

**Forest Service Handbook  
National Headquarters - Washington Office  
Washington, DC**

**Forest Service Handbook 6609.15 – Standards for Data and Data Structures Handbook  
Chapter 20 – Standard Terms and Definitions**

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**Approved by:** F. Dale Robertson, Chief

**Date approved:**

**Responsible Staff:**

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**Digest:** Following is an explanation of the changes throughout the directive by section.

**6609.15:** Establishes a new Handbook, FSH 6609.15, Standards for Data and Data Structures Handbook. Chapter 10, Database Naming Standards, is reserved. Chapter 20 covers Standard Terms and Definitions for the integrated data environment.

**Table of Contents**

<b>20.2 – Objective.....</b>	<b>3</b>
<b>20.3 - Policy .....</b>	<b>3</b>
<b>20.5 – Definitions.....</b>	<b>3</b>
<b>20.6 - Procedures for Proposing Changes, Additions, and Deletions to This Handbook .....</b>	<b>4</b>
<b>21 - Existing Environment Category.....</b>	<b>4</b>
<b>21.1 - Natural Component.....</b>	<b>5</b>
<b>21.11 - Vegetation Theme .....</b>	<b>5</b>
<b>21.11a - Vegetation Features .....</b>	<b>5</b>
<b>21.11b - Vegetation Attributes .....</b>	<b>5</b>
<b>21.12 - Ecology Theme .....</b>	<b>12</b>
<b>21.12a - Ecology Feature.....</b>	<b>12</b>
<b>21.12b - Ecology Attributes.....</b>	<b>12</b>
<b>21.13 - Geology Theme.....</b>	<b>12</b>
<b>21.13a - Geologic Features.....</b>	<b>13</b>
<b>21.13b - Geology Attributes.....</b>	<b>13</b>
<b>21.14 - Topography Theme.....</b>	<b>26</b>
<b>21.14a - Topography Feature .....</b>	<b>26</b>
<b>21.14b - Topography Attributes .....</b>	<b>26</b>

This chapter establishes standard terms and definitions for use throughout the Forest Service in the integrated data environment. The sections of this chapter match the hierarchical organization of the National Geographic Information Structure.

## 20.2 – Objective

To establish one standard definition for each term used in Forest Service data processing, databases, and information systems.

## 20.3 - Policy

1. If a term is defined and declared a Forest Service standard in the Forest Service Information Atlas and is also in a Forest Service directive as a data standard, the definition in the Forest Service Information Atlas takes precedence.
2. If a term is defined in this Handbook and also in a different Forest Service directive, for data purposes, the definition in this Handbook takes precedence.
3. If the multiple definition situations described in paragraphs 1 and 2 occur, it is the joint responsibility of the sponsors of the different definitions to reconcile the definitions so that they are the same in the Forest Service Information Atlas and in the Forest Service directive(s). If it is determined that two or more definitions are necessary (that is, two or more different data terms are being defined), it is acceptable for the sponsors to agree on new, unique term names for the different definitions.
4. Some term definitions include valid codes and/or lists of valid values (domains) for the term. These shall apply agency-wide except where explicitly noted otherwise.
5. Some term definitions include indications of valid formats. These shall NOT apply agency-wide except where explicitly noted otherwise.
6. All automated application distribution procedures (for example, the National Application Distribution Procedure described in the Application Developer's Handbook (FSH 6609.13)) shall ensure that the meaning of terms used by the application (for example, as database entities or attributes or fields on data entry screens or reports) conform to the definition (meaning) of the terms in this Handbook.

## 20.5 – Definitions

For standard abbreviations of units of measure and scientific terminology, follow the U.S. Government Printing Office Style Manual. (See sec. 05 of this Handbook for further information on the style manual.)

Attribute. Attributes are associated with features and describe their characteristics, measurements, and other facts or observations about them.

Category. The broadest subdivision of information in the National Geographic Information Structure.

Component. The sub-category, or second level subdivision of information in the National Geographic Information Structure.

Description. A precise narrative statement of the meaning of a term used to name a data item or data structure.

Example. A demonstration of the use of a term, and, as applicable, associated valid value, codes, and units of measure in recording or reporting data.

Feature. Features are things which can be mapped and located on the earth and are relatively constant over time. They can be surveyed, measured, named, and otherwise described.

