DEPARTMENT OF THE INTERIOR

U.S. GEOLOGICAL SURVEY

Palynological Data from the Fort Union and Wasatch Formations, Powder River Basin, Wyoming and Montana

by

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CONTENTS

INTRODUCTION

The palynological data presented in this report result from a biostratigraphic and paleoecologic study of the Fort Union and Wasatch Formations in the northern Powder River Basin, Wyoming and Montana. This work has been the subject of an assignment by the author while on leave from the New Zealand Geological Survey, Lower Hutt, New Zealand and as a Visiting Scientist at the U.S. Geological Survey, Denver, Colorado.

Samples for palynological examination were obtained from core and surface sections near Arvada, Wyoming, and Broadus, Montana (see Fig. 1). Cores were placed in stratigraphic context by Flores et al. (1982). Fig. 2 is a composite stratigraphic section of the Tongue River Member of the Fort Union Formation and the lowermost Wasatch Formation. On this figure are marked the major coal beds and the position of samples collected for a stratigraphic analysis (prefixed with a USGS Paleobotany "D" number). Coal bed nomenclature follows Olive (1957), Flores et al. (1982), and McLellan (1981; oral communication, 1985).

The data are presented in two appendices: in Appendix 1 all the palynological data are tabulated, and in Appendix 2 the locality data for all samples are presented.

The data obtained from the biostratigraphic samples are presented in Tables 1 and 2 of Appendix 1. A more detailed analysis was made of the Anderson and Smith coals in several cores and these data are recorded in Tables 3 and 4 of Appendix 1, respectively.

QUANTITATIVE ANALYSIS

Most samples examined contained a rich and well preserved palynomorph assemblage. Assemblages from the Tongue River Member were almost without exception dominated by pollen of the Taxodiaceae and Cupressaceae families. This dominance tends to mask the more stratigraphically and paleoecologically important elements in the assemblages and for this reason are excluded from many percentage calculations. In several samples additional palynomorph counts were required to obtain a statistically reliable base for percentage calculations, a minimum count of 100 palynomorphs. These additional counts are recorded in parentheses in Table 2 of Appendix 1 (e.g., 3(7)). In all tables a "+" indicates the palynomorph was recorded after the count was completed. A "-" indicates the absence of the palynomorph.

All slides are held in the Denver laboratory of the U.S. Geological Survey. They may be accessed by their "D" numbers.

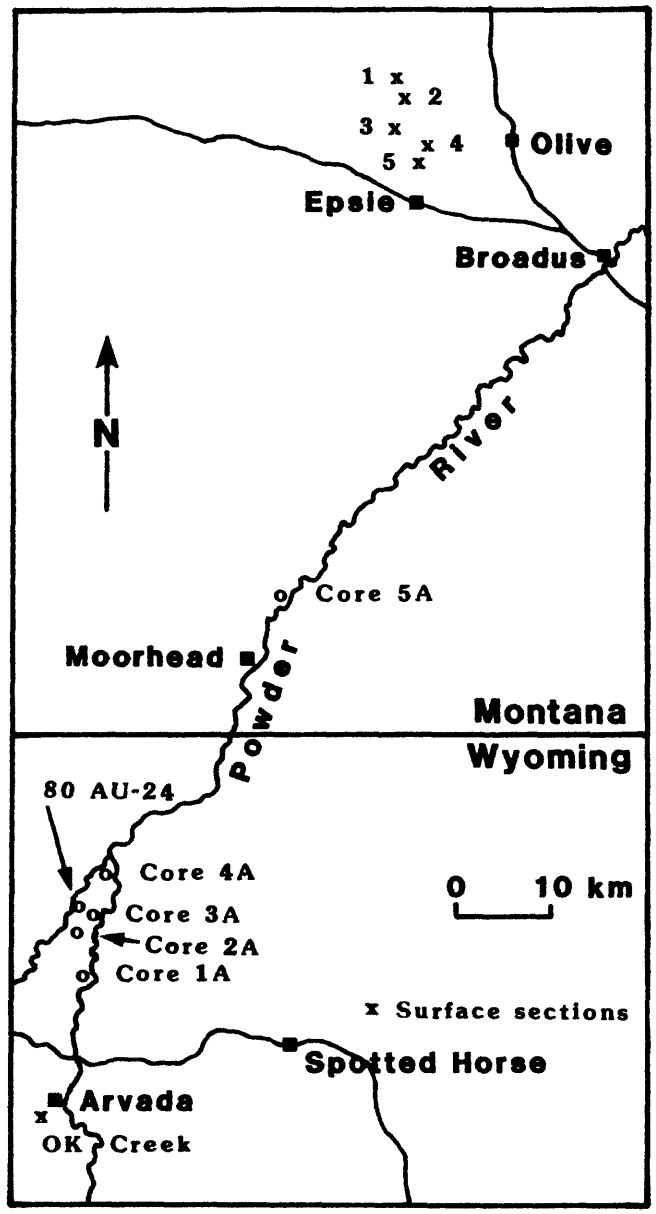

Fig. 1. Locality of cores and surface sections studied in the Powder River Basin. Surface localities are:
1. O'Dell coal (D6768). 2. Below O'Dell coal (D6767).
3. Mackin-Walker coal (D6765 & D6764). 4. Local 2 coal (D6766).
5. Sawyer coal (D6763 & D6762).

