MESOZOIC AND CENOZOIC HISTORY OF ALASKA

Compiled by Thomas G. Payne

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This map is preliminary and has not been edited or reviewed for conformity with U. S. Geological Survey standards and nomenclature.

(For continuity read from bottom to top of columns. Grouping of tectonic elements in columns is according to their occurrence in major geologic trends or provinces.)

STAGES OF SEDIMENTATION AND OROGENESIS	1. ARCTIC PLATFORM 2. ARCTIC OCEAN BASIN 3. BEAUFORT SHELF 4. BARROW ARCH	5. COLVILLE GEOSYNCLINE 6. UMIAT BASIN 7. CHUKCHI BASIN 8. MEADE ARCH 9. TIGARA UPLIFT	10. ROMANZOF UPLIFT	11. BROOKS RANGE GEOSYNCLINE 12. KOBUK TROUGH 13. COLEEN BASIN	14. CHUKOTSKIY-SEWARD UPLIFT	15. KOYUKUK GEOSYNCLINE 16. HOGATZA UPLIFT 17. GALENA BASIN 18. KOTZEBUE BASIN 19. NORTON BASIN	20. RUBY GEANTICLINE 21. RAMPART TROUGH 22. YUKON FLATS BASIN 23. LOWER TANANA BASIN 24. INNOKO BASIN 25. BETHEL BASIN	26. KUSKOKWIM GEOSYNCLINE 27. GOODNEWS ARCH 28. EUREKA SEGMENT(OF 27) 29. KANDIK SEGMENT(OF 27) 30. NATION ARCH 31. EAGLE TROUGH	32. TANANA GEANTICLINE 33. COAST MOUNTAINS GEANTICLINE 34. HEALY TROUGH 35. UPPER TANANA BASIN 36. MIDDLE TANANA BASIN 37. NIKOLAI BASIN 38. ITULILIK BASIN	39. ALASKA RANGE GEOSYNCLINE 40. NUTZOTIN SEGMENT (OF 39) 41. SEYMOUR GEOSYNCLINE 42. NUSHUGAK BASIN	43. TALKEETNA GEANTICLINE 44. PRINCE OF WALES GEANTICLINE 45. COPPER RIVER BASIN 46. ADMIRALTY TROUGH	47. MATANUSKA GEOSYNCLINE 48. SHELIKOF TROUGH 49. COOK INLET BASIN	50. SELDOVIA GEANTICLINE	51. CHUGACH MOUNTAINS GEOSYNCLINE	52. CORDOVA GEANTICLINE 53. YAKATAGA GEOSYNCLINE 54. MIDDLETON SHELF 55. SHUMAGIN SHELF	56. ALEUTIAN TRENCH
QUATERNARY	2-4. Marine deposition (Gubik fm.).	5-8. Marine and non-marine Gubik fm. in coastal plain; max. 200 ft. Glacial outwash, moraines, terrace deposits in foothills. Slight uplift; erosion.	10. High mountainous region. Glaciation. Further uplift; erosion.	11. High mountainous region. Glaciation. Further uplift; erosion. 12-13. A topographic trench (12) and basin (13), from which Eocene has been mostly eroded.	14. Region of shallow sea, coastal plains, low mts. Glaciation in and near mt. areas. Extrusion of lava and tuff. Marine deposits in coastal plain terraces indicate slight uplift. Erosion.	15-16. Region of hills and low mts. Further uplift; erosion. 17-19. Lowland basins. Deposition; probably includes marine in Kotzebue and Norton basins. Slight uplift of Quaternary beds.	20-21. Region of hills and low mts. Further uplift; erosion. 22-25. Lowland basins. Stream deposition; possibly marine in Bethel basin.	26-31. Low mountainous region. Glaciation in and near mts. Further uplift. Erosion.	32, 34. Region of hills and low mts. Glaciation in and near mts. Further uplift; erosion. 33. High mountainous region. Glaciation. Further uplift; erosion. Volcanics (Behm Canal). 35-38. Lowland basins. Stream deposition. Subsid. of 36.	39-41. Mountainous region. Glaciation. Further uplift; erosion. 41. Glacial scouring of valleys later drowned as fiords and straits. 42. Lowland. Deposition, in part marine. Slight uplift of Quaternary beds.	43-44. Mountainous region. Glaciation. Volcanism. Further uplift; erosion. 44. Glacial scouring of valleys latter drowned as fiords and straits. 45. Intramontaine basin. Nonmarine deposition, more than 500 ft. Uplift; erosion.	47-48. Relatively low region; shallow seaway, broad valleys, hills, and mts., including volcanoes. Extensive glaciation. Volcanism. Slight uplift; erosion. 49. Lowland basin; party occupied by sea. Subsid. and deposition.	50. Mountainous region lying between higher Chugach and Kenai Mts. and lower belt of Matanuska geosyncline and Shelikof trough. Glaciation. Further uplift; erosion.	