National Geographic Information Structure. The structure adopted by the Forest Service to describe natural resource data. Elements of the structure include, in descending hierarchical order: category, component, theme.

Source for Data Standard. The name of a publication or organizational entity which has established standards, for a description of a term used as the name of a data item or structure, and, as applicable, standards for its valid values, codes, and units of measure.

Theme. The subcomponent, or third level subdivision of information of the National Geographic Information Structure. Themes are meant to organize information about a class of related features of the environment, for example, the vegetation features.

Units. The numerical units in which data about an attribute term is measured.

## **20.6 - Procedures for Proposing Changes, Additions, and Deletions to This Handbook**

Send proposals for changes, additions, and deletions of terms or definitions in this Handbook to the Director, Information Systems and Technology Staff, Washington Office. With the proposal, include an explanation of the term's proper position in the National Geographic Information Structure according to the codes and captions in this chapter. The Information Systems and Technology Staff arranges for reviews of the proposals and prepares amendments to incorporate changes in the Handbook.

## **21 - Existing Environment Category**

The Existing Environment Category organizes information which describes existing natural and cultural features of the environment, as well as demarcations of the land into different political, legal, and administrative jurisdictions and uses. It is divided into three components: Cultural, Natural, and Status.

## 21.1 - Natural Component

The Natural Component organizes information about existing land, water, plant, and animal characteristics. It is divided into the following themes: Air and Climate; Ecology; Geology; Soil; Topography; Vegetation; Water; and Wildlife/Fish.

### 21.11 - Vegetation Theme

The Vegetation theme organizes information about measurements and interpretations of vegetation. It includes the following features: Plants and Stands.

#### 21.11a - Vegetation Features

Plants. A plant is an individual tree, shrub, and grass/forb of special interest (for example, genetically superior trees, threatened/endangered plants, snags).

Stands. A stand is an area of homogeneous vegetation.

#### 21.11b - Vegetation Attributes

Vegetation features have one or more of the following attributes:

Basal Area (BA). The cross-sectional area of the stem or stems of a plant or of all plants in a stand, generally expressed as square units per unit area. For trees, measured at 4.5 feet (1.37 m) above ground, for forbs and grasses, measured at the root crown.

1. Valid Values. Not Applicable.
2. Units. Nearest square foot per acre, or, tenths of square inches per square foot or tenths of square meters per hectare for forbs and grasses.
3. Example. 120 square feet of BA per acre.
4. Source for Data Standard. Not Applicable.

Basal Diameter. Length of the straight line passing through the center of a cross section of a bole, measured at the root collar of a shrub or tree.

1. Valid Values. Not Applicable.
2. Units. Inches and tenths of inches or centimeters and tenths of centimeters.
3. Example. Basal diameter of the stand is 13.2 inches, 26 centimeters.

4. Source for Data Standard. Not Applicable.

Canopy Cover. Extent of a fixed area covered by the crown of an individual plant species, or delimited by the vertical projection of its outermost perimeter; small openings in the crown are included.

1. Valid Values. 0-100.

2. Units. Percent, in whole numbers, for each measured species.

3. Example. Douglas-fir canopy covers 20 percent of an area.

4. Source for Data Standard. Not Applicable.

Cause of Death. The nominal most obvious cause or most important cause of death or mortality. To be judged as important, the injury must be serious enough now to have (1) ultimately caused death, or (2) predisposed the tree to fatal attack by another agent.

1. Valid Values.

Abiotic Conditions

Animals

Bark Beetles

Biotic Diseases

Competition

Decline Complexes

Defoliating Insects

Domestic Animals

Fire

Foliage Diseases

Harvest

Human Activities

Insects

Mistletoes

None

Root Diseases

Shoot Borers

Stem Diseases

Unknown

Wild Animals

2. Units. Not Applicable.

3. Example. Cause of death is bark beetles.

4. Source for Data Standard. Not Applicable.

Cause of Injury. The nominal most obvious cause of injury or most important cause of injury to live trees. To be judged as important, the injury must be serious enough now or in the future to (1) ultimately cause death, (2) predispose the tree to fatal attack by another agent, or (3) significantly reduce diameter or height growth.