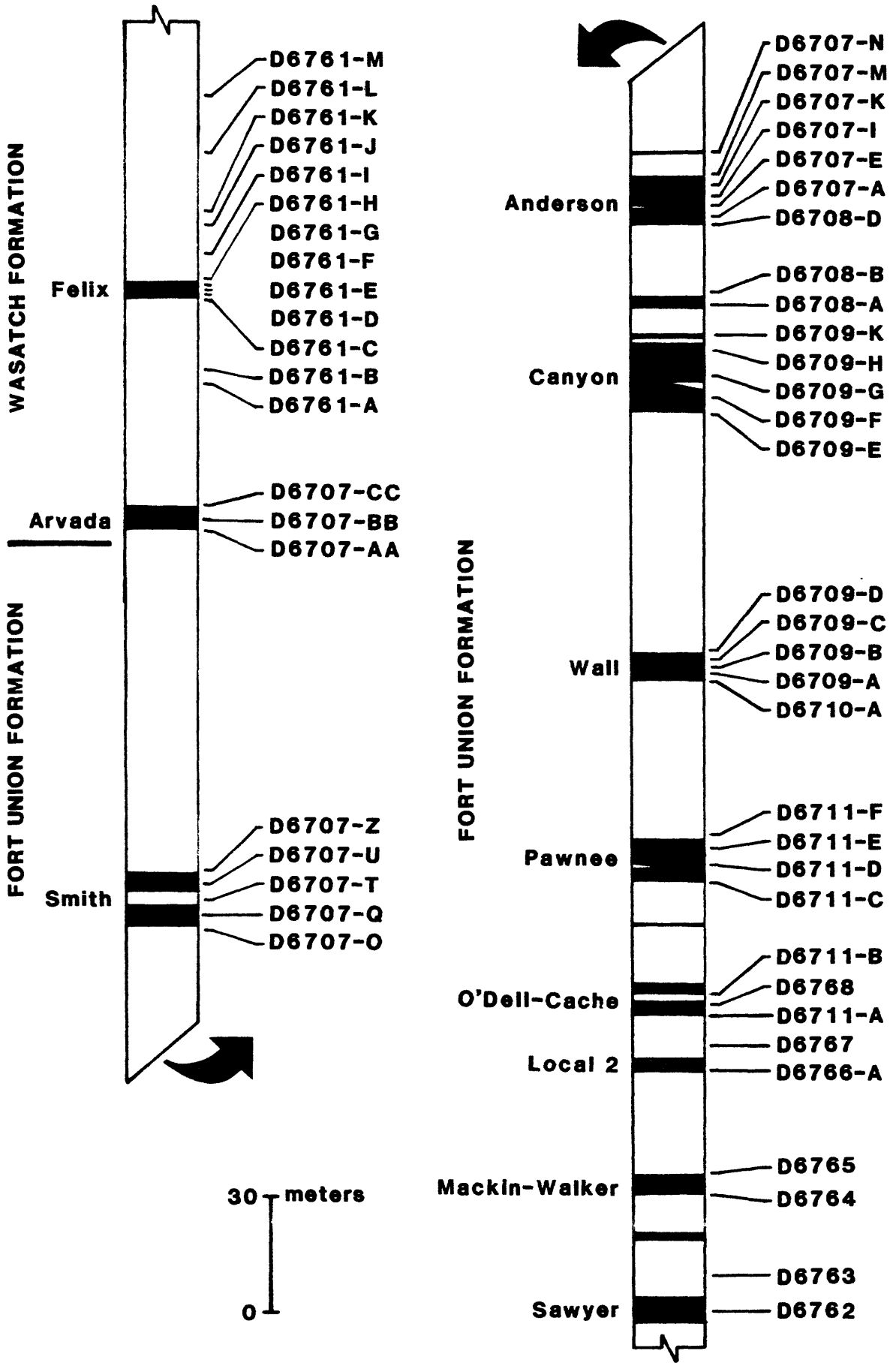

Fig. 2. Composite stratigraphic section showing distribution of coal beds and sampling horizons in the Fort Union and Wasatch Formations, Powder River Basin.

TAXONOMIC NOMENCLATURE

For ease of tabulation, all palynomorphs have been assigned a number. The numbers appear along the horizontal axes of all tables. Both numerical and alphabetical listings are provided.

No new taxonomic names are used in this report. Some taxa which are undescribed at present have been assigned either to genera or to a morphological type (e.g., Tricolporate A.), when no described genus is considered suitable. A variety of tricolpate and tricolporate taxa were recorded that could not be assigned to existing species or genera; these have been included in the category "Tricolpate/tricolporate unknown". Taxodiaceae and Cupressaceae types have been recorded collectively under their family affinity because of the difficulty in distinguishing between them. Although several bisaccate conifer pollen types were noted, they are not subdivided into fossil generic taxa; they have been recorded as "bisaccates".

NUMERICAL LISTING OF PALYNOMORPHS

1. Taxodiaceae - Cupressaceae
2. Bisaccates
3. Caryapollenites veripites (Wilson & Webster) Nichols & Ott
4. C. imparalis Nichols & Ott
5. C. inelegans Nichols & Ott
6. C. wodehousei Nichols & Ott
7. Momipites wyomingensis Nichols & Ott
8. M. ventifluminis Nichols & Ott
9. M. annellus Nichols & Ott
10. M. amplus (Leffingwell) Nichols
11. M. waltmanensis Nichols & Ott
12. Ulmipollenites krempii/tricostatus
13. Alnipollenites verus (Potonié) Potonié
14. A. trina (Stanley) Norton & Hall
15. Alnus scoticus Simpson
16. Tilia tetraforaminipites Wodehouse
17. Triporopollenites spp.
18. Quercus explanata Anderson
19. Nyssa ingentipollinia Traverse
20. Tricolporate A.

21. Tricolporate B.
22. Cupuliferoipollenites spp.
23. Triatriopollenites granulatus (Simpson) Leffingwell
24. Polyatriopollenites vermontensis (Traverse) Frederiksen
25. Paraalnipollenites cf. P. confusus Hills & Wallace
26. Pistillipollenites mcgregorii Rouse
27. Insulapollenites rugulatus Leffingwell
28. Syncolporites cf. S. minimus Leffingwell
29. Tricolpate (fine reticulum)
30. Tricolpites hians Stanley
31. Tricolpate A.
32. Tricolpate B.
33. Tricolpate C.
34. Tricolpites angululuminosus Anderson
35. Erdtmanipollis pachysandroides Krutzsch
36. Periporopollenites sp.
37. Malvacipollis spp.
38. Liliacidites spp.
39. Arecipites cf. A. tenuiexinous Leffingwell
40. Pandaniidites radicus Leffingwell
41. Ericipites sp.
42. Corollina sp.
43. Ephedripites spp.
44. Cycadopites spp.
45. ?Araucariacites sp.
46. Tricolpites sp. cf. Eucommia
47. Aesculiidites sp.
48. Aesculiidites circumstriatus (Fairchild) Elsik
49. Monosulcites spp.
50. Sparganium cf. S. globipites Wilson & Webster
51. Dyadonipites reticulatus Tschudy
52. Platycarya platycaryoides (Roche) Frederiksen & Christopher
53. Aquilapollenites spinulosus Funkhouser
54. Ailanthipites cf. A. berryi Wodehouse
55. Intratriporopollenites sp.
56. Proteacidites cf. P. thalmanni Anderson

57. Tricolpate/tricolporate unknown
58. Leiotriletes spp.
59. Gleicheniidites sp.
60. Stereisporites spp.
61. Reticuloidosporites pseudomurii Elsik
62. Laevigatosporites spp.
63. Lycopodiumsporites sp.
64. Baculatisporites sp.
65. Zlivisporis novomexicanum (Anderson) Leffingwell
66. Cicatricosisporites sp.

ALPHABETICAL LISTING OF PALYNOMORPHS

Erdtmanipollis pachysandroides Krutzsch	35
Ericipites sp.	41
Gleicheniidites sp.	59
Insulapollenites rugulatus Leffingwell	27
Intratriporopollenites sp.	55
Laevigatosporites spp.	62
Leiotriletes spp.	58
Liliacidites spp.	38
Lycopodiumsporites	63
Malvacipollis spp.	37
Momipites amplus (Leffingwell) Nichols	10
M. annellus Nichols & Ott	9
M. ventifluminis Nichols & Ott	8
M. waltmanensis Nichols & Ott	11
M. wyomingensis Nichols & Ott	7
Monosulcites spp.	49
Nyssa ingentipollinia Traverse	19
Pandaniidites radicus Leffingwell	40
Paraalnipollenites cf. P. confusus Hills & Wallace	25
Periporopollenites sp.	36
Pistillipollenites mcgregorii Rouse	26
Platycarya platycaryoides (Roche) Frederiksen & Christopher	52
Polyatriopollenites vermontensis (Traverse) Frederiksen	24
Proteacidites cf. P. thalmanni Anderson	56
Quercus explanata Anderson	18
Reticuloidosporites pseudomurii Elsik	61
Sparganium cf. S. globipites Wilson & Webster	50
Stereisporites spp.	60
Syncolporites cf. S. minimus Leffingwell	28
Taxodiaceae - Cupressaceae	1
Tilia tetraforaminipites Wodehouse	16
Triatriopollenites granulatus (Simpson) Leffingwell	23
Tricolpate (fine reticulum)	29
Tricolpate A.	31
Tricolpate B.	32
Tricolpate C.	33

Tricolpate/tricolporate unknown	57
Tricolpites angululuminosus Anderson	34
T. hians Stanley	30
T. sp. cf. *Eucommia*	46
Tricolporate A.	20
Tricolporate B.	21
Triporopollenites spp.	17
Ulmipollenites krempii/tricostatus	12
Zlivisporis novomexicanum (Anderson) Leffingwell	65

REFERENCES CITED

Flores, R.M., Toth, J.C., and Moore, T.A., 1982, Use of geophysical logs in recognizing depositional environments in the Tongue River Member of the Fort Union Formation, Powder River area, Wyoming and Montana. U.S. Geological Survey Open-File Report 82-576, 40 p.

McLellan, M.W., 1981, Geologic map and coal resources of the Leslie Creek Quadrangle, Powder River County, Montana. U.S. Geological Survey Miscellaneous Field Studies, Map MF-1296.

Olive, W.W., 1957, The Spotted Horse Coalfield, Sheridan and Campbell Counties, Wyoming. U.S. Geological Survey Bulletin 1050, 83 p.