51. High mountainous region. Extensive glaciation. Further uplift; erosion.	52-53. Region of mts., shallow sea, islands. Glaciation in mts. Further uplift; erosion. 54-55. Continental shelf, including submarine canyons, rocky shoals, and islands of Tert. rocks. Slight uplift; erosion. Probably little or no accum. of Quaternary seds.	56. Oceanic trench. Depth more than 2,500 fathoms in eastern part and more than 3,500 fathoms in western part. Faulting indicated by seismic records. Probably active subsid. and thick accum. of Quaternary deposits. Seds. swept across continental shelf and moved into trench by slumping or turbidity currents(?). Subsid. of trench and accum. of seds may have begun in Tert. time.
Pliocene orogenesis	1-4. Little or no uplift.	5-9. Mod. uplift in southern, little or no uplift in northern area. Erosion.	10. Great uplift. Erosion.	11-13. Great uplift. Erosion.	14. Uplift. Erosion.	15-16. Uplift. Erosion. 17-19. Little or no uplift and erosion (r).	20-21. Uplift. Erosion. 22-25. Little or no uplift and erosion(r).	26-31. Uplift. Erosion.	32-34. Uplift. Erosion. 35-38. Possibly little or no uplift and erosion(r).	39-41. Great uplift. Erosion. 42. Little or no uplift and erosion (r).	43-46. Uplift; erosion.	47. Gentle def. of Miocene and Pliocene(?) beds. 47-48. Uplift; erosion. 49. Little or no uplift(r).	50. Uplift;erosion.	51. Great uplift; erosion.	53. Def. strong to north, gentle to south. North-dipping reverse faults. Uplift; erosion. 54. Gentle def. Little uplift.	
TERTIARY, OLIGOCENE THROUGH PLIOCENE	2-4. Not reported. Possibly continued north-building of Beaufort shelf into Arctic Ocean basin.	5-9. Not reported (ℓ). Pliocene reported in coastal plain probably is Quaternary.	10. Not reported. Continued erosion (?).	11-13. Not reported. Eroslon. Extrusion of lava and tuff.	14. Not reported(ℓ). Marine Pliocene reported in coastal plain probably is Quaternary. Extrusion of lava and tuff.	15-16. Not reported(ℓ). Extrusion of lava and tuff. 17-19. Possible subsid. and deposition(r).	20-25. Not reported(ℓ). Extrusion of lava and tuff. 22-25. Possible subsid. and deposition(r).	26-31. Not reported(ℓ). Extrusion of lava and tuff. 28. High-level, gold-bearing stream gravels, preserved in Rampart district, may be Pliocene.	32-33. High-level gravels in Fortymile and Eagle districts. Marine deposition in area of 32 indicated by transported Tert. fossils in Quaternary deposits near Fairbanks. Extrusion of lava and tuff. 34. Deposition of Nenana gravel. 35-38. Possible subsid. and deposition(r).	39. Differential uplift; nonmarine deposition in basins (Nenana gravel). Extrusion of lava and tuff. 42. Possible subsid. and deposition(r). Miocene-marine fossils reported.	43-46. Not reported(ℓ). Extrusion of lava and tuff; several thous. ft. in Wrangell and St. Elias Mts. (Wrangell lava). 45. Possible subsid. and deposition(r).	47-48. Extrusion of lava and tuff. 48. Marine Miocene and Pliocene(?) deposits reported in southern part of trough (area of Pavlof and Herendeen Bays and Unga I.). Includes Unga conglomerate. 49. Possible subsid. and deposition(r).	50. Not reported. Erosion.	51. Continued uplift; erosion. Probable source of seds. in Yakataga geosyncline and Middleton shelf. Glaciation in Pliocene. Source of ice depositing thick Pliocene marine glacial deposits in 53 and 54(?).	53-55. Marine deposition, Oligocene, Miocene, Pliocene. Katalla, Poul Creek, Yakataga fms., max. 20,000 ft.(?) in 53. Pliocene marine glacial seds. 54. Shelf deposits continuous with but probably thinner than those in Yakataga geosyncline. 55. Shelf deposits continuous with those of Shelikof trough.	
