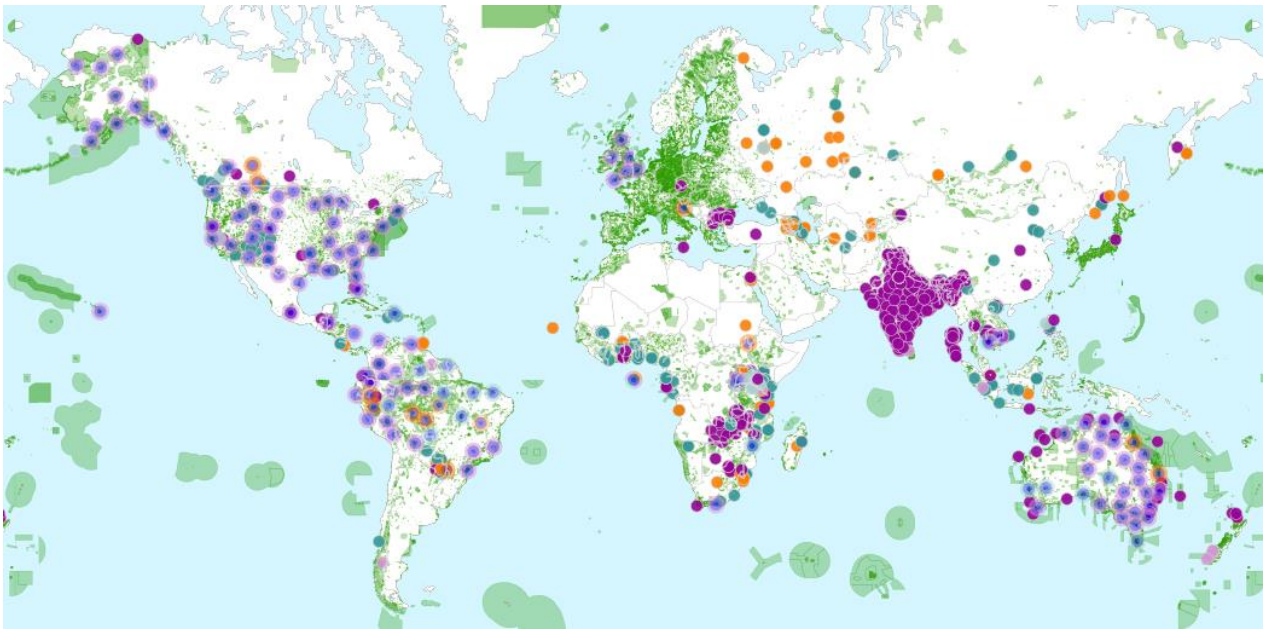
PADDDtracker Data Release Version 2.1: Technical Notes

Erik Olsson, Renee Albrecht, and Rachel Golden Kroner



May 2021

Please reference as: Olsson, E., Albrecht, R., & Golden Kroner, R.E. (2021). PADDDtracker Data Release Version 2.1: Technical Notes. Conservation International, Arlington, VA. DOI: https://doi.org/10.5281/zenodo.4749615

Contents

Overview

This document provides technical notes to accompany PADDDtracker Data Release Version 2.1. It includes field (attributes) definitions, an overview of updates made to the current data release, and information about supplementary databases that were newly added to the PADDDtracker data release: offsets to PADDD events, reversals of PADDD events, and PADDD Events affecting zoning of marine protected areas. In addition, this document includes a review of the methodology and descriptive statistics used to generate the small portion of data that have not yet been peer-reviewed but were included in this data release with high confidence in their accuracy. The information presented here supplements existing PADDDtracker technical guidance (Mascia et al. 2020).

Field (Attribute) Definitions

The primary database of PADDD events is located in the Excel (PADDDevents tab) and accompanying shapefiles (PADDD event points and polygons). The Excel sheet contains 48 fields, including:

- 27 fields retained from PADDDtracker Version 2.0
- 21 newly added fields, highlighted below in light blue (Table 1)

Of the fields from the Excel sheet, 27 fields of these are also included in the GIS attribute table, along with 4 automatically generated GIS-exclusive fields: OBJECTID, Shape, Shape_Length, Shape_Area. Two fields from PADDDtracker 2.0 were archived; see “Archived Fields” below for more details.

