# Early Tertiary Magmatism Part I

Reference:
DNAG v. 3, Ch. 7, pp 294-314

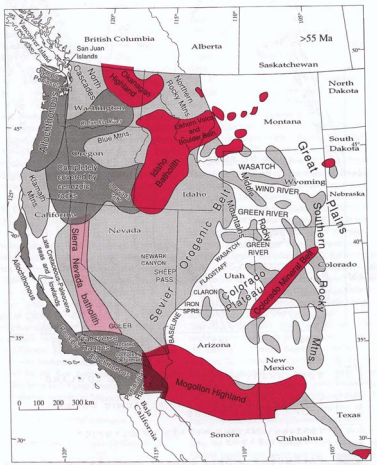
## End of Laramide

**Pink = Cretaceous batholiths**

**Red = plutons, Volcanic, metamorphic**

**Dark grey = accreted terrane and volcanic belts**

**Light grey, basins and tectonic belts**




## Events

- **Eocene to Early Miocene**
- **Areas that underwent Laramide and older Mesozoic crustal shortening subsequently underwent extension and magmatism**

## Magmatism

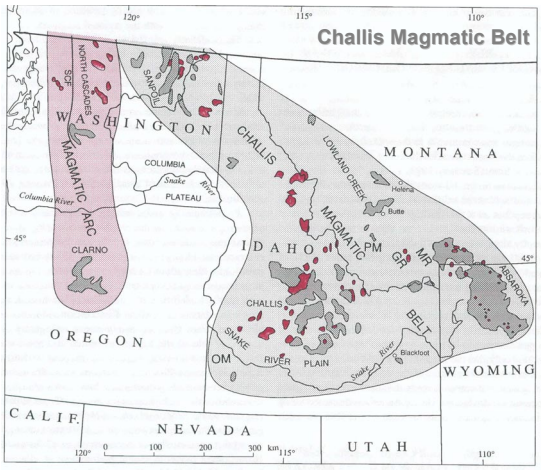
- **Active at different times in different areas**
- **Far inland location of some magmatic systems**
- **Suggests a different type of process**

## Northern USA Cordillera

- Mainly calc-alkaline composition
- Magmatism migrated southward as a series of distinct belts
- Activity of newer belts overlapped with that of older areas
- Towards the continent
  - Magmatism more silicic and potassic
  - Associated with more extension

## Challis Magmatic Belt

- Most active from 50 to 45 Ma
- Calc-alkaline andesite to dacite & abundant rhyolite
- Belt of small alkalic intrusions in BC
  - Highly potassic shoshonites in eastern part

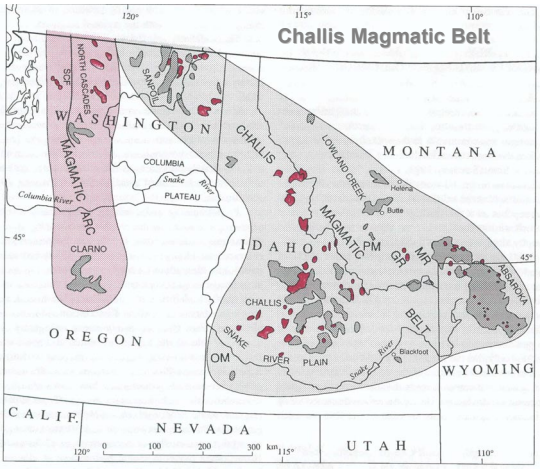



## Challis Magmatic Belt

- Ash flow sheets
  - Most voluminous units
  - Associated with collapse calderas
- Several mineralized plutons
  - Especially near the Boulder Batholith
  - Porphyry -type bodies
  - Chalcophile veins

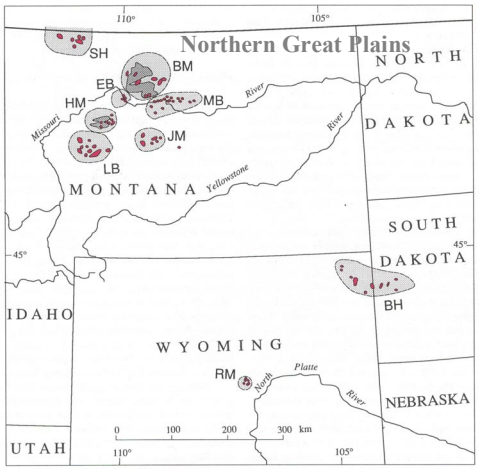
## Washington & Oregon

- Active from 52 to 43 Ma
- Older part of Clarno volcanics (older than 43 Ma) belong to this arc
- Mafic to intermediate middle Eocene rocks
- Some more silicic rocks (dacite and rhyolite)
- Typical magmatic arc
  - Quartz diorite plutons in North Cascades




## Foreland Magmatism N. Great Plains

- Age range 54-47 Ma in Montana
- Magmas mainly alkalic
- Phonolites, trachytes, latites
  - Some compositions are sodic
  - Most are potassic
- Carbonatite (Bearpaw Mts.)
- Kimberlite diatremes (Missouri Breaks)



## Foreland Magmatic Style

- Erupted as small fields of central volcanoes
- Most exist as stocks, sills, and laccoliths
- Each center active for a short time
  - Dispersed magmas
    - Late orogenic and post orogenic
    - Associated with uplifts in the foreland belt of orogenic regions

## Economic Aspects

- Base metal mineralization
  - Little Belt Mts.
  - Sweetgrass Hills
  - Bearpaw Mts.
- Diamonds in kimberlites of Missouri Breaks
- Vein deposits of Th and REE in Black Hills