Post-Eocene orogenesis (late Laramide)	1-4. Little or no def.	5-9. No evidence (*). Eroded to low plain.	10. No evidence (*). Eroded to surface of low relief.	12-13. Mod. def. of Eocene beds. 11-13. Eroded to surface of low relief.	14. Mod. def. of local bodies of Eocene. Eroded to surface of low relief.	15-19. No evidence(*). Eroded to surface of low relief.	21-25. Def. of Eocene; strong in Rampart trough, gentle in Bethel basin. Eroded to surface of low relief.	26-31. Mod. def. of Eocene beds. Eroded to surface of low relief.	32-33. Gentle def. of Eocene beds. 34. Strong def. along southern border; gentle def. to north. 32-38. Eroded to surface of low relief.	39. Gentle to strong def. of Eocene deposits. Eroded to surface of low relief.	46. Gentle def. of Eocene deposits. 43-46. Eroded to surface of low relief.	48. Gentle def. of Eocene deposits. Eroded to surface of low relief.	50. No evidence(*). Eroded to surface of low relief.	51. No evidence(*).	52-55. No evidence(*). Eroded to surface of low relief.	
TERTIARY, EOCENE	2-4. Not reported. Possibly continued north-building of Beaufort shelf into Arctic Ocean basin	5-9. Not reported. Possibly deposited and removed.	10. Not reported. Continued erosion (?).	11. Not reported. Erosion. 12-13. Subsid. and nonmarine deposition.	14. Nonmarine deposition locally on St. Lawrence I., Seward Pen., Chukotskiy Pen.	15-19. Not reported. 17-19. Possible subsid. and deposition. Possibly present beneath Quaternary (r).	21-25. Subsid. and nonmarine deposition. Eocene beds exposed in or marginal to Rampart trough, Yukon Flats and Bethel basins.	26-31. Not reported except in Eagle trough and two very small bodies not shown on map. 31. Nonmarine deposition, few thous. ft.(?).	32-33. Nonmarine deposition in local basins; isolated remnants reported. 34. Nonmarine deposition; max. 4,000 ft. 35-38. Probable deposition(r).	39. Nonmarine deposition in local basins in Alaska Range area. 42. Possible subsid. and deposition(r).	46. Nonmarine deposition; few thous. ft. Includes tuff and breccia. 45. Probable subsid. and deposition(r). Present beneath Quaternary(?).	48. Nonmarine deposition, few thous. ft. Kenai Fm. Present beneath and marginal to Cook Inlet basin. Marine Eocene in southern part of trough. Eocene volcanics in some areas.	50. Not reported. Erosion.	51. Uplift; erosion. Probable source of Eocene seds. in Shelikof trough, Yakataga geosyncline, and Middleton shelf.	53-55. Marine and nonmarine deposition, few thous. ft. Kushtaka and Tokun. fm. in area of 53. 55. Shelf deposits continuous with those of Shelikof trough.	