1. Valid Values.

Abiotic Conditions  
Animals  
Bark Beetles  
Biotic Diseases  
Competition  
Decline Complexes  
Defoliating Insects  
Domestic Animals  
Fire  
Foliage Diseases  
Harvest  
Human Activities  
Insects  
Mistletoes  
None  
Root Diseases  
Shoot Borers  
Stem Diseases  
Unknown  
Wild Animals

2. Unit. Not Applicable.

3. Example. Cause of injury is fire.

4. Source for Data Standard. Not Applicable.

Diameter at Breast Height (DBH). Tree (or snag) DBH is outside bark diameter at breast height. Breast height is defined as 4.5 feet (1.37 m) above the forest floor on the uphill side of the tree. For purposes of determining breast height, the forest floor includes the duff layer that may be present, but does not include unincorporated woody debris that may rise above the ground line.

1. Valid Values. Not Applicable.

2. Units. Inches and tenths of inches or centimeters and tenths of centimeters.
3. Example. 13.2 inches, 26 centimeters.
4. Source for Data Standard. Not Applicable.

Down Material Condition. The deterioration of trees lying on the ground or across a stream.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Stage 1	Bark intact; twigs present; texture intact; round shape; original color of wood; log elevated on support points.
Stage 2	Bark intact; twigs absent; texture intact to partly soft; original color of wood; log elevated on support points but sagging.
Stage 3	Trace of bark intact; twigs absent; texture hard, large pieces; shape round, wood original color to faded; log is sagging near ground.
Stage 4	Bark absent; twigs absent; texture small, soft blocky pieces; shape round to oval; wood light brown to faded brown or yellowish; all of log on ground.
Stage 5	Bark absent; twigs absent; texture soft and powdery; shape oval; color faded to light yellow or gray; all of log on ground.

2. Units. Not Applicable.
3. Example. Not Applicable.
4. Source for Data Standard. Thomas, Jack Ward. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Handb. 553. Washington, DC: U.S. Department of Agriculture, Forest Service. 512 p.



Existing Vegetation. The dominant vegetation layers and species from the uppermost canopy layer and including up to four additional layers of vegetation. This attribute identifies existing vegetation on areas of land by describing up to three tree layers, a shrub layer and an herb layer. Canopy layers can be described for both forested and non-forested lands. Individual canopy layers are identified by dominant or codominant species.

1. Valid Values. Up to five canopy layers may be identified. Each layer may be identified by one or more codes identified in Plant Species.
2. Units. Not Applicable.
3. Example. Existing vegetation consists of an uppermost canopy of Douglas-fir (PSME), western hemlock (TSHE), and white fir (ABCO), with a second canopy of western hemlock, an understory of western hemlock saplings, a shrub layer of vine maple (ACCI) and Oregon grape (BEAQ), and an herb layer of sword fern (POMU).

Layer 1	PSME/TSHE/ABCO
Layer 2	TSHE
Layer 3	TSHE
Layer 4	ACCI/BEAQ (that is, a shrub layer)
Layer 5	POMU (that is, an herb layer)

4. Source for Data Standard. Resource Inventory Coordination Task Group.

Forage Production. Annual production of herbage, shrubs, woody vines, and trees which may provide food for grazing animals or be harvested for feeding.

1. Valid Values. Not Applicable.
2. Units. Pounds per acre per year or kilograms per hectare per year.
3. Example. Total annual forage production of 1,250 lb/ac/year.
4. Source for Data Standard. Not Applicable.

Height Growth. Change in height over a period of time.

1. Valid Values. Not Applicable.
2. Units. Feet and tenths of feet per year or centimeters per year.
3. Example. 1.2 feet per year; or 26 centimeters per year.

4. Source for Data Standard. Not Applicable.

Plant Species. The major subdivision of a genus or subgenus of a plant being described or measured.

1. Valid Values. From the National List of Scientific Plant Names (see source) modified to include the following special codes for cases when genus and species are not known; for example, annual grass.