APPENDIX 1

TABLE 1

PALYNOMORPHS IN THE OK CREEK SECTION

USGS Paleobotany locality no.	Palynomorph number										
	1.	2.	3.	4.	5.	7.	8.	9.	12.	13.	14.
D6761-M	5	+	3	4	-	3	-	+	47	3	-
D6761-L	48	4	1	9	1	3	-	-	13	+	-
D6761-K	31	3	+	-	+	-	-	+	4	10	-
D6761-J	183	+	4	2	3	2	+	-	3	+	-
D6761-I	188	3	+	3	+	1	+	-	12	3	-
D6761-H	129	2	1	+	1	+	-	+	70	2	-
D6761-G	-	+	+	2	1	1	+	+	100	4	-
D6761-F	9	-	-	-	-	-	-	-	30	5	-
D6761-E	58	1	+	+	-	1	1	-	9	4	-
D6761-D	161	+	-	2	+	1	+	-	22	1	-
D6761-C	361	1	1	2	+	4	+	+	33	6	+
D6761-B	587	+	1	1	-	1	+	-	4	57	1
D6761-A	148	1	12	2	+	4	+	+	13	50	+

continued on p. 10

TABLE 1

	15.	16.	17.	19.	22.	24.	25.	26.	29.	30.	31.	34.
D6761-M	2	1	11	-	-	-	+	6	1	3	-	-
D6761-L	-	1	6	-	-	-	-	9	3	5	-	-
D6761-K	+	-	+	-	+	-	-	6	-	6	-	-
D6761-J	-	1	3	-	3	-	-	4	2	37	-	-
D6761-I	-	3	2	+	-	+	-	19	10	23	-	1
D6761-H	-	2	1	1	-	-	-	+	2	4	-	-
D6761-G	-	-	3	-	-	+	-	1	5	+	-	+
D6761-F	-	-	4	-	-	-	-	-	6	-	-	12
D6761-E	-	-	50	-	-	-	-	-	-	4	-	+
D6761-D	-	+	+	-	-	-	-	1	-	35	1	-
D6761-C	-	1	1	1	2	-	-	5	-	58	-	+
D6761-B	-	+	+	+	2	+	+	+	1	100	-	-
D6761-A	-	+	+	+	2	+	+	21	2	24	7	+

continued on p. 11

TABLE 1

	35.	36.	37.	38.	40.	43.	44.	46.	50.	52.	54.	55.
D6761-M	-	-	-	-	4	-	-	13	6	100	-	+
D6761-L	-	-	-	-	5	+	-	+	47	50	-	+
D6761-K	-	-	-	+	+	-	-	-	36	200	-	8
D6761-J	+	+	-	2	5	-	-	+	3	50	4	2
D6761-I	+	+	+	-	2	+	-	3	4	5	-	+
D6761-H	-	-	-	+	-	-	-	+	15	100	-	+
D6761-G	-	-	-	-	+	-	+	1	7	78	-	2
D6761-F	-	-	+	-	-	-	-	1	-	-	-	-
D6761-E	-	-	-	-	-	-	-	-	-	1	-	-
D6761-D	+	+	+	+	2	-	-	-	1	33	-	28
D6761-C	-	-	2	-	-	-	+	-	-	32	-	1
D6761-B	+	+	-	-	2	-	-	-	1	28	-	+
D6761-A	-	-	-	-	+	-	+	1	7	34	+	9

continued on p. 12

TABLE 1

	57.	58.	59.	60.	61.	62.	64.	65.	66.
D6761-M	6	-	+	-	-	11	-	-	-
D6761-L	2	3	-	+	-	8	-	+	+
D6761-K	3	2	-	-	-	30	-	-	-
D6761-J	33	15	-	2	-	97	+	2	+
D6761-I	7	6	-	-	+	1	+	-	-
D6761-H	-	1	+	1	-	8	+	-	-
D6761-G	-	1	-	-	-	15	-	-	-
D6761-F	24	2	-	-	-	13	-	-	-
D6761-E	24	-	-	19	-	-	-	-	-
D6761-D	4	+	+	+	+	8	-	-	-
D6761-C	4	2	+	1	+	25	-	-	-
D6761-B	4	2	-	-	-	4	-	-	-
D6761-A	2	2	+	+	-	19	-	-	+

TABLE 2

PALYNOMORPHS IN THE COMPOSITE STRATIGRAPHIC SECTION

USGS Paleobotany Locality no.		Palynomorph number						
		1.	2.	3.	4.	5.	6.	7.	8.
D6707-CC	200	7(31)	5(5)	-	-	-	(1)	-
D6707-BB	100	31	28	-	11	-	+	-
D6707-AA	150	2	12	7	6	-	9	+
D6707-Z	200	2(3)	1(10)	5(4)	4	-	1(6)	+
D6707-U	200	+(1)	4(2)	3(1)	+(2)	-	3(1)	+
D6707-T	200	3(22)	3(2)	5(13)	-	-	+(8)	-
D6707-Q	200	8(9)	+(1)	1(3)	(1)	-	5(5)	1
D6707-O	100	2(1)	+	(1)	-	-	2(2)	-
D6707-N	200	2(13)	4(9)	4(26)	(4)	(1)	2(5)	+
D6707-M	200	+	2(13)	4(10)	1(1)	-	3(9)	+
D6707-K	200	5(23)	1(3)	10(11)	-	(1)	11(10)	-
D6707-I	200	2(17)	4(9)	2(11)	2(2)	+(5)	10(10)	+
D6707-E	200	8	20	26	9	7	25	+
D6707-A	200	5(13)	3(17)	8(12)	1(5)	+(2)	9(17)	+(2)

continued on p. 14

TABLE 2

	1.	2.	3.	4.	5.	6.	7.	8.
D6708-D	200	9(25)	7(21)	6(13)	(4)	+(2)	8(22)	+(4)
D6708-B	200	1(5)	+(5)	+(3)	2	-	+(14)	+
D6708-A	200	1	+	24	6	-	32	2
D6709-K	200	+(2)	+(5)	4(4)	+	+(1)	2(7)	+(2)
D6709-J	+	-	-	+	+	-	+	-
D6709-I	+	-	-	+	+	-	-	-
D6709-H	100	7	+	16	1	-	29	+
D6709-G	200	4	3	8	1	-	21	-
D6709-F	200	4	2	3	+	+	12	+
D6709-E	100	8	1	8	7	5	30	5
D6709-D	100	6(12)	-	2(13)	3	-	11(20)	(1)
D6709-C	200	15	3	3	-	8	20	+
D6709-B	100	2	2	13	-	4	21	-
D6709-A	200	+(4)	+(6)	1(10)	1	+(4)	18(45)	+(12)

continued on p. 15

TABLE 2

	1.	2.	3.	4.	5.	6.	7.	8.
D6710-A	200	4	2	5	2	1	16	-
D6711-F	200	8(8)	(1)	2(3)	-	+(1)	5(15)	(2)
D6711-E	100	21	1	9	-	+	11	-
D6711-D	200	3(11)	(5)	2(10)	-	2(5)	9(38)	+(2)
D6711-C	100	7	-	-	-	+	10	+
D6711-B	200	2(4)	+(1)	+(2)	+	2(1)	2(16)	+(2)
D6768	354	33	1	7	-	3	33	+
D6711-A	100	2	1	6	-	1	12	+
D6767	200	10	2	4	-	4	41	3
D6766-A	424	1	-	2	+	2	21	+
D6765	10	3	-	-	-	+	5	-
D6764	200	7	-	5	-	4	14	+
D6763	7	7	-	5	-	3	35	3
D6762	296	9	-	8	-	6	9	1

continued on p. 16

TABLE 2

	10.	11.	12.	13.	14.	15.	16.	17.
D6707-CC	-	-	+(1)	+(1)	-	-	+(1)	3(10)
D6707-BB	-	-	66	-	-	-	-	37
D6707-AA	+	-	3	+	-	-	-	6
D6707-Z	-	-	1(6)	+(2)	-	-	-	(19)
D6707-U	-	-	2(1)	1(1)	(1)	-	(+)	2(3)
D6707-T	-	-	2(4)	+(2)	-	(+)	(1)	14
D6707-Q	-	-	+(2)	1(8)	-	-	-	18
D6707-O	-	-	4(3)	+	(1)	-	-	(1)
D6707-N	-	-	1(1)	+(2)	-	-	(1)	1(20)
D6707-M	+	-	(4)	+(3)	-	-	(1)	6(15)
D6707-K	-	-	-	(7)	-	-	+(17)	+(16)
D6707-I	-	-	1(2)	1	-	-	+	10(28)
D6707-E	-	-	5	+	-	-	+	+
D6707-A	-	-	1(4)	+	(1)	-	+(2)	4(10)