Paleocene(?) orogenesis (early Laramide)	1-4. Very gentle warping and tilting. Eroded to low plain.	5-9. Def.: strong in southern, mod. in central, gentle in northern area. 9. Uplift occurs exposing Pal. rocks. 5-9. Eroded to low plain.	10. Strong def. Uplift along south-dipping reverse faults. Eroded to surface of low relief.	11. Strong def. South-dipping imbricate thrust faults. Eroded to surface of low relief.	14. Def., including faulting. North- to northeast grain. Possibly further int. Eroded to surface of low relief.	15-16. Mod. to strong def. Few small granitic intrusives. 16. Hogatza uplift occurs, exposing K1 beds. 15-16. Eroded to surface of low relief.	20. No evidence (*). Few small granitic intrusives. Eroded to surface of low relief.	26-30. Strong def. Many small silicic to ultramafic intrusives. Mineralization. 30. Nation arch formed(?); erosion exposed Pal. and pre-C rocks. 26-30. Eroded to surface of low relief.	32-33. No evidence(*). Probably some small granitic intrusives. Eroded to surface of low relief.	39-41. Strong def., silicic to mafic int. Mineralization (?). Eroded to surface of low relief.	43-44. No evidence(*). Eroded to surface of low relief.	47. Mod. to strong def. Silicic to mafic int, (stocks, sills, dikes). Eroded to surface of low relief.	50. No evidence(*). Strong def. indicated by def. of K3 rocks to north in 47 and to south in 51. Eroded to surface of low relief.	51. Intense def., metam., granitic int., mineralization. Eroded to surface of low relief.	52. Probable strong def. (See 51). Granitic intrusives may be of this age. Eroded to surface of low relief.	
TERTIARY PALEOCENE(?)	2-4. Not reported. Possibly continued north-building of Beaufort shelf into Arctic Ocean basin.	6-7. Nonmarine Sagavanirktok fm. Contains bentonite, tuff. Max. 2,000 ft. 8. Little or no deposition on Meade arch.	10. Emerg. Little or no deposition.	11. Continued uplift. Volcanism(?). Source of seds. in Umiat and Chukchi basins.	14. Mostly emerg. and erosion. Nonmarine deposition in southern part of Chukotskiy Pen.	15-16. Not reported.	20. Continued uplift and erosion (?).	26-30. Not reported.	32-33. Probably continued uplift and erosion.	39-41. Not reported.	43-44. Probably continued uplift and erosion. Source of seds. in Matanuska geosyncline(?).	47. Nonmarine deposition, max. 5,000 ft. Chickaloon fm. and Eska conglomerate of Matanuska Valley. Not reported elsewhere but possibly present.	50. Not reported. Probably emergent; possible source of Paleocene seds. in Matanuska geosyncline.	51. Not reported.	52. Continued uplift and erosion.	
Maastrichtian-Danian hiatus. Orogenesis (?).	1-4. Little or no def.	5-8. Slight energ. and erosion in foothills province.	10. No evidence (*).	11. No evidence (*).	14. No evidence (*).	15-16. No evidence (*).	20. No evidence (*).	26-30. No evidence(*).	32-33. No evidence(*).	39-41. No evidence(*).	43-44. No evidence(*).	47. Little or no def. Probable emerg. and erosion.	50. No evidence(*).	51. No evidence(*).	52. No evidence(*).	
