

Including GAP Codes in CPAD and CCED

In response to user requests, we have expanded our GAP data in both CPAD and CCED to quantify the acreage each holding/unit/super unit has within the GAP status categories (1, 2, 3, 4).

GAP Status Definitions

GAP status codes serve as a metric that reflects the long-term management intent (USGS 2020, Prior-McGee 1998) for the biodiversity of the land.

- GAP 1 land has a mandated management plan for biodiversity to prevent conversion of natural land cover and maintain a natural state. Natural disturbance events proceed or are mimicked in the management. Example: Wilderness Areas
- GAP 2 land has a mandated management plan for biodiversity to prevent conversion of natural land cover and maintain a natural state but management practices can degrade natural states and natural disturbance events can be suppressed. Example: National Wildlife Refuges
- GAP 3 lands are managed for multiple uses, they include protection from conversion of natural lands for the majority but can also include recreation, and extraction uses. Example: National Forests
- GAP 4 has no known mandate for biodiversity protection or conversion of natural habitat. Example: Agricultural areas, unknown areas

Data Sources

California Protected Areas Database (CPAD), current release holdings feature class

California Conservation Easement Database (CCED), current release

Protected Areas Database of the United States (PAD-US), current release):

- PAD-US_x_xCombined_Proclamation_Marine_Fee_Designation_Easement (feature class)

California Department of Parks and Recreation (CDPR), GAP by management unit (Personal Communication - Natural Resources Division)

Local agency input, GAP codes by holding (Personal Communications - Natural Resources Division)

Methods Overview

The Protected Areas Database of the United States (PAD-US) combined layer includes GAP status codes for over 98% of CPAD lands. While these codes can be subjective and can conflict based on assigning agency, they offer a path forward for understanding management intent with respect to biodiversity in nationally held lands. (Those owned by USFS, BLM, USFWS, etc.).

PAD-US GAP codes are often assigned by designation and other attributes that do not always align to parcel owners and can overlap. Integrating them into CPAD, which is owner-based, parcel-aligned and cannot have overlaps, is not straightforward. Consequently, to resolve this, for each CPAD holding, unit and super unit, we report the acreage under each GAP code. In cases where there is overlap between different PAD-US GAP codes, we allocate the overlapped acreage to the more protective GAP status code. This prevents over-counting acreage by assuming a hierarchy in GAP codes.

In addition to PAD-US GAP codes, California Department of Park and Recreation (CDPR) has assigned GAP codes to the lands they manage. If these differ from the PAD-US codes, the state level (CDPR) codes take precedence.

Processing Steps

GAP Code Data Processing (PAD-US + CDPR):

A series of geoprocessing steps were followed to produce the acreages:

- 1) Generate a PAD-US layer for each GAP code, and remove all overlaps
- 2) Using an implied hierarchy of GAP codes¹, erase any lower level GAP codes.
 - a) GAP code 1, used as is (most stringent level of protection for biodiversity)
 - b) Subtract GAP codes 1 from GAP code 2
 - c) Subtract GAP codes 1, 2 from GAP code 3
 - d) Subtract GAP code 1, 2, 3 from GAP code 4
- 3) Merge the results of #2 across all GAP codes to generate one comprehensive flat PAD-US GAP layer
- 4) Generate a CDPR layer for each GAP code, and remove all overlaps
- 5) Using an implied hierarchy of GAP codes, erase any lower level GAP codes.
 - a) GAP code 1, used as is (most stringent level of protection for biodiversity)
 - b) Subtract GAP codes 1 from GAP code 2
 - c) Subtract GAP codes 1, 2 from GAP code 3
 - d) Subtract GAP code 1, 2, 3 from GAP code 4
- 6) Merge the results of #5 across all GAP codes to generate one comprehensive flat CDPR GAP layer
- 7) Merge the PAD-US and CDPR hierarchical GAP code layers. Where they overlap, CDPR is considered authoritative, by subtracting CDPR from PADUS.
- 8) Intersect the hierarchical GAP code layer (PAD-US + CDPR) with CPAD (or CCED)
 - a) Calculate new acreage
 - b) Summarize the acreage of each intersected piece, by source (PAD-US or CDPR)
 - c) Pivot and join new GAP code acreage to CPAD, assigning a source of PAD-US, CDPR, or PAD-US + CDPR

Local Agency Data Processing:

- 1) Collect GAP assignments from select agencies, assigning GAP codes to relevant holdings²
- 2) Join any local agency GAP codes back to CPAD (this will overwrite any previously PAD-US + CDPR assigned GAP codes)

Note: In CPAD, the GAP acres are calculated at the holdings level. Unit and super unit GAP code acres are summarized totals from holdings.

¹GAP codes were not developed with the direct intention of being a hierarchy, but the numeric scale provides a meaningful way to resolve areas with multiple GAP codes assigned - selecting only the most protected.

²Local agency GAP codes collected for 2022a were a part of a pilot project to test the implementation of additional local data from agencies. Agencies selected for the pilot were typically part of a HCP and/or NCCP and had documented land management plans that could be readily crosswalked to GAP code criteria.