continued on p. 17

TABLE 2

	10.	11.	12.	13.	14.	15.	16.	17.
D6708-D	-	-	4(4)	3(2)	-	+	4(7)	(6)
D6708-B	-	-	19(55)	-	-	-	+	+
D6708-A	1	-	63	+	-	-	-	+
D6709-K	-	-	1(4)	+	-	-	(2)	+(1)
D6709-J	-	-	+	-	-	-	-	-
D6709-I	-	-	+	-	-	-	-	-
D6709-H	-	-	7	1	-	+	7	14
D6709-G	-	-	23	+	-	-	1	1
D6709-F	-	-	3	-	-	-	+	4
D6709-E	-	-	10	-	-	+	-	1
D6709-D	-	-	2(4)	-	-	-	+(3)	(2)
D6709-C	1	-	27	+	-	-	+	+
D6709-B	-	-	1	+	-	-	+	22
D6709-A	+	-	4(14)	1	+	-	-	2(8)

continued on p. 18

TABLE 2

	10.	11.	12.	13.	14.	15.	16.	17.
D6710-A	-	-	+	-	-	-	1	19
D6711-F	-	-	+	+	-	-	1	9(39)
D6711-E	-	-	6	+	-	-	+	10
D6711-D	-	-	4(5)	+(3)	+	(+)	+	28(65)
D6711-C	-	-	12	-	1	-	-	7
D6711-B	-	-	+(1)	+	+	-	-	25(61)
D6768	-	+	3	1	1	-	2	34
D6711-A	-	-	17	+	-	-	-	1
D6767	+	-	20	2	+	-	+	6
D6766-A	-	-	18	+	+	-	1	+
D6765	-	+	100	2	-	-	-	2
D6764	-	+	57	-	-	-	-	2
D6763	-	3	42	-	-	-	-	15
D6762	-	4	18	2	+	-	-	32

continued on p. 19

TABLE 2

	18.	19.	20.	21.	22.	23.	24.	25.	26.
D6707-CC	+	1(11)	+	(7)	+(2)	-	1(4)	-	-
D6707-BB	-	2	-	-	-	-	23	-	1
D6707-AA	-	2	-	-	-	-	3	-	+
D6707-Z	(6)	9(12)	-	(10)	(2)	-	+(1)	-	-
D6707-U	-	-	-	-	1(3)	-	(2)	-	-
D6707-T	-	+	-	-	+(2)	-	+(2)	-	+(2)
D6707-Q	+	+(2)	(2)	(28)	+(3)	-	-	-	-
D6707-O	-	-	-	-	(2)	-	-	-	+(1)
D6707-N	+	+(6)	-	+	+(6)	-	+	-	+
D6707-M	+(2)	8(20)	-	(2)	(3)	-	+(4)	-	-
D6707-K	-	(3)	(1)	-	(2)	-	15(34)	-	(+)
D6707-I	+(1)	4(12)	(8)	-	(3)	-	2(2)	-	-
D6707-E	-	+	-	-	-	-	-	+	4
D6707-A	-	+	-	-	(4)	(1)	-	+	-

continued on p. 20

TABLE 2

	18.	19.	20.	21.	22.	23.	24.	25.	26.
D6708-D	+	2(2)	-	-	-	+	1	-	+
D6708-B	-	+	-	-	(1)	-	-	+	+(2)
D6708-A	-	-	-	-	-	-	7	+	+
D6709-K	+	1	-	(1)	(4)	-	+	-	+
D6709-J	-	-	-	-	-	-	-	-	-
D6709-I	-	-	-	-	-	-	-	-	-
D6709-H	21	36	4	6	-	+	9	-	-
D6709-G	1	1	-	-	-	-	-	+	+
D6709-F	+	+	-	-	2	-	-	+	-
D6709-E	8	+	-	-	-	-	+	1	-
D6709-D	(1)	(1)	-	-	-	-	-	-	-
D6709-C	-	-	-	-	+	-	-	-	9
D6709-B	-	+	-	+	-	-	-	-	-
D6709-A	-	+	-	-	2(4)	(1)	-	+	+

continued on p. 21

TABLE 2

	18.	19.	20.	21.	22.	23.	24.	25.	26.
D6710-A	3	1	-	-	-	-	35	-	27
D6711-F	-	+	-	(3)	+(1)	(2)	-	-	-
D6711-E	-	2	-	+	-	-	-	-	-
D6711-D	2	4(11)	-	1(3)	+	+	(2)	-	+
D6711-C	4	2	-	2	1	-	-	-	+
D6711-B	1(2)	(5)	-	-	-	-	-	-	-
D6768	2	3	1	+	+	+	2	-	+
D6711-A	2	+	-	-	1	-	2	-	1
D6767	-	+	-	-	-	+	+	-	+
D6766-A	-	-	-	-	2	-	-	-	-
D6765	-	-	-	-	-	-	-	-	-
D6764	-	-	-	-	-	-	-	-	-
D6763	-	-	-	-	-	-	+	-	-
D6762	-	-	-	-	-	+	-	-	-

continued on p. 22

TABLE 2

	27.	28.	29.	30.	31.	32.	33.	34.	35.
D6707-CC	1(1)	-	3	(6)	-	+	-	1(3)	-
D6707-BB	-	-	-	40	1	-	-	5	1
D6707-AA	-	18	-	32	-	11	-	2	-
D6707-Z	1(1)	-	(8)	14(3)	-	(1)	-	(5)	+
D6707-U	-	26(50)	(10)	18(14)	+(1)	8(13)	+	3(3)	-
D6707-T	+	+(1)	7(5)	7(18)	-	1	(2)	(4)	-
D6707-Q	+(3)	-	2	4(9)	-	+	-	(3)	-
D6707-O	-	1(1)	4	13(28)	-	-	-	1	1
D6707-N	+	-	10(6)	2(19)	-	-	(1)	4(16)	-
D6707-M	+(6)	(1)	12(13)	(11)	2	-	-	2(9)	-
D6707-K	-	(2)	6(4)	5(12)	(1)	-	-	+(4)	+
D6707-I	+(1)	-	4(16)	4(12)	-	-	-	3(12)	-
D6707-E	-	-	9	4	4	+	-	3	-
D6707-A	-	(2)	4(6)	7(37)	1	-	-	3(17)	-

continued on p. 23

TABLE 2

	27.	28.	29.	30.	31.	32.	33.	34.	35.
D6708-D	-	2(2)	4	5(13)	+	+(5)	-	2(10)	-
D6708-B	-	+(1)	+	14(37)	+	+(1)	-	3(5)	-
D6708-A	-	6	5	21	-	2	-	12	-
D6709-K	+	4(21)	+	8(18)	(5)	+	-	+(10)	-
D6709-J	-	-	+	+	-	-	-	-	-
D6709-I	-	-	-	-	-	-	-	-	-
D6709-H	+	-	61	14	7	3	-	9	+
D6709-G	-	-	89	+	7	1	+	10	-
D6709-F	-	2	56	6	3	+	-	3	-
D6709-E	-	+	65	2	4	3	-	6	-
D6709-D	+(4)	(3)	2(12)	5(17)	-	-	-	2(5)	2(1)
D6709-C	-	5	11	13	2	1	+	5	-
D6709-B	1	-	10	-	-	-	-	11	1
D6709-A	+	7(21)	-	14(38)	-	(5)	1(6)	3(5)	+