Table 1: PADDD Events Database Structure and Definitions

Attribute Name	Attribute Definition	Values Entered	Definitions and Clarifications
PADDDtrackerID[1,2]	Primary key	Unique identifier for each PADDD event: ISO + 8-digit alphanumeric code (e.g., AUS1T4GTH91)	ID linking the Excel sheet with the shapefiles/spatial information
GeoDataType[1,2]	Type of spatial data	Point Polygon Non-spatial	
Region[1]	Region of the world in which the PADDD event was enacted or proposed	Africa Asia Europe LAC Northern America Oceania	Follows the UN statistics division's definitions of regions: https://unstats.un.org/unsd/methodology/m49/
Country[1]	Country in which the PADDD event was enacted or proposed	Country Names	Follows the UN statistics division's definitions of countries: https://unstats.un.org/unsd/methodology/m49/
ISO3166[1]	Three letter country code	ISO codes	Follows the UN statistics division's country codes: https://unstats.un.org/unsd/methodology/m49/

WDPAID[1]	ID number assigned to the protected area by the WDPA		See https://www.protectedplanet.net/ for WDPA IDs
Location_K[1]	Is the location of the PADDD event known?	Y N	• If the location of a degazettement (and hence the location of an entire protected area) is unknown, place the point for the PADDD event on the capital city of the country • If the location of a downsize is unknown, place a point at the centroid of the protected area polygon • If the location of a downgrade is unknown, use the boundary of the entire protected area to represent the PADDD event
PACODE[1]	Unique identifier for protected area, used internally in PADDD database	Unique identifier for each PADDD event	A protected area retains the same PA code even after undergoing name changes, PADDD, etc.
primarynam[1,2]	Name of protected area at the time PADDD was enacted or proposed	Protected Area Names	Use the WDPA for the primary protected area name, if available. If not available, use the highest tier information available.
allnames[1]	All other names associated with the protected area	Protected Area Names	Includes previous names of the protected area, names of the protected area if it was changed after a PADDD event, local names, and alternative spellings for the protected area name. Compiled from WDPA, national-level databases, and other sources.
EventType[1,2]	Type of legal change affecting the protected area	**Downgrade**	**A decrease in legal restrictions on the number, magnitude, or extent of human activities within a protected area by the relevant authority. Note that an activity may be authorized but it need not be implemented or practiced.** Clarification of Terms: **Number**: additional categories or types of human activities are authorized

			Magnitude: the maximum authorized limit of activity, in amount or intensity, is increased. **Extent**: the maximum limit of area on which activities are authorized is increased. Note that multiple authorities may have jurisdiction over protected areas. For example, the above-ground resources in a protected area may be under the authority of the Environmental Ministry, while all materials under the ground are under the jurisdiction of the Ministry of Mines. In such cases, both would be considered relevant authorities capable of increasing the number, magnitude, or extent of human activities authorized in a protected area. Further operational criteria for qualification as a downgrade include: • If an activity is carried out and is not in violation of existing laws, this does not constitute a downgrade. For example, if a permit for oil exploration is issued when oil exploration is legally authorized, this does not constitute a downgrade as the authorizing legislation already exists, and no legal change has taken place. However, a national or protected area level decision to authorize an activity when it was not previously allowed constitutes a downgrade. • An increase in activities in a protected area due to lack of enforcement of rules/laws or poor management does not constitute a downgrade. • The area must still be legally recognized as a protected area by that country. If the protected area status is legally eliminated for some or all of the protected area, this may qualify as a downsize or degazettement (not a downgrade). • Devolution of authority from higher to lower levels of government (e.g., federal to state, or state to community) constitutes a downgrade only if the devolution is accompanied by a legal increase in the number, magnitude, or extent of human activities authorized in a protected area and if the land remains a part of the national protected area system. If the land is no longer a part of the protected area system (legally designated by the national government as a protected area) after transfer of authority to a private group, this is a downsize or degazettement. • Devolved authority from state actors to private ownership constitute downgrades only if the devolution of power is accompanied by a legal increase in the number, magnitude, or extent of human activities authorized in a protected area, and if the land remains a part of the national protected area system. If the land is no longer a part of the protected area system after transfer of authority to a private, community, or indigenous group, this is a downsize or degazettement. • An increase in illegal activities does not constitute a downgrade. For example, an increase in illegal quarrying does not constitute a downgrade. However, if an appropriate authoritative body newly authorizes quarrying when it had previously been illegal, this constitutes a downgrade.