<u>Value</u>	<u>Meaning</u>
Unknown algae	ALGAE
Unknown annual forb	FORBA
Unknown annual grass	GRASSA
Unknown conifer tree	TREEC
Unknown deciduous shrub	SHRUBD
Unknown deciduous tree	TREED
Unknown evergreen, non-conifer tree	TREEE
Unknown evergreen shrub	SHRUBE
Unknown fern	FERN
Unknown forb	FORB
Unknown grass	GRASS
Unknown grass-like	GRASSL
Unknown lichen	LICHEN
Unknown perennial forb	FORBP
Unknown perennial grass	GRASSP
Unknown shrub	SHRUB
Unknown tree	TREE

2. Units. Not Applicable.

3. Example.

ABLA - Abies lasiocarpa

GRASS - grass of unknown genus and species

4. Source for Data Standard. U.S. Department of Agriculture, Soil Conservation Service. 1982. National list of scientific plant names. SCS-TP-159. Washington, DC: U.S. Department of Agriculture, Soil Conservation Service. 2 vol.

Radial Growth. The increase in tree radius over a period of time at breast height, or occasionally at the base.

1. Valid Values. Not Applicable.
2. Units. Tenths of inches or centimeters and tenths of centimeters per year.
3. Example. 0.8 inches or 2 centimeters per year.
4. Source for Data Standard. Not Applicable.

Snag Condition. A description of the deterioration of a standing dead or dying tree.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Stage 1	Live tree.
Stage 2	Tree declining.
Stage 3	Tree dead; branches, twigs, bark intact.
Stage 4	Loose bark; secondary branches gone.
Stage 5	Bole clean.
Stage 6	Top broken.
Stage 7	Top broken, bole decomposed.

2. Units. Not Applicable.
3. Example. Not Applicable.
4. Source for Data Standard. Thomas, Jack Ward. 1979. Wildlife habitats in managed forests: the Blue Mountains of Oregon and Washington. Agric. Handb. 553. Washington, DC: U.S. Department of Agriculture, Forest Service. 512 p.

Tree Age. Total age of the aboveground stem of a tree (not age of the root stock or the total age from seed). Total age is usually the annual ring count to the pith of the tree at breast height plus an estimate of the number of years it took the tree to reach breast height. This must be an estimate based on local knowledge.

1. Valid Values. Not Applicable.
2. Units. Years.
3. Example. A Douglas-fir with a ring count of 90 and an estimated time to reach breast height of 5 years has an age of 95 years.
4. Source for Data Standard. Not Applicable.

Vegetation Density. Number of individual plants (live, dead, or down) of a given species per unit area.

1. Valid Values. Not Applicable.
2. Units. Number per acre or number per hectare.
3. Example. 10 snags per acre.
4. Source for Data Standard. Not Applicable.

Vegetation Height/Length. The vertical distance from ground level to the top of an individual plant or canopy, or the horizontal distance from one end of a downed plant to another.

1. Valid Values. Not Applicable.
2. Units. Feet and tenths of feet or meters and tenths of meters.
3. Example. The tree height is 232.2 feet.
4. Source for Data Standard. Not Applicable.

## **21.12 - Ecology Theme**

The Ecology theme organizes information about the relationships between organisms and their environments. It includes the Ecologic Map Units feature.

### **21.12a - Ecology Feature**

Ecologic Map Units. Areas of land with similar unique biotic conditions and potentials to produce similar vegetation and similar responses to management activities.

### **21.12b - Ecology Attributes**

Ecology attributes are regional or local, depending on classification scheme, but should follow conventions for attributes in the Vegetation and other Natural Component features.

## **21.13 - Geology Theme**

The Geology theme organizes information about mineral potential and geological measurements and interpretations. It includes the following features: Aquifer, Geologic Feature, Geologic Formation, Geologic Hazard, and Mineral Resource.

### 21.13a - Geologic Features

Aquifer. An Aquifer is a geologic formation that can yield significant quantities of ground water to wells and springs (for example, Ogallala aquifer).

Geologic Features. A Geologic Feature is a naturally occurring structure, outcrop, or landform of significant interest (for example, caves, lava tubes, rock outcrops).

Geologic Formation. A Geologic Formation is a mappable body of rock identified by distinctive characteristics and stratigraphic position (for example, Mancos shale, Navajo sandstone).

Geologic Hazard. A Geologic Hazard is a condition that poses a risk to health or safety or has potential adverse impacts on resource values or property (for example, avalanche hazard, floodplain, landslide).

