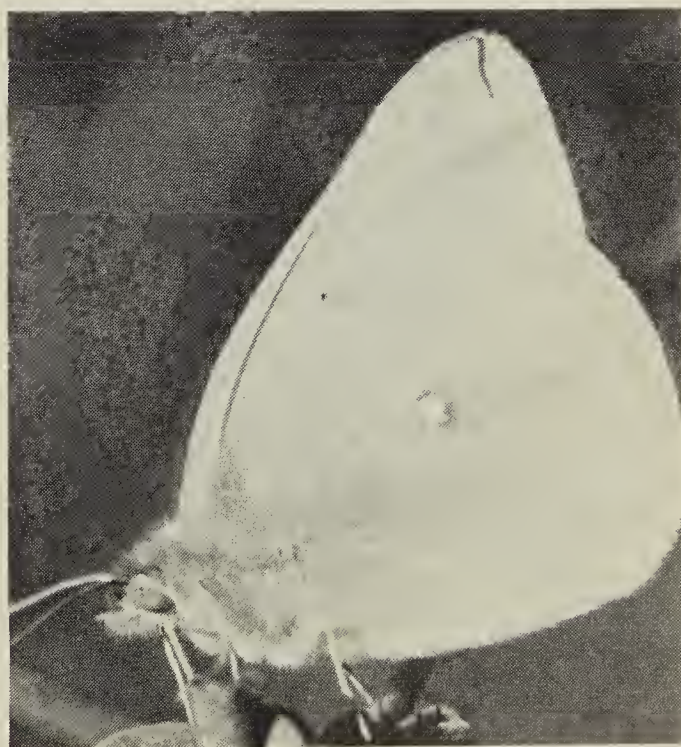
¹⁷PIKE, E. M. 1978. Origin of tundra butterflies in Alberta, Canada and their significance in the study of refugia of Wisconsin age. M.Sc. Thesis, University of Alberta. 137 pp.

¹⁸SHEPARD, J. H. 1975. Genus *Boloria* Reuss. Pp. 243-252 in Howe, W. H. (ed.) The butterflies of North America. Doubleday and Co., Inc., Garden City, New York.

¹⁹TANDE, G. F. 1977. A fire history of the coniferous forests around Jasper townsite, Jasper National Park, Alberta. M.Sc. Thesis, University of Alberta. 169 pp.

²⁰TILDEN, J. W. and D. H. HUNTZINGER. 1977. The butterflies of Crater Lake National Park, Oregon. Journal of Research on the Lepidoptera 16:176-192.

²¹TROTTIER, G. C. 1972. Ecology of the alpine vegetation of Highwood Pass Alberta. M.Sc. Thesis, University of Calgary. 229 pp.



Alexandra Sulphur

C. R. Wershler