CRETACEOUS, TURONIAN THROUGH CAMPANIAN (K3)	2. Continued subsid. 3. Shelf composed of 4,000 ft. of K3 seds. built northward into Arctic Ocean basin. 4. Not reported.	6-7. Marine and nonmarine Colville group. Contains bentonite, tuff. Max. 5,000 ft. 8. Little or no deposition on Meade arch.	10. Emerg. Little or no deposition.	11. Continued uplift. Volcanism(?). Source of seds. in Umiat and Chukchi basins.	14. Mostly emerg. and erosion. Nonmarine deposition in southern part of Chukotskiy Pen.	15-16. Not reported.	20. Uplift and source of seds. in Kuskokwim geosyncline.	26. Deposition, mostly marine. Several thous. ft. includes lava and tuff. 27. Not reported. Emerg.; source of seds. in 26(?). 28-31. Not reported.	32-33. Probably continued uplift and erosion. Possibly a source of seds. in Alaska Range geosyncline.	39-40. Nonmarine deposition, including volcanics. Unconformably overlies Cantwell fm. in Alaska Range. 41. Not reported.	43-44. Continued uplift and erosion. Source of seds. in Matanuska geosyncline(?).	47. Marine deposition, max. 5,000 ft. Matanuska and Chignik fms.	50. No evidence(*). Geanticline probably emergent; possible source of K3 seds. in Chugach Mountains geosyncline.	51. Marine deposition, many thous. ft. Valdez group.	52. Continued uplift and erosion(?). Source of K3 seds. of Chugach Mountains geosyncline(?).	
Late Cenomanian orogenesis	1, 2, 4. Little or no def.	5. Gentle folding in foothills province. Slight emerg., erosion.	10. No evidence (*).	11. No evidence (*).	14. No evidence (*).	15-16. No evidence (*).	20. No evidence (*).	26-27. Def., probably not strong. Emerg. and erosion. 28-30. No evidence(*).	32-33. No evidence(*).	39-40. Def. and erosion indicated in Alaska Range area. 41. No evidence(*).	43-44. No evidence(*).	47. No evidence(*).	50. No evidence(*).	51. No evidence(*).	52. No evidence(*).	
CRETACEOUS, ALBIAN AND CENOMANIAN (K2)	1. Platform destroyed by subsid. 2. Subsid.; shelf of thick K2 seds. built northward across Colville geosyncline. 4. Barrow arch positive; thin accum.	5. Marine Torok fm., overlain by marine and nonmarine Nanushuk group. Max. 10,000 to 15,000 ft.	10. Probable thin deposition. Area positive relative to Colville geosyncline to west.	11. Continued uplift. Source of seds. in Colville and Koyukuk geosynclines.	14. Continued uplift. Source of seds. in Koyukuk geosyncline.	15-16. Ungalik, Bergman, and Shaktolik fms; mostly marine. Nonmarine Nulato fm. Several thous. ft.	20. Uplift and source of seds. in Koyukuk and Kuskokwim geosynclines.	26, 28-30. Marine and nonmarine deposition. Several thous. ft. 27. Not reported. In part emergent and source of seds. in 26. 30. Not reported; possibly emergent.	32-33. Continued uplift and source of seds. in Kuskokwim and Alaska Range geosynclines.	39-40. Nonmarine deposition, several thous. ft. Cantwell fm. of Alaska Range. 41. Not reported.	43-44. Continued uplift and erosion(?).	47. Marine deposition, few thous. ft. Kotsina conglomerate and Kennicott fm. of Chitina Valley. Not reported elsewhere. Nonmarine arkose fm. in Matanuska Valley may be of this age.	50. Not reported. Geanticline probably emergent.	51. Marine deposition(?). Conglomerate fm., few thous. ft., exposed in Eliamar district, may be of this age. Unconformably overlies greenstone-bearing Orca group, believed pre-Albian.	52. Probable uplift and erosion. Source of conglomerate in Eliamar district(?). See 51.	
Late Neocomian-Aptian orogenesis. Stratigraphic hiatus.	1. Emerg., erosion. Jmu and K1 absent at Cape Simpson and Barrow. 4. Tr, J, and K1 eroded on Barrow arch.	5. Mostly undeformed. Mod. def., emerg., and erosion along southern border.	10. Def., probably same as in Colville geosyncline. Mafic int.(?).	11. Strong def. in northern part. Intense def., metam., granitic int., mineralization in southern part. Erosion.	14. Intense def., metam., granitic int., mineralization. East-grain. Erosion.	15-16. Intense def., metam., granitic int. Probably east-grain. Erosion.	20. Probably intense def. and metam. Large granitic intrusives in Melozi, Tozi, and Dall districts. Erosion.	26-30. Def., emerg., erosion. 28. Intense def., metam., granitic int., mineralization.	32-33. Intense def., batholithic int., and mineralization. Erosion.	39-41. Intense def., batholithic int., and mineralization. Erosion.	43-44. Def. and possibly further int. and mineralization.	47. Gentle def. Erosion.	50. No evidence(*).	51. Def. indicated by unconformity (see above).	52. Probable def. See 51.	