Mineral Resource. A Mineral Resource is a concentration of solid, liquid or gaseous material in form and amount such that economic extraction of commodities is or may become feasible (for example, oil and gas field, gravel bed).

### 21.13b - Geology Attributes

Geological features have one or more of the following attributes:

Activity Status. Type of operations currently being conducted to discover, develop, operate, or close a mineral deposit.

#### 1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Prospecting (Reconnaissance)	Searching for economically valuable deposits of minerals; collecting and interpreting geologic data to determine the potential for an undiscovered deposit.
Exploration	Establishing the nature of a known (or inferred) mineral deposit. More detailed than prospecting, usually includes the process of securing the mineral rights.

<u>Value</u>	<u>Meaning</u>
Development	The preparation of a mining or drilling property so that the deposit can be analyzed and its reserves can be estimated.
Production	The removal and on-site beneficiation of the resource.
Reclamation	The return of a mining or drilling property to a condition suitable for other planned, productive uses.
Abandoned	A mining or drilling property which has not been reclaimed and there is no operator of record; used mainly when environmental or safety hazards remain and are now responsibility of landowner. (See also "Geologic Hazards.")

2. Units. Acres disturbed and acres reclaimed; current annual and total historic production (see "Mineral Commodity" and measurement units).

3. Example.

Locatable/High/(hot spring/Au, Ag) - an area on lands reserved from the public domain which has high potential for the discovery of gold and silver deposits based on the hot-spring model.

Lease/Production/(oil-15,000) - a lease with a producing oil well having 15,000 barrels of output annually.

4. Source for Data Standard. Thrush, Paul W., comp. 1990. A dictionary of mining, mineral, and related terms. Chicago, IL: Maclean Hunter. 1269 p.

Authority for Disposal. The specific legislative action that is the legal basis to dispose of mineral commodities from the National Forest System.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Leasable energy minerals	Activities governed by Mineral Lands Leasing Act of 1920, as amended, the Geothermal Steam Act of 1970, the Federal Coal Leasing Amendments Act of 1976, and the Surface Mining and Reclamation Act of 1977.
Leasable non-energy minerals	Activities governed by Mineral Resources on Weeks Law Lands Act of 1917, the Mineral Lands Leasing Act of 1920, as amended, and the Mineral Leasing Act for Acquired Lands of 1947.
Locatable minerals	Activities governed by General Mining Law of 1872, as amended. Applies to lands reserved from public domain.
Mineral materials	Activities governed by the Materials Act of 1947 and the Multiple Use Mining Act of 1955.
Reserved and outstanding minerals	Minerals which are in non-federal ownership but are located beneath National Forest System lands. Activities are governed by the terms of the individual deed and the regulations in effect at the time the deed was issued.

2. Units. Not Applicable.

3. Example. Sec. 21.13b, Activity Status, para. 3.

4. Source for Data Standard. FSM 2800, zero code.

Geologic Stratigraphy. The arrangement of rocks as classified by geographic position and chronologic order. The hierarchy of terms is province, terrane (where applicable), group (where applicable), formation, and member.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Formation	A mappable body of rock identified by distinctive characteristics, some degree of internal homogeneity, and stratigraphic position. The name normally consists of two parts. The first is the name of the geographic locality where the formation was first identified and described ("Type section"). This is followed by a descriptive geologic term, usually the dominant rock type. Most geologic mapping in support of forest planning is at the formation level.
Group	A unit consisting partly or entirely of named formations. Named for a geographic locality.
Member	A specially developed unit, not necessarily mappable, of a formation. When named, it consists of a geographic name, an optional lithologic designation, and the word "member." In sedimentary formations, members may be locally subdivided into "beds."
Physiographic province	A region where all parts display similar geologic structure and climate and have a unified geomorphic history; differs significantly in patterns of relief features and landforms from adjacent regions.
Terrane	Fault-bounded body of rock of regional extent, characterized by a geologic history different from that of contiguous terranes; generally considered to be a discrete fragment of oceanic or continental material added by accretion.