continued on p. 24

TABLE 2

	27.	28.	29.	30.	31.	32.	33.	34.	35.
D6710-A	-	-	10	+	6	-	-	1	-
D6711-F	+	-	1	1(3)	(2)	1(5)	-	2(8)	-
D6711-E	2	-	28	1	-	-	-	+	-
D6711-D	-	-	9(31)	3(36)	+	-	1	1(3)	-
D6711-C	+	-	35	36	-	-	-	+	-
D6711-B	+(1)	2	+(2)	-	+	-	-	(1)	-
D6768	+	+	-	6	2	+	-	-	+
D67611-A	-	6	+	119	-	55	-	2	-
D6767	-	5	+	48	2	1	1	+	-
D6766-A	-	1	10	35	-	1	-	+	-
D6765	-	-	-	-	-	-	-	-	-
D6764	-	-	-	5	-	-	-	-	-
D6763	-	-	-	4	2	-	-	26	-
D6762	-	-	-	5	10	-	-	-	+

continued on p. 25

TABLE 2

	36.	37.	38.	39.	40.	41.	42.	43.	44.
D6707-CC	-	-	(1)	+	-	-	-	-	-
D6707-BB	-	-	2	-	3	2	+	-	3
D6707-AA	+	-	3	3	+	-	2	-	1
D6707-Z	-	-	-	+	-	-	+	-	1
D6707-U	+	-	+	+	+	-	1	+	+
D6707-T	-	-	-	+	-	-	+	(1)	-
D6707-Q	-	-	-	(1)	-	-	-	-	(3)
D6707-O	+	-	-	1	-	-	-	-	1
D6707-N	+	-	+	+(2)	+	-	+	-	+
D6707-M	-	-	-	-	(1)	-	+	-	-
D6707-K	+(1)	2	-	-	-	-	+	-	-
D6707-I	-	+	+	-	-	-	-	-	-
D6707-E	+	-	+	+	1	+	-	-	+
D6707-A	-	-	-	+(4)	-	+	+	-	-

continued on p. 26

TABLE 2

	36.	37.	38.	39.	40.	41.	42.	43.	44.
D6708-D	+	-	-	1	1(1)	+	+	-	+(3)
D6708-B	+	-	-	-	2	-	+(1)	-	+
D6708-A	+	-	+	2	1	-	+	-	+
D6709-K	-	-	-	+	-	+(1)	-	-	+
D6709-J	-	-	-	-	-	+	-	-	-
D6709-I	-	-	-	-	-	-	-	-	-
D6709-H	-	+	1	2	-	+	-	+	1
D6709-G	-	-	-	-	1	-	-	-	-
D6709-F	+	+	-	-	-	-	+	-	-
D6709-E	-	-	-	-	-	1	-	-	-
D6709-D	-	-	-	1(1)	-	-	-	-	(2)
D6709-C	+	-	-	-	-	+	+	-	-
D6709-B	-	-	4	+	-	-	-	-	-
D6709-A	(1)	+	-	+	+	+	+	+	-

continued on p. 27

TABLE 2

	36.	37.	38.	39.	40.	41.	42.	43.	44.
D6710-A	+	-	-	-	-	-	-	-	-
D6711-F	-	-	1	-	-	-	-	-	-
D6711-E	+	-	-	-	-	-	-	-	-
D6711-D	(2)	-	-	-	-	-	+	-	+
D6711-C	-	-	+	-	-	-	-	-	+
D6711-B	-	-	-	-	-	-	+	-	-
D6768	-	-	+	-	-	-	+	-	-
D6711-A	-	-	-	1	-	-	-	-	1
D6767	-	-	1	-	-	-	+	-	+
D6766-A	-	-	-	-	1	-	-	-	-
D6765	-	-	-	-	-	-	-	-	+
D6764	-	-	-	-	-	-	-	-	1
D6763	-	-	-	-	-	-	-	-	1
D6762	-	-	-	-	-	-	-	-	-

continued on p. 28

TABLE 2

	45.	46.	47.	49.	50.	51.	53.	54.	56.
D6707-CC	-	-	-	-	-	-	-	-	-
D6707-BB	-	-	-	-	-	-	-	-	-
D6707-AA	+	-	-	-	-	-	-	-	-
D6707-Z	-	-	-	-	-	-	-	-	-
D6707-U	-	-	+(7)	-	-	-	-	-	-
D6707-T	-	-	-	-	-	(2)	-	(1)	-
D6707-Q	-	-	-	-	-	-	-	(1)	-
D6707-O	-	-	-	-	-	69(161)	-	-	-
D6707-N	-	-	-	-	-	-	-	(1)	-
D6707-M	-	-	-	-	-	-	-	-	-
D6707-K	-	-	-	-	-	-	-	-	-
D6707-I	-	-	-	-	-	-	-	-	-
D6707-E	-	-	-	-	-	-	-	-	-
D6707-A	-	-	-	-	-	-	-	-	+

continued on p. 29

TABLE 2

	45.	46.	47.	49.	50.	51.	53.	54.	56.
D6708-D	-	-	-	-	-	-	-	-	-
D6708-B	-	-	+	-	-	-	-	1	-
D6708-A	-	-	+	-	-	-	-	-	-
D6709-K	-	-	+(1)	-	-	-	-	(1)	-
D6709-J	-	-	-	-	-	-	-	-	-
D6709-I	-	-	-	-	-	-	-	-	-
D6709-H	-	+	-	-	+	-	-	-	-
D6709-G	-	-	-	-	-	-	-	-	-
D6709-F	-	-	+	-	-	-	-	-	-
D6709-E	-	-	-	-	+	-	-	-	-
D6709-D	-	-	-	-	-	-	-	-	-
D6709-C	-	-	-	-	-	-	-	-	-
D6709-B	-	+	-	-	-	-	-	1	-
D6709-A	(4)	-	-	-	-	-	-	-	-

continued on p. 30

TABLE 2

	45.	46.	47.	49.	50.	51.	53.	54.	56.
D6710-A	-	-	-	-	+	-	-	-	-
D6711-F	-	-	-	-	-	-	-	(3)	-
D6711-E	-	-	-	-	-	-	-	-	-
D6711-D	-	-	-	-	7	-	-	-	-
D6711-C	-	-	-	-	-	-	-	-	-
D6711-B	-	-	+	-	+	-	-	-	-
D6768	-	-	+	-	-	-	-	-	-
D6711-A	-	-	-	-	-	-	-	3	-
D6767	-	-	1	-	-	-	+	-	-
D6766-A	-	-	-	-	-	-	-	-	-
D6765	-	-	-	-	-	-	1	-	-
D6764	-	-	1	-	-	-	1	-	-
D6763	-	-	-	-	-	-	+	-	-
D6762	-	-	-	-	-	-	-	-	-

continued on p. 31

TABLE 2

	57.	58.	59.	60.	61.	62.	63.	64.
D6707-CC	(7)	-	-	+(6)	(1)	3	-	-
D6707-BB	2	9	-	-	-	6	-	-
D6707-AA	6	7	2	5	1	2	-	(1)
D6707-Z	-	-	-	-	+(1)	+(1)	-	+
D6707-U	-	(1)	-	1(1)	-	+(1)	-	+(2)
D6707-T	+(27)	+	-	+	-	(1)	-	+(1)
D6707-Q	2(3)	3	-	1(1)	-	+(9)	-	-
D6707-O	-	-	-	-	-	+(2)	-	(1)
D6707-N	1	+(2)	1	+(8)	2(1)	+	-	-
D6707-M	(3)	-	-	-	1(2)	-	+	-
D6707-K	3	2(3)	(+)	+	+(1)	1	-	-
D6707-I	(3)	(1)	+	-	4(2)	+	+	+
D6707-E	1	+	+	+	+	+	-	+
D6707-A	4(1)	(1)	+(2)	+	+	1(1)	-	-