CRETACEOUS, NEOCOMIAN (K1)	1. Not reported. Possibly deposited and eroded (see above).	5. Marine Okpikruak fm. Max. 3,000 ft.	10. Part of Colville geosyncline. Okpikruak fm. probably deposited but thinner.	11. Continued uplift. Source of seds. in Colville and Koyukuk geosynclines.	14. Continued uplift. Erosion.	15-16. Marine Koyukuk group, including lava and tuff. Several thous. ft. Volcanics in Kiwalik-Buckland divide area.	20. Probable uplift and source of seds. in Kuskokwim geosynclines.	26-30. Marine deposition. Several thous. ft. Kandik fm. in 29. 26-27. Includes lava and tuff.	32-33. Continued uplift and source of seds. in Kuskokwim, Alaska Range, and Seymour geosynclines.	39-41. Marine deposition. Few thous. ft.	43-44. Continued uplift and possible source of seds. in 39, 40, 41, 47.	47. Marine deposition, few hundred to few thous. ft. Nelchina limestone, Herendeen limestone.	50. Not reported. Geanticline possibly emergent and source of K1 and older Mesozoic rocks bordering Gulf of Alaska.	51. Not reported. Possible deposition.	52. Marine deposition. K1 rocks believed included in thick graywacke-slate-greenstone sequence (Orca group). See below.	
Jurassic orogenesis: post-Portlandian post-Callovian post-Bathonian	1. Little or no def.	5. Mostly undeformed. Mod. def., emerg., erosion along southern border. Callovian and Portlandian phases recognized.	10. Def., probably same as in Colville geosyncline. Mafic int.(?).	11. Def., gentle or mod. Ultramafic and mafic int. Erosion.	14. Def.(?). Beginning of uplift and erosion. Ultramafic and mafic int.(?).	15-16. No evidence(*).	20. No evidence(*).	26-27. Probable def., emerg., and erosion. 28-30. No evidence(*).	32-33. Def.; first phase of batholithic int., mineralization. Uplift, erosion in middle and late Jurassic; source of seds. in Kuskokwim, Alaska Range, Seymour geosynclines.	39-41. Def. and first phase of batholithic int. in middle or late Jurassic time. Erosion.	43. Def., batholithic int., mineralization. 44. Possibly same as 43.	47. Def., gentle to mod. Three phases indicated by unconformities(see first column). Few intrusive bodies; related to batholiths of Talkeetna geanticlinal belt.	50. Def. of Tr and J1 rocks may in part represent Jurassic orogenesis. Silicic to ultramafic intrusives may be of this age.	51. No evidence(*).	52. No evidence(*).	