2. Units. Acres.3. Example.

Basin and Range (province)  
 Chulitna Terrane  
 Mancos Shale (formation)  
 Navajo Sandstone (formation)  
 Northern Rockies (province)  
 San Rafael Group  
 Skyline Trail Conglomerate Member of the Hoback Formation

4. Source for Data Standard. U.S. Geological Survey geologic maps and their related publications.

Geologic Time Unit. A division of time traditionally distinguished on the basis of observable changes in worldwide life forms as represented in the fossil record in sedimentary rocks. Radioactive dating of igneous and some sedimentary rocks is used to correlate absolute ages to the relative scale. This correlation is approximate and there are several estimates published in the literature. The ages below represent those used by the International Union of Geological Sciences, the divisions by a U.S. Geological Survey working group.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>	<u>Code</u>
Cenozoic Era	Age of recent life.	Cz
a. Quaternary Period	Development of human race.	Q
(1) Holocene Epoch	Last 10,000 years.	
(2) Pleistocene Epoch	Ice age; mammoths; sabre-toothed tigers. MYBP = 2.	
b. Tertiary (Neogene/ Paleogene) Period	Development of mammals; western U.S. lava flows; formation of the basin and range, Cascades, and Coast Ranges; culmination of Rocky Mountain uplift.	T

## Chapter 20 – Standard Terms and Definitions

Amendment: 6609.15-1993-1

Effective date: April 28, 1993

<u>Value</u>	<u>Meaning</u>	<u>Code</u>
(1) Pliocene Epoch	MYBP = 5.	Tpl
(2) Miocene Epoch	Abundant grasses; mammals dominant; Columbia River basalt flows. MYBP = 24.	Tm
(3) Oligocene Epoch	Flowering plants dominant; central continent stable. MYBP = 37.	To
(4) Eocene Epoch	Formation of several ranges in Central Rockies (Laramide orogeny). MYBP = 53.	Te
(5) Paleocene Epoch	First primates appear; the "K-T" boundary (period of mass extinction). MYBP = 65.	Tp
Mesozoic Era	Age of dinosaurs.	Mz
a. Cretaceous Period	North America separates from Eurasia; accretion begins along west coast; intercontinental seaway from Arctic to Gulf; western mountain building activity (Sevier orogeny). MYBP = 135.	K
b. Jurassic Period	Birds first appear. MYBP = 205.	J
c. Triassic Period	Dinosaurs first appear; reptiles and conifers dominant. North America begins to separate from Africa as the Atlantic Basin originates. MYBP = 250.	T <sub>R</sub>

## Chapter 20 – Standard Terms and Definitions

Amendment: 6609.15-1993-1

Effective date: April 28, 1993

<u>Value</u>	<u>Meaning</u>	<u>Code</u>
Paleozoic Era	Age of ancient life.	Pz
a. Permian Period	Climax of Appalachian mountain building. MYBP = 290.	P
b. Pennsylvanian Period	Coal-forming swamps dominant; North America part of supercontinent "Pangaea"; warm, shallow seas. MYBP = 320.	Cp/P
c. Mississippian Period	First insect fossils and amphibians; ferns and coal-forming swamps abundant.	Cm/M
d. Carboniferous Period	Combines Pennsylvanian and Mississippian periods, used outside North America. MYBP = 355.	(C)
e. Devonian Period	Life moves on land; first land plant fossils; fish abundant. MYBP = 410.	D
f. Silurian Period	Fish dominant; extensive coral reefs; "North America" collides with "Europe." MYBP = 438.	S
g. Ordovician Period	Marine invertebrates dominant; trilobites abundant; vertebrates (fish) appear late in period; accretion of "North American" east coast and beginning of Appalachian Mountains. MYBP = 510.	O

<u>Value</u>	<u>Meaning</u>	<u>Code</u>
h. Cambrian Period	Marine invertebrates, plants, and algae dominant; supercontinent "Gondwanaland"; ancestral "North America" about half the present-day area, located along the equator. MYBP = 570.	-C-
Precambrian	Generic term for undivided Proterozoic/ Archean time.	pC
Late Proterozoic Eon	First multicelled organisms. MYBP = 1000.	Z
Middle Proterozoic Eon	First complex-celled organisms. MYBP = 1600.	Y
Early Proterozoic Eon	Early organic structures. MYBP = 2500.	X
Archean Eon	Large cratons form; earliest life; formation of Earth's crust. MYBP = 4550.	A

2. Units. Million years before present (MYBP).

3. Example. See paragraph 1.

4. Source for Data Standard.

International Union of Geological Sciences;

Stanley, Steven M. 1989. Earth and life through time. 2nd ed. New York, NY: W.H. Freeman. 689 p.