continued on p. 32

TABLE 2

	57.	58.	59.	60.	61.	62.	63.	64.
D6708-D	-	+	+(3)	-	+	+	-	-
D6708-B	-	(1)	1(2)	+	+	+(3)	-	-
D6708-A	-	8	1	1	1	+	-	-
D6709-K	(5)	1(2)	+(4)	+(5)	+	-	-	-
D6709-J	-	+	-	-	-	-	-	-
D6709-I	-	+	-	-	-	-	-	-
D6709-H	-	+	-	-	+	-	-	-
D6709-G	1	1	-	-	-	1	-	-
D6709-F	-	+	-	+	-	-	-	-
D6709-E	-	-	-	-	-	+	-	-
D6709-D	-	2	-	-	-	2(8)	-	-
D6709-C	-	2	+	+	-	+	-	-
D6709-B	-	-	-	+	1	1	-	-
D6709-A	6(4)	+(4)	-	(1)	-	2(1)	-	-

continued on p. 33

TABLE 2

	57.	58.	59.	60.	61.	62.	63.	64.
D6710-A	-	+	-	-	-	5	-	-
D6711-F	2(6)	(1)	-	-	-	-	-	-
D6711-E	8	-	-	-	-	-	-	+
D6711-D	(3)	-	-	+(2)	-	+(7)	-	-
D6711-C	1	-	-	-	-	10	-	-
D6711-B	2(10)	-	+	-	1	(2)	-	+
D6768	4	+	-	2	+	6	-	-
D6711-A	-	-	-	-	-	3	+	-
D6767	9	5	-	+	-	5	-	-
D6766-A	4	1	-	+	-	1	-	-
D6765	4	-	-	-	-	23	-	-
D6764	2	-	-	-	-	26	-	-
D6763	12	-	-	-	-	35	-	-
D6762	-	-	-	-	-	-	-	-

TABLE 3

PALYNOMORPHS IN THE ANDERSON COAL ZONE

USGS Paleobotany locality no.	Palynomorph number									
	1.	2.	3.	4.	5.	6.	7.	8.	10.	12.	13.
D6707-N'	434	1	2	3	2	-	+	-	-	+	-
D6707-M'	234	9	16	9	1	-	3	+	-	1	-
D6707-L	338	15	2	2	1	-	8	+	-	-	2
D6707-J	305	7	12	6	1	-	22	+	-	1	+
D6707-H	329	18	9	15	-	-	7	+	-	1	1
D6707-G	347	+	12	8	+	+	6	2	-	2	+
D6707-F	394	19	8	5	1	+	6	2	-	+	-
D6707-D	362	7	10	5	3	+	6	1	+	+	3
D6707-C	240	11	8	10	-	-	20	+	-	4	1
D6707-B	312	3	9	12	-	2	16	+	-	4	1
D6710-E	218	22	3	3	2	-	8	1	-	+	2
D6710-D	384	16	10	12	-	-	13	1	-	+	2
D6710-C	350	21	12	9	-	-	7	-	-	+	+
D6710-B	372	8	7	-	-	2	2	3	-	+	8

continued on p. 35

TABLE 3

	1.	2.	3.	4.	5.	6.	7.	8.	10.	12.	13.
D6708-O	300	9	9	2	-	2	1	-	-	3	2
D6708-N	354	11	4	-	-	-	10	1	-	-	+
D6708-M	260	16	14	8	-	+	17	+	-	2	+
D6708-L	319	1	9	3	-	+	7	-	-	+	+
D6708-K	327	42	16	6	-	-	18	+	-	2	1
D6708-J	368	18	11	7	-	1	5	1	-	2	+
D6708-I	244	6	30	15	3	-	19	2	-	3	+
D6708-H	303	29	11	14	-	+	22	-	-	+	+
D6708-G	179	17	37	27	-	3	14	3	-	9	-
D6708-F	284	2	7	17	-	2	13	3	-	3	+
D6708-E	350	1	11	5	-	2	16	2	-	1	2
D6708-C	383	6	10	15	-	+	8	3	-	4	1

continued on p. 36

TABLE 3

	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
D6707-N'	-	-	-	18	8	2	5	-	1	-	-
D6707-M'	-	+	4	12	13	51	1	5	-	-	4
D6707-L	-	-	2	5	-	19	1	5	2	1	34
D6707-J	2	+	1	33	+	41	+	+	+	1	+
D6707-H	-	+	+	30	1	35	1	9	2	-	+
D6707-G	1	-	-	15	-	34	+	3	+	-	+
D6707-F	+	-	-	10	-	4	2	-	5	1	1
D6707-D	-	-	+	8	-	13	1	-	-	-	2
D6707-C	+	1	2	5	11	21	2	-	-	-	+
D6707-B	+	-	1	3	6	2	-	-	-	+	+
D6710-E	+	-	+	8	2	38	3	29	2	+	90
D6710-D	1	-	+	12	2	13	1	4	2	1	+
D6710-C	+	-	1	26	+	26	1	3	2	+	-
D6710-B	+	+	1	13	+	16	-	-	-	-	-

continued on p. 37

TABLE 3

	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.
D6708-O	-	-	+	2	8	55	3	15	-	+	3
D6708-N	1	-	-	2	-	13	-	14	-	+	46
D6708-M	+	+	+	10	2	40	5	+	+	+	8
D6708-L	1	-	+	4	1	45	4	3	1	-	-
D6708-K	-	-	1	26	1	34	3	+	1	1	-
D6708-J	-	-	1	24	-	23	2	3	3	+	+
D6708-I	1	+	+	16	6	57	11	16	2	-	2
D6708-H	-	+	+	32	+	22	4	9	1	-	5
D6708-G	2	-	3	7	+	32	2	-	-	1	95
D6708-F	+	-	+	5	8	20	2	-	-	-	-
D6708-E	-	1	+	3	1	13	-	-	2	+	+
D6708-C	+	-	1	2	-	7	-	-	9	-	-

continued on p. 38

TABLE 3

	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.
D6707-N'	-	-	-	-	-	3	5	-	-	1	1	-
D6707-M'	-	-	3	+	111	+	4	-	-	4	+	+
D6707-L	+	+	1	28	-	8	-	4	-	2	-	+
D6707-J	-	+	4	+	25	2	2	-	-	7	1	-
D6707-H	-	+	4	-	7	2	4	-	-	9	+	-
D6707-G	-	-	8	-	28	3	13	-	-	6	-	-
D6707-F	-	-	1	1	4	7	9	-	-	+	-	+
D6707-D	-	+	1	-	46	9	3	-	+	1	-	-
D6707-C	-	+	+	4	143	22	1	-	-	4	-	-
D6707-B	-	-	-	45	-	37	9	-	-	8	-	-
D6710-E	-	-	5	4	24	6	-	-	-	-	-	-
D6710-D	-	+	+	1	3	7	+	-	-	5	-	-
D6710-C	-	-	4	-	10	5	7	-	-	12	-	-
D6710-B	-	-	1	3	48	4	2	-	-	3	-	-

continued on p. 39

TABLE 3

	25.	26.	27.	28.	29.	30.	31.	32.	33.	34.	35.	36.
D6708-O	-	-	4	-	44	4	12	-	-	10	-	-
D6708-N	-	+	2	+	2	18	5	-	-	2	-	-
D6708-M	-	-	+	+	68	16	10	-	-	12	2	+
D6708-L	-	-	1	+	94	3	-	-	-	3	-	+
D6708-K	-	-	2	-	6	5	2	-	-	1	-	-
D6708-J	-	-	-	-	6	7	1	1	-	12	-	-
D6708-I	-	+	10	-	12	4	2	1	-	17	1	+
D6708-H	-	-	10	-	4	2	13	-	-	5	-	-
D6708-G	+	-	4	4	-	20	13	-	-	6	-	2
D6708-F	-	1	2	7	78	28	1	4	-	5	+	-
D6708-E	-	-	-	11	42	17	1	2	-	10	-	-
D6708-C	-	+	-	8	5	28	1	-	-	7	-	+