JURASSIC (J), Lower (l) Middle (m) Upper (u)	1. Marine J1. Platform facies. Few hundred ft. Jmu not reported but possibly present.	5. Marine Kingak fm. Jlmu. Max. 4,000 ft. J1 absent in south central and Jlm absent in southwestern part of area.	10. Part of Colville geosyncline. Kingak fm. deposited.	11. Beginning of uplift and erosion. Source of seds. in Colville geosyncline.	14. Marine deposition locally in Chukotskiy Pen. and possibly elsewhere. Mostly emerg. and erosion.	15-16.Possible deposition. Pre-K1 rocks not uncovered.	20. Probable uplift and source of seds. in Kuskokwim and Koyukuk geosynclines.	26-27. Marine deposition, Jlmu. Includes lava and tuff. 28-30. Not reported but possibly present in 28, 29.	32. Not reported in Alaska. 33. Marine deposition, J1 (Laberge series). Reported in Canadian part of Coast mountains and in Yukon area to north.	39-41. Marine deposition, Jlmu. Several thous. ft. Skwentna volcanic group, Tordrilo fm. Treadwell slate, and Thane and Douglas I. volcanic groups.	43. Talkeetna fm., J1; mostly volcanics. Few thous. ft. 44. Not reported. 43-44. Uplift and erosion in middle and late J time; source of seds. in 39, 40, 41, 47.	47. Marine deposition, Jlmu, 10,000 to 20,000 ft. Volcanics in J1 (Talkeetna fm.). Jmu includes Tuxedni, Kialagvik, Chinitna, Shelikof, and Naknek fms, Stanikovich shale.	50. Marine and nonmarine Talkeetna fm., J1. Most volcanics. Jmu not reported; probably emergent with little or no Jmu deposition.	51. Possible deposition. Pre-K rocks not exposed.	52. Probable marine deposition. Jurassic rocks believed included in thick marine graywacke-slate-greenstone sequence (Orca group) bordering Gulf of Alaska.	
TRIASSIC (Tr), Lower (l) Upper (u)	1. Marine Tru. Platform facies. Less than 200 ft.	5. Marine Shublik fm. Few hundred ft. Mostly Tru; Trl present locally.	10. Part of Colville geosyncline. Shublik fm. deposited.	11. Probable deposition of marine Tru.	14. Marine deposition locally in Chukotskiy Pen., on St. Lawrence I., and possibly elsewhere.	15-16. Possible deposition. Pre-K1 rocks not uncovered.	20. Not reported.	26-30. Marine deposition, Tru. 26-27. Includes lava and tuff. 28. Not reported; possibly present.	32. Not reported in Alaska. 33. Marine deposition, Tru. Reported in Canadian part of Coast Mountains.	39-41. Marine deposition, Tru. Few thous. ft. Volcanics included in 41 and possibly in 39 and 40. Includes Nabesna limestone.	43-44. Marine deposition, Tru.	47. Marine deposition, Tru. Few thous. ft. Includes lava and tuff. Kamishak chert, Chitistone and Nizina limestones, Kuskulana fm.	50. Marine deposition, Tru, few thous. ft. Includes lava and tuff.	51. Possible deposition. Pre-K rocks not exposed.	52. Not reported. Possible deposition.	

ABBREVIATIONS USED IN TABLE AND ON MAP (SHEET 1)

emerg. - emergence
subsid. - subsidence
accum. - accumulation
def. - deformation
metam. - metamorphism
int. - intrusion
max. - maximum
thous. - thousand
ft. - feet
fm. - formation
fms. - formations
seds. - sediments
mod. - moderate
pre-€ - preCambrian
Paleoz. - Paleozoic
Tert. - Tertiary
I. - Island
Pen. - Peninsula
mts. - mountains
R. - River

MEANING OF SYMBOLS

(*). Although there is no evidence of deformation in area where symbol is shown, deformation is known to have occurred in other parts of Alaska and may have occurred in that area.

(r). See discussion of history of Cenozoic basins on Sheet 1.

(ℓ). Although post-Eocene Tertiary rocks have not been reported in area where symbol is shown, they may have been deposited there and mostly or entirely eroded during Pliocene uplift. Large parts of Alaska were topographically low during much of Tertiary time, and there is some evidence that Interior Alaska, between the Alaska Range and Brooks Range, may have been invaded by the sea. Tertiary rocks may be preserved beneath some of the topographic basins. In future more detailed mapping Tertiary rocks may be found.

TYPES OF DEFORMATION

Gentle def.: open folds, with dips generally less than 20 degrees; few or no thrust faults.
Mod. def.: open folds, with dips generally 20 to 60 degrees; some thrust faults.
Strong def.: complex right folds, some overturned; dips steep and erratic; numerous thrust faults.
Intense def.: folds and dips as above, but structures largely obliterated by metamorphism.