			• Downgrades can be reflected in the protection status given to the protected area by the country's authority, such as a change in name and protection (e.g., from a "National Park" to an "Extractive Forest Reserve") only if the new legal framework authorizes an increase in the number, magnitude, or extent of human activities. • A downgrade event cannot be confirmed solely on the basis of differing management plans, where an earlier plan explicitly prohibits an activity, but a later management plan does not make explicit mention of the prohibition. Declarative statements acknowledging a legal increase in the number, magnitude, or extent of prohibited/authorized activities are required to confirm a downgrade. • Change in IUCN category is insufficient to confirm a downgrade event; additional supporting documentation is required to demonstrate a legal increase in the number, magnitude, or extent of human activities was authorized.
		Downsize	**A decrease in size of a protected area as a result of excision of land or sea area through a legal boundary change.** Further operational criteria for qualification as a downsize include: • If less than 100% of the protected area is legally transferred to private, community, or indigenous group ownership while losing government protection, this qualifies as a downsize. • If a protected area is degazetted, and simultaneously, a portion of the original extent is added to a new or existing protected area(s) as part of an explicitly associated legal change (e.g., at the same time, part of the same legal document, within the same legislative session), this qualifies as a downsize. For example, if Park X of 100 km^2 is legally degazetted and two smaller parks of 45 km^2 each are gazetted within the former boundaries of Park X in an explicitly associated legal change, it qualifies as a functional downsizing of 10 km^2. To determine if the two legal changes are explicitly associated, refer to supporting documentation and provide details in the supporting details (Supporting) field. • Protected area boundary changes resulting solely from the correction of cartographic, GIS, or survey errors do not qualify as downsize events.
		Degazette	**Loss of legal status for an entire protected area.** Further operational criteria for qualification as a degazettement include:

			• If a protected area is degazetted and then immediately (e.g., within the same legal document or in an explicitly associated legal change) regazetted as a protected area of less restrictive status and/or smaller size, this may be a downgrade and/or downsize. • When there is a legal transfer of a protected area to private, community, or indigenous group ownership, 100% of the protected area territory must be legally transferred while losing government protection to qualify as a degazettement. For transfers of less than 100%, see "Downsize". • When there is a legal transfer of a protected area to a private, community, or indigenous group, and the associated transfer of authority is partial or ambiguous, a degazettement is considered enacted if the protected area is removed from the relevant government authority's official lists of protected areas after the decision. • PADDDtracker records PADDD events for sites that were downgraded, downsized, or degazetted prior to the creation of the WDPA that may meet the definition of a protected area but may not have been recognized or reported to official protected area lists. In general, PADDDtracker errs on the side of inclusion of protected areas when screening for PADDD events. If there are conflicting sources of information about what to count as a protected area, use the primary or secondary documents (see "Acceptable Sources") to decide and record all sources and supporting details. • Protected areas that are no longer legally considered to be a part of a protected area system by the applicable authority (national, state, provincial, or local), but are still managed by that authority, are degazetted. For instance, an existing category of protected area is no longer considered by a country's government to be part of their protected area system, but the area is still held as federal land. • A protected area in which management ceases (or is "shut down") for war, political unrest, or budgetary constraints, does not qualify as degazetted unless the above definition and applicable criteria have also been met.
EnactedPro[1,2]	The status of a downgrade, downsize, or degazettement	Enacted	A PADDD event is considered enacted when downgrading, downsizing, or degazettement has been approved by a relevant government authority, even if the legal decision has not been implemented. For example, the law changes to newly authorize mining within protected areas. Even if mining activity has not commenced, this is considered an enacted downgrade at the time of the approval of the new law.
		Proposed	A PADDD event is proposed when a plan to downgrade, downsize, or degazette is under formal consideration by a relevant government authority. This includes but is not limited to a proposal for