continued on p. 40

TABLE 3

	37.	38.	39.	40.	41.	42.	43.	45.	46.	48.	49.	50.
D6707-N'	-	-	-	-	-	-	-	-	-	-	-	+
D6707-M'	-	2	-	-	1	-	-	-	+	-	-	-
D6707-L	+	6	-	-	-	+	+	-	+	-	-	-
D6707-J	-	1	-	-	-	-	-	-	+	-	-	-
D6707-H	-	-	-	-	-	+	-	-	-	+	-	-
D6707-G	-	-	+	-	-	-	-	-	-	-	-	-
D6707-F	-	3	-	-	-	+	-	-	1	-	-	-
D6707-D	-	3	1	-	-	+	-	-	+	-	-	-
D6707-C	-	1	-	+	-	-	-	-	+	-	-	1
D6707-B	-	1	1	-	2	+	+	-	+	-	-	-
D6710-E	-	15	-	-	-	+	-	-	-	-	-	-
D6710-D	-	-	1	+	-	-	-	-	-	-	-	-
D6710-C	-	+	-	-	1	-	-	-	-	-	-	-
D6710-B	-	+	-	-	-	-	-	-	-	1	-	-

continued on p. 41

TABLE 3

	37.	38.	39.	40.	41.	42.	43.	45.	46.	48.	49.	50.
D6708-O	-	2	-	-	-	-	-	-	-	-	-	-
D6708-N	-	2	-	+	-	1	+	-	-	-	-	-
D6708-M	-	+	-	-	1	-	-	-	-	-	-	-
D6708-L	+	-	1	-	-	-	-	-	-	-	-	-
D6708-K	-	-	-	-	-	-	-	-	-	-	-	-
D6708-J	+	-	-	-	-	-	-	-	-	-	-	-
D6708-I	+	-	-	-	-	-	-	-	-	-	-	-
D6708-H	1	-	-	-	-	+	-	-	-	-	-	-
D6708-G	-	-	-	-	-	-	-	-	-	-	-	-
D6708-F	-	2	1	-	-	-	+	-	-	-	2	-
D6708-E	-	-	+	-	-	2	-	+	-	-	-	-
D6708-C	-	2	-	-	-	+	+	-	+	-	-	-

continued on p. 42

TABLE 3

	54.	57.	58.	59.	60.	61.	62.	63.	64.
D6707-N'	-	10	1	-	-	1	1	-	-
D6707-M'	-	7	1	+	-	2	-	-	-
D6707-L	-	6	5	+	+	3	-	-	-
D6707-J	-	14	3	1	+	5	3	-	-
D6707-H	-	9	+	2	+	1	1	-	-
D6707-G	-	8	-	-	1	1	-	-	-
D6707-F	-	-	4	4	2	3	4	-	-
D6707-D	-	14	+	+	+	-	1	-	-
D6707-C	+	5	+	+	-	+	2	-	-
D6707-B	2	15	+	+	+	+	5	-	-
D6710-E	-	9	+	-	-	1	5	-	-
D6710-D	-	2	2	+	4	+	1	-	-
D6710-C	-	1	1	-	1	+	+	+	-
D6710-B	-	4	4	-	+	1	1	-	-

continued on p. 43

TABLE 3

	54.	57.	58.	59.	60.	61.	62.	63.	64.
D6708-O	-	-	-	-	-	10	-	-	-
D6708-N	-	4	+	+	-	3	3	-	2
D6708-M	-	-	3	3	1	2	+	-	-
D6708-L	-	-	-	-	+	+	+	-	-
D6708-K	-	-	+	-	1	+	4	-	-
D6708-J	-	2	+	-	-	1	-	-	-
D6708-I	-	8	1	1	-	4	5	-	-
D6708-H	-	4	5	-	1	2	1	-	-
D6708-G	-	4	1	-	-	11	4	-	-
D6708-F	+	-	2	-	-	1	1	-	-
D6708-E	+	4	1	-	+	-	+	+	-
D6708-C	-	-	-	+	1	+	+	-	+

TABLE 4

PALYNOMORPHS IN THE SMITH COAL ZONE

USGS Paleobotany locality no.	Palynomorph number										
	1.	2.	3.	4.	5.	6.	7.	8.	10.	12.	13.
D6720-I	291	6	12	16	3	+	14	+	-	3	1
D6720-H	389	11	2	2	-	-	1	1	-	+	1
D6720-G	318	12	6	4	2	-	7	1	-	4	+
D6720-F	264	9	2	4	-	+	2	-	-	6	3
D6720-E	502	5	-	-	-	-	2	-	-	2	+
D6720-D	350	11	5	3	-	-	3	-	-	21	-
D6720-C	230	7	7	-	1	2	7	+	-	52	1
D6720-B	339	13	1	-	-	-	2	-	-	1	2
D6720-A	266	8	1	2	-	-	+	-	-	15	32

continued on p. 45

TABLE 4

	1.	2.	3.	4.	5.	6.	7.	8.	10.	12.	13.
D6707-Z'	399	4	5	3	-	-	12	+	-	1	1
D6707-Y	370	15	-	4	-	-	14	-	-	1	-
D6707-X	384	29	2	2	-	-	9	+	-	1	2
D6707-W	321	10	2	6	-	-	6	-	-	-	1
D6707-V	294	11	5	14	+	1	8	1	-	10	12
D6707-S	246	31	6	3	-	-	7	-	-	5	-
D6707-R	385	21	1	9	-	-	8	-	-	+	1
D6707-P	348	41	+	4	1	-	4	+	-	3	+

continued on p. 46

TABLE 4

	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	26.
D6720-I	+	+	+	7	2	39	4	4	+	1	+	-
D6720-H	-	-	-	9	-	19	+	3	7	-	+	-
D6720-G	+	+	1	11	-	4	5	2	2	3	4	-
D6720-F	1	1	1	9	1	7	3	4	-	1	-	1
D6720-E	1	+	-	4	-	5	2	-	5	-	-	-
D6720-D	+	-	-	1	-	2	-	-	-	-	6	3
D6720-C	-	-	+	3	-	2	-	-	+	1	+	1
D6720-B	+	-	-	8	-	2	2	1	4	-	+	-
D6720-A	2	2	-	2	-	2	3	-	+	+	1	2

continued on p. 47

TABLE 4

	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	26.
D6707-Z'	1	-	-	3	+	22	1	1	6	1	+	-
D6707-Y	-	-	-	6	-	3	2	-	7	-	-	-
D6707-X	-	-	-	15	2	4	-	+	5	-	-	-
D6707-W	3	-	+	11	+	9	5	3	11	-	+	-
D6707-V	1	2	+	21	+	10	2	-	1	+	3	-
D6707-S	1	1	-	11	4	21	3	-	-	-	+	2
D6707-R	-	+	+	7	-	4	3	1	1	1	-	-
D6707-P	-	-	-	4	-	-	1	-	-	1	2	1

continued on p. 48

TABLE 4

	27.	28.	29.	30.	31.	32.	33.	34.	35.	37.	38.	39.
D6720-I	2	1	38	9	4	-	-	19	-	-	2	2
D6720-H	2	-	3	+	5	1	-	7	-	-	+	-
D6720-G	4	-	36	15	7	-	-	4	2	-	3	-
D6720-F	1	2	114	36	-	4	-	1	-	2	7	+
D6720-E	-	5	-	32	4	1	-	5	-	-	5	-
D6720-D	-	6	-	50	-	3	-	1	-	-	-	-
D6720-C	-	12	4	107	-	3	-	-	-	-	6	+
D6720-B	2	-	1	19	-	1	-	1	-	-	1	+
D6720-A	+	28	39	48	-	15	-	-	+	-	3	2

continued on p. 49

TABLE 4

	27.	28.	29.	30.	31.	32.	33.	34.	35.	37.	38.	39.
D6707-Z'	2	-	9	15	4	-	-	6	-	-	-	-
D6707-Y	1	-	3	9	18	-	-	-	1	-	-	1
D6707-X	9	+	5	4	13	-	-	3	+	-	-	-
D6707-W	1	-	44	13	1	-	-	5	-	-	-	-
D6707-V	2	8	12	51	-	+	1	1	-	-	7	-
D6707-S	-	1	6	71	8	+	-	-	-	-	11	+
D6707-R	1	-	11	11	-	-	-	3	2	-	-	+
D6707-P	1	6	3	10	4	-	-	6	-	-	+	-

continued on p. 50

TABLE 4

	41.	42.	43.	46.	47.	50.	54.	57.	58.	59.	60.	61.
D6720-I	7	-	-	+	-	-	-	-	7	-	1	3
D6720-H	-	1	-	-	-	+	-	15	8	1	2	7
D6720-G	1	+	-	-	-	+	-	-	19	4	5	1
D6720-F	1	-	-	-	-	-	-	-	5	-	2	3
D6720-E	-	-	1	-	-	-	-	10	-	-	3	-
D6720-D	-	1	-	-	2	-	-	5	3	-	+	-
D6720-C	-	-	-	-	4	-	-	-	-	-	-	-
D6720-B	-	-	-	-	+	1	-	6	8	1	54	-
D6720-A	-	-	+	-	7	+	2	6	3	+	2	-

continued on p. 51

TABLE 4

	41.	42.	43.	46.	47.	50.	54.	57.	58.	59.	60.	61.
D6707-Z'	1	-	-	-	-	-	-	-	1	-	1	-
D6707-Y	6	-	-	-	-	-	-	-	8	-	25	1
D6707-X	+	-	-	1	-	-	-	-	5	-	+	1
D6707-W	+	-	-	-	-	1	-	-	18	-	21	5
D6707-V	-	+	-	-	+	-	-	-	9	-	+	3
D6707-S	-	-	-	2	-	-	-	8	37	+	4	-
D6707-R	2	1	-	-	-	-	-	9	2	-	1	1
D6707-P	+	-	-	-	2	2	-	-	3	13	8	-

continued on p. 52

TABLE 4

	62.	63.	64.
D6720-I	2	-	-
D6720-H	3	-	1
D6720-G	1	-	2
D6720-F	3	-	-
D6720-E	8	-	-
D6720-D	23	-	1
D6720-C	50	-	-
D6720-B	20	-	10
D6720-A	7	-	-

continued on p. 53

TABLE 4

	62.	63.	64.
D6707-Z'	1	-	+
D6707-Y	5	-	-
D6707-X	4	+	-
D6707-W	3	-	-
D6707-V	10	-	-
D6707-S	21	-	-
D6707-R	14	-	1
D6707-P	31	-	1

APPENDIX 2

Appendix 2 is a list of all palynomorph samples examined during the course of this investigation. All locality data are given in meters from two section boundaries. The stratigraphic position of surface samples is given in meters in relation to the major coals; sample position in cores is given as depth in meters relative to the ground surface.

USGS Paleobotany Locality No.	Section/Locality	Sample data depth (m)

OK Creek Section

20 mNL 440 mEL, Sec. 30, T. 54 N., R. 77 W.,
Sheridan Co., Wy; Arvada Quadrangle

D6761-M	52 above Felix coal
D6761-L	35 "
D6761-K	18 "
D6761-J	11 "
D6761-I	6 "
D6761-H	channel (1 m) of Felix coal
D6761-G	shale at top of Felix coal
D6761-F	top of Felix coal
D6761-E	middle of Felix coal
D6761-D	base of Felix coal
D6761-C	shale at base of Felix coal
D6761-B	4 below Felix coal
D6761-A	14.5 "

Core 1A

10 mWL 20 mSL, Sec. 2, T. 55 N., R. 77 W.,
Sheridan Co. Wy; Cabin Creek SE Quadrangle

D6720-I	89.62 - 90.29
D6720-H	90.29 - 90.92

D6720-G.....90.92 - 91.70
D6720-F.....91.70 - 92.22
D6720-E.....92.43 - 92.62
D6720-D.....92.62 - 92.74
D6720-C.....92.74 - 92.98
D6720-B.....95.34 - 96.21
D6720-A.....96.21 - 96.61

Core 2A

780 mEL 1140 mNL, Sec. 30, T. 55 N., R. 77 W.,
Sheridan Co., Wy; Cabin Creek SE Quadrangle

D6707-CC.....15.20
D6707-BB.....17.77
D6707-AA.....18.32
D6707-Z'.....89.92 - 90.37
D6707-Z.....89.82 - 89.92
D6707-Y.....90.37 - 90.64
D6707-X.....90.64 - 90.91
D6707-W.....90.91 - 91.89
D6707-V.....91.89 - 92.44
D6707-U.....93.05 - 93.14
D6707-T.....98.45
D6707-S.....98.55 - 98.71
D6707-R.....98.71 - 99.33
D6707-Q.....98.97 - 99.06
D6707-P.....99.33 - 99.95
D6707-O.....100.25 - 100.30
D6707-N'.....149.55 - 149.88
D6707-N.....149.63 - 149.69
D6707-M'.....149.88 - 150.70
D6707-M.....149.78 - 149.90
D6707-L.....150.93 - 151.18
D6707-K.....151.70 - 151.79
D6707-J.....154.63 - 155.52

D6707-I.....154.99 - 155.08
D6707-H.....155.52 - 156.36
D6707-G.....156.36 - 157.22
D6707-F.....157.22 - 157.55
D6707-E.....157.73 - 157.83
D6707-D.....158.14 - 158.64
D6707-C.....158.64 - 159.08
D6707-B.....159.08 - 159.31
D6707-A.....159.20 - 159 29

Core 3A

20 mEL 1220 mNL, Sec. 14, T. 56 N., R. 77 W.,
Sheridan Co., Wy; Cabin Creek SE Quadrangle

D6708-O.....53.87 - 54.60
D6708-N.....54.60 - 55.12
D6708-M.....57.45 - 57.83
D6708-L.....57.83 - 58.12
D6708-K.....58.12 - 58.55
D6708-J.....58.55 - 59.83
D6708-I.....59.83 - 60.46
D6708-H.....60.46 - 60.97
D6708-G.....60.97 - 61.25
D6708-F.....61.25 - 61.72
D6708-E.....61.84 - 62.18
D6708-D.....63.4 - 63.55
D6708-C.....63.26 - 64.46
D6708-B.....77.15 - 77.35
D6708-A.....79.49 - 79.55

Core 4A

1380 mNL 1825 mEL, Sec. 31, T. 57 N., R. 76 W.,
Sheridan Co., Wy; Cabin Creek SE Quadrangle

D6709-K.....29.56
D6709-J.....32.06 - 32.16
D6709-I.....33.19 - 33.34
D6709-H.....34.59 - 34.69
D6709-G.....37.67 - 37.76
D6709-F.....40.11 - 40.23
D6709-E.....41.12 - 41.20
D6709-D.....94.49 - 95.25
D6709-C.....96.86 - 97.17
D6709-B.....98.48 - 98 63
D6709-A.....99.27 - 99.46

Core 80 AU-24

1190 mNL 1280 mEL, Sec. 11, T. 56 N., R. 77 W.,
Sheridan Co., Wy; Cabin Creek SE Quadrangle

D6710-E.....26.58 - 27.08
D6710-D.....27.08 - 27.99
D6710-C.....28.65 - 30.20
D6710-B.....32.43 - 32.80
D6710-A.....221.74 - 221.83

Core 5A

110 mNL 1450 mEL, Sec. 1, T. 8 S., R. 48 E.,
Powder River Co., Mt; Bloom Creek Quadrangle

D6711-F.....9.81 - 9.87
D6711-E.....12.22 - 12.31
D6711-D.....19.81 - 19.87
D6711-C.....20.63 - 20.69

D6711-B.....40.29 - 40.96
D6711-A.....43.58

Surface sections

D6768.....O'Dell coal.....120 mSL 515 mEL, Sec. 4, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6767.....16.1 below O'Dell coal.....55 mNL 620 mEL, Sec. 9, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6766-A & B....Local 2 coal.....90 mSL 280 mEL, Sec. 30, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6765.....Mackin-Walker coal.....510 mWL 560 mSL, Sec. 22, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6764...9.1 below Mackin-Walker coal....430 mWL 780 mSL, Sec. 22, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6763.....15.7 above Sawyer coal.....420 mNL 625 mEL, Sec. 35, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle

D6762.....Sawyer coal.....515 mEL 610 mNL, Sec. 35, T. 3 S.,
R. 49 E., Powder River Co., Mt;
Leslie Creek Quadrangle