## Appendix E

# USFS PALEONTOLOGICAL CLASSIFICATION

# USFS: POTENTIAL FOSSIL YIELD CLASSIFICATION

Occurrences of paleontological resources are closely related to the geological units that contain them. The potential for finding important paleontological resources can, therefore, be broadly predicted by the presence of the pertinent geological units at or near the surface. Therefore, geological mapping can be used as a proxy for assessing the potential for the occurrence of important paleontological resources. The PFYC system was originally developed by the USFS Paleontology Center of Excellence and the Region 2 Paleo Initiative (USFS 1996). It is in the process of being formally adopted by the BLM to promote consistency between agencies and throughout the BLM. The PFYC should be used for land use planning efforts and for the preliminary assessment of potential impacts and mitigation needs for specific projects.

Under the PFYC system, geological units are classified on the basis of the relative abundance of vertebrate fossils or uncommon invertebrate or plant fossils and their sensitivity to adverse impacts; a higher class number indicates a higher potential. This classification should be applied at the geological formation or member level. It is not intended to be an assessment of whether important fossils are known to occur occasionally in these units (i.e., a few important fossils or localities widely scattered throughout a formation do not necessarily indicate a higher class), nor is it intended to be applied to specific sites or areas. The classification system is intended to provide baseline guidance for assessing and mitigating impacts to paleontological resources. In many situations, the classification should be an intermediate step in the analysis and should be used to assess additional mitigation needs. For the purposes of this overview study, Class 4/5 was added to the PFYC to replace Classes 4 and 5, which are described below (see Chapter 3, Section 3.6, "Paleontological Resources," for an explanation).

- **Class 1.** Class 1 units are geological units that are not likely to contain recognizable fossil remains. This includes units that are igneous or metamorphic in origin (but excludes tuffs), as well as units that are Precambrian in age or older. Management concern for paleontological resources in Class 1 units is negligible or not applicable. No assessment or mitigation is needed, except in very rare circumstances. The occurrence of significant fossils in Class 1 units is nonexistent or extremely rare.
- **Class 2.** Class 2 units are sedimentary geological units that are not likely to contain vertebrate fossils or scientifically significant nonvertebrate fossils.[1] This includes units in which vertebrate or significant nonvertebrate fossils are unknown or very rare, units that are younger than 10,000 years B.P., units that are eolian in origin, and units that exhibit significant diagenetic alteration. The potential for impacting vertebrate fossils or uncommon invertebrate or plant fossils is low. Management concern for paleontological resources is low, and management actions are not likely to be needed. Localities containing important resources may exist but would be rare and would not influence the classification.
- **Class 3.** Class 3 units are fossiliferous sedimentary geological units where fossil content varies in significance, abundance, and predictable occurrence, or sedimentary units of unknown fossil potential. These units are often marine in origin, with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and uncommon nonvertebrate fossils are known to occur inconsistently, and predictability is known to be low. Class 3 includes units that are poorly studied or poorly documented, so that the potential yield cannot be assigned without ground reconnaissance. Management concern for paleontological resources in these units is moderate or cannot be determined from existing data. Surface-disturbing activities may require field assessment to determine a further course of action. The Class 3 category includes a broad range of potential impacts. Geological units of unknown potential, as well as units of moderate or infrequent fossil occurrence are included. Assessment and mitigation efforts also include a broad range of options. Surface-disturbing activities will require sufficient assessment to determine whether significant

[1] In the USFS PFYC system, nonvertebrates refers to fossil invertebrates and plants.

fossil resources occur in the area of a proposed action and whether the action could affect the paleontological resources. Authorizations for any surface-disturbing activities should include the following statement, or one similar in nature:

> The operator shall immediately bring any paleontological resources discovered as a result of operations under this authorization to the attention of the BLM-authorized officer. The operator shall suspend all activities in the vicinity of such discovery until notified to proceed by the authorized officer and shall protect the site from damage or looting. The authorized officer will evaluate, or will have evaluated, such discoveries as soon as possible, but not later than five working days after being notified. Appropriate measures to mitigate adverse effects to significant paleontological resources will be determined by the authorized officer after consulting with the operator. The operator is responsible for the cost of any investigation necessary for the evaluation and for any mitigation measures. There is no need to suspend operations if the operator can avoid further impacts to a discovered site; however, the discovery shall be brought to the attention of the authorized officer as soon as possible and protected from damage or looting.

- **Class 4.** Class 4 units are Class 5 geological units (see below) that have lowered risks of human-caused adverse impacts or lowered risk of natural degradation. They include bedrock units with extensive soil or vegetative cover, bedrock exposures that are limited or not expected to be impacted, units with areas of exposed outcrop smaller than 2 contiguous acres, units in which outcrops form cliffs of sufficient height and slope that impacts are minimized by topographic effects, and units where other characteristics are present that lower the vulnerability of both known and unidentified fossil localities. The potential for impacting significant fossils is moderate to high and is dependent on the proposed action. The bedrock unit is Class 5, but a protective layer of soil, thin, alluvial material, or other mitigating circumstances may lessen or prevent potential impacts to the bedrock that could result from the activity. Mitigation efforts must include assessment of the disturbance, such as removal or penetration of protective surface alluvium or soils, potential for future accelerated erosion, or increased ease of access that could result in greater looting potential. If impacts to significant fossils are anticipated, on-the-ground surveys before authorization of the surface-disturbing action will usually be necessary. On-site monitoring may also be necessary during construction activities. Management prescriptions for resource preservation and conservation through controlled access or special management designation should be considered. Class 4 and 5 units are often combined as Class 5 for general application, such as planning efforts or preliminary assessments, because Class 4 is determined from local mitigating conditions and the impacts of the planned action.

- **Class 5.** Class 5 units are highly fossiliferous geological units that regularly and predictably produce vertebrate fossils or uncommon invertebrate or plant fossils and that are at risk of human-caused adverse impacts or natural degradation. These include units in which vertebrate fossils or uncommon invertebrate or plant fossils are known and documented to occur consistently, predictably, or abundantly. Class 5 pertains to highly sensitive units that are well exposed, with little or no soil or vegetative cover, units in which outcrop areas are extensive, and exposed bedrock areas larger than 2 contiguous acres. Management concern for paleontological resources in Class 5 units or areas is high because the potential for impacting significant fossils is high. Vertebrate fossils or uncommon nonvertebrate fossils are known from the impacted area or can reasonably be expected to occur in the impacted area. Assessment by a qualified paleontologist is required in advance of surface-disturbing activities or land-tenure adjustments, and mitigation will often be necessary before or during surface-disturbing actions, or both. Field surveys before authorization of any surface-disturbing activities will usually be necessary. On-site monitoring may also be necessary during construction activities. Designation of areas of special interest and concern may be appropriate.