Mineral Commodity. A mineral resource with sufficient value to be individually produced and traded on the open market.

1. Valid Values. (\* = commodities selected as "indicator minerals" for Resource Planning Assessment.)

<u>Value</u>	<u>Meaning</u>
Construction materials	Sand and gravel*, crushed stone*, limestone, dimension stone, cement lime, clay, pumice, cinders, and vermiculite.
Energy minerals	Oil*, natural gas*, coal*, uranium* and other fissionable materials, and geothermal steam*.
Ferrous and ferroalloy metals	Iron, manganese, silicon, chromium, nickel, vanadium, molybdenum*, tungsten, cobalt, titanium, tellurium, and niobium (columbium).
Gemstones	Diamond, jade, opal, sapphire, star garnet, turquoise, and tourmaline.
Industrial and nonmetallic minerals	Ceramic minerals (cement lime, specialty clay, feldspar, nepheline syenite, and silica), abrasives (diamond, quartz, emery, spinel, magnetite, and garnet), fertilizers (phosphate*, potash, and ammonia), salines (halite, trona, sodium sulfate, boron, and bromine), fillers (mica), sulfur, barite, fluorspar, talc and pyrophyllite, asbestos, graphite, zeolite, diatomite, helium, iodine, kyanite, selenium, perlite, and gypsum.
Nonferrous metals	Aluminum, copper*, lead*, zinc, tin, antimony, bismuth, arsenic, magnesium, mercury, lithium, beryllium, cadmium, gallium, germanium, indium, rhenium, strontium, tantalum, thallium, thorium, zirconium, and rare-earth metals.

<u>Value</u>	<u>Meaning</u>
Precious metals	Gold*, silver*, and platinum group metals (includes palladium, iridium, osmium, rhodium, and ruthenium).

2. Units.

Barrels - unit used for oil.

Carats - unit used for gemstones.

Megawatts of power - unit used for geothermal steam.

Pounds - unit used for nonferrous metals, ferrous and ferroalloy metals, some industrial and nonmetallic minerals, and uranium-uranium oxide ( $U_3O_8$ ) concentrate.

Thousand cubic feet - unit used for natural gas.

Thousand tons - unit used for construction materials and coal.

Tons - unit used for bulk industrial and nonmetallic minerals.

Troy ounces - unit used for precious metals.

3. Example. Sec. 21.13b, Activity Status, para. 3.

4. Source for Data Standard. U.S. Bureau of Mines, Mineral Commodity Summaries.

Structure. The general disposition, attitude, arrangement, and relative position of rock masses of an area.

1. Valid Values.

<u>Value</u>	<u>Meaning</u>
Bedding	The general physical and structural character or pattern of the beds and their contacts within a rock mass. Usually significant only at large scales.

<u>Value</u>	<u>Meaning</u>
Contact	Plane or irregular surface between two types or ages of rocks, usually the boundary of two formations, members, or beds.
Fault	A fracture or zone of fractures along which there has been displacement of the sides relative to one another parallel to the fracture. Where vertical motion is involved, the "footwall" is the surface beneath the fracture. Faults may be classified based on the apparent movement of the blocks.
a. Normal fault	The hanging wall appears to have moved downward relative to the footwall. Dips are usually in the 45-90° range. Also called "gravity fault."
b. Oblique fault	Displacement is diagonal, or in an intermediate direction between horizontal and vertical.
c. Rotational fault	Displacement increases outward from a point, so that alignment of formerly parallel features is disturbed. Also called a "hinge" fault.
d. Strike-slip fault	A horizontal displacement parallel to the strike of the fault. Called "right-lateral" if the side opposite the observer appears displaced to the right, or "left-lateral" if displacement appears left.
e. Thrust fault	The hanging wall appears to have moved upward relative to the footwall. Also called "reverse fault" if the dip is greater than 45° or "overthrust" if the dip is low angle and there is a great amount of displacement.
f. Transform fault	A special form of strike-slip fault, usually regional in scale, in which the displacement suddenly stops or changes form.