Example (Figure 1)

PADUS GAP codes overlap – key to “flatten” codes is to accept a hierarchy

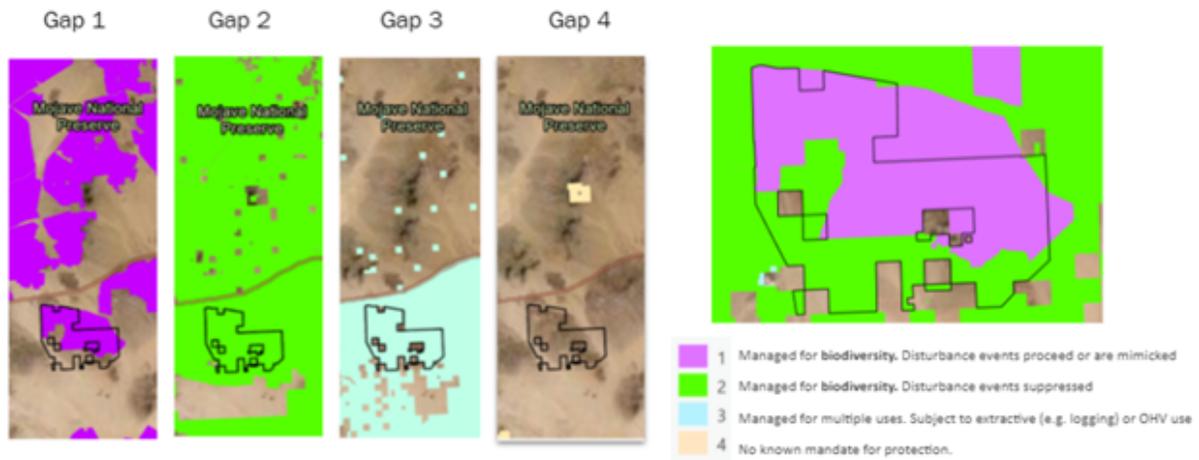


Figure 1: In PAD-US, Marble Mountains Wildlife Area is assigned multiple, and overlapping, classifications. Using the method presented here, the final assignment is partially to GAP 2 and partially to GAP 1 once one accepts a hierarchy in favor of the most stringent protection level.

Data Dictionary for GAP Fields

Field Name	Description	Data Source	Data Type	Domains
HOLDING_ID	Unique ID from CPAD Holdings	CPAD	Long	N/A
ACCESS_TYP	Access Code	CPAD	Text	Open Access, Restricted Access, Unknown Access, No Public Access
GAP1_ACRES	Acres under GAP status 1	PADUS, CDPR, Local Agency	Double	N/A
GAP2_ACRES	Acres under GAP status 2	PADUS, CDPR, Local Agency	Double	N/A
GAP3_ACRES	Acres under GAP status 3	PADUS, CDPR, Local Agency	Double	N/A
GAP4_ACRES	Acres under GAP status 4	PADUS, CDPR, Local Agency	Double	N/A
TOT_GAP_AC	Total GAP acres. Sum of GAP status 1,2,3,4 acres.	N/A	Double	N/A
GAP_SOURCE	Data source for GAP data	N/A	Text	CDPR, PADUS, PADUS + CDPR, Agency

Data Dictionary for GAP Fields: CDPR = California Department of Parks and Recreation, PADUS = Protected Areas Database of the United States; Agency = Local or authorized agency (typically landowner and/or manager)

Important Notes

The 2022a release marks an important bug fix in the GAP code assignments for CPAD and CCED lands. The two previous releases of 2021a and 2021b failed to assign approximately 5.3 million acres of lands that contained conflicting GAP codes between PAD-US and CDPR. Through the inclusion of additional data hierarchies between sources, we now assign all lands that contain GAP data in PAD-US, CDPR, or from a local agency. CCED was not impacted by this bug, but has improved using the new methods developed with the 2022a release.

GAP codes are a work in progress. Previous CPAD releases have included approximate or inferred GAP codes. These were based on key attributes about the owner/manager of the land as well as the name. As of CPAD2021a these have been retired, specifically the columns DES_TP and GAP_STS.

Because GAP acreages are an estimate, they have been rounded. Any holding less than 1 acre rounds the GAP acreage two decimal places. Holdings that are 1 acre or larger have their GAP acreage rounded down to the nearest whole numbers. The GAP acreage is displayed with 2 decimal places for consistency. Note that this rounding helps reduce the reporting of slivers and helps reduce the perception of higher accuracy beyond what is significant. The error introduced, as a result of this rounding, is less than 1% of total CPAD lands.

The new methods described above should yield more meaningful results for national lands while still allowing for more detailed local GAP codes to be incorporated as was done with state CDPR and agency assigned GAP codes.

We invite other land-owning and land-managing agencies to share their assigned GAP codes of their respective lands, as well as feedback on these new methods. These are critical in helping us shape our next steps. Please reach out to cpad@calands.org