			downgrading, downsizing, or degazettement under consideration of a parliament, congress, senate, or other body. Proposed PADDD does not include: • Demands to downgrade, downsize, or degazette by citizens, NGOs, or other non-government actors who do not have direct authority over protected areas. • Changes to proposed boundaries of protected areas before they are gazette (e.g., the protected area was originally proposed to be 100 km^2 and then gazette to be 85 km^2).
YearPAGaze[1]	The year in which the protected area was legally established (i.e., gazetted, inscribed)	1872 - present unk	• If a protected area was downgraded to a different classification or its name was changed (e.g., National Park to National Game Reserve), the year gazette is the original year in which the protected area was established under its original designation. • If a protected area was degazetted, then regazetted in later years, the year gazetted is the year in which the protected area was first established, and not the year in which it was re-established. • Note that the WDPA attribute for "Status Year" may differ from the original year that the protected area was gazetted. "Status Year" represents the year that the protected area's current status was assigned (e.g., as a National Park), so does not always capture the year that the protected area was first established. • PADDDtracker records the original legal gazettement or inscription date, according to the legal document, although the protected area may be implemented or definitively categorized at a later date, consistent with the WDPA status of "designated" (as distinct from proposed, or established). • PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
YearPADDD[1,2]	The year in which PADDD was enacted or proposed	1872 - present	PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
Cause[1]	The proximate (most closely associated) cause of enacted or proposed	Conservation Planning	Protected area downgrading, downsizing, or degazettement resulting from legal changes that are designed to enhance the conservation efficiency and efficacy of a class, group, or geographically distinct set of protected areas. Involves simultaneous reallocation of lands or regulatory changes to multiple protected areas. Does not include individual instances of degraded protected areas (see "Degradation"); excision of settlements (see "Rural Settlements"); or excision of protected areas that no longer serve a conservation purpose (see "Degradation"). Excludes protected area

	PADDD event (choose from list)		downgrading, downsizing, and degazettement to attain non-conservation ends or divest from protected areas no longer serving a conservation function.
		Degradation	Protected area downgrading, downsizing, or degazettement in response to the degradation of the ecological, biophysical, touristic, symbolic, or other functions of a protected area, such that the protected area no longer fulfills its intended purpose(s). Includes degradation as a result of human activities or natural processes. Does not include degradation due to settlements in protected area (see “Rural Settlements”).
		Fisheries	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale wild-capture fishing operations. Includes fishing licenses, territorial use rights, and related activities for the harvest of marine and freshwater plants and animals. Does not include aquaculture or mariculture (see “Industrial Agriculture”) or non-industrial fisheries (see “Subsistence”).
		Forestry	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale forestry operations. Includes forestry concessions, timber plantations, logging activities, timber operations, logging camps, and related forestry activities. Does not include mills and other timber processing facilities (see “Industrialization”), non-timber plantations such as oil palm (see “Industrial Agriculture”) or forest clearing for agricultural expansion (see “Industrial Agriculture” or “Subsistence”).
		Industrial Agriculture	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale (i.e., mechanized) operations for agriculture or aquaculture. Includes industrial or semi-industrial row crops, tree crops, ranching, grazing, and other forms of animal husbandry, captive breeding of wildlife, and related activities. Also includes agricultural activities where scale is unspecified. Does not include small-holder agriculture (see “Subsistence”).
		