<u>Value</u>	<u>Meaning</u>
Fold axis	The line of symmetry about which a previously planar structure, such as rock strata, bedding planes, foliation or cleavage, curves or bends. Folds may be classified based on the relationship of the limbs of the fold. Other descriptive terms used in describing folds are "assymetrical" (strata of one limb dip more steeply than the other), "overturned" (limbs are tilted beyond the vertical and dip in the same direction, but not necessarily by the same amount), "recumbent" (one limb is inverted and the axis is nearly horizontal), and "isoclinal" (beds on both limbs nearly parallel).
a. Anticline	A generally convex upward fold, or arch, with the stratigraphically older rocks in the core.
b. Basin	A low area or crustal downwarp in which the strata dip towards a common center, and in which sediments have accumulated. (Also name of term in "Topographic Feature").
c. Dome	An uplift or anticlinal structure, either circular or elliptical in outline, in which the rocks dip gently away in all directions. (Also name of term in "Topographic Feature").
d. Monocline	A local steepening in an otherwise uniform gentle dip.
e. Syncline	A generally concave upward fold, or trough, with the stratigraphically younger rocks in the core.
Foliation	A general term for the planar arrangement of textural or structural features in any type of rock. Usually only significant at large scales.



<u>Value</u>	<u>Meaning</u>
Joint	A surface of fracture or parting in a rock, without displacement; the surface is usually plane and often occurs with parallel joints to form a joint set. "Sheeting" is a pattern of essentially horizontal joints. "Columnar" jointing results from contraction during the cooling of basalts and some other igneous rocks.
Lineation	A general, nongeneric term for any linear structure in a rock; for example, flow lines, slickensides, mineral streaking, and crinkles. Usually significant only at large scales.

2. Units.

##\* Dip - the angle that a structural surface makes with the horizontal, measured perpendicular to the strike of the structure and in the vertical plane. Also called "plunge" when applied to the axis of a fold. Measurement is the vertical angle in degrees (##), followed by the primary direction (\*) of dip; for example, 30N.

\*##\* Strike - the direction or trend of a structural surface as it intersects the horizontal. The direction, or "bearing," of the line is expressed as the acute angle (##) with respect to the north/south line (\*\*); for example, N60W.

The following terms relate to the confidence level of the presence of a structural feature:

Approximate - Location is estimated between known points.

Concealed - Location is overlain by material, but there is direct evidence of presence (such as from drilling).

Inferred - Geologic evidence suggests the presence of a feature, but it has not been observed.

Known - Location can be observed on the surface, measured, and mapped.

3. Example. Fn/k/N80W/60N. A known normal fault which has a strike of north 80° west and dips 60° northerly.

4. Source for Data Standard. Dietrich, R. V.; Dutro, Jr., J. T.; and Foose, R. M. 1982. American Geological Institute data sheets for geology in the field, laboratory, and office, 2nd ed. Alexandria, VA: American Geological Institute.

## **21.14 - Topography Theme**

The Topography theme organizes information about topographic measurements and interpretations. This theme includes the Terrain feature.

### **21.14a - Topography Feature**

Terrain. A Terrain feature is the characterization of the shape of the Earth's surface (for example, point measurements of elevation, contours).

### **21.14b - Topography Attributes**

The Topography feature has one or more of the following attributes:

Aspect. Direction in which a slope faces.

1. Valid Values. 0 to 360.
2. Units. Compass degrees measured clockwise from true north (Azimuth) to nearest degree.
3. Example. The aspect of the ski run is 321 degrees.
4. Source for Data Standard. Common usage.

Elevation. Vertical distance from a datum, usually mean sea level, to a point or object on the earth's surface. (Not to be confused with altitude which refers to points above the earth's surface.)

1. Valid Values. Not Applicable.
2. Units. Feet or meters to the nearest 0.01 of a unit (or 2 decimal places).
3. Example. The benchmark is 2745.34 feet above mean sea level.
4. Source for Data Standard. Common usage.

Slope. The ratio of vertical rise to horizontal distance.

1. Valid Values. Not Applicable.
2. Units. Percent, to nearest 1 percent.

3. Example. The slope of the ski run is 42 percent.
4. Source for Data Standard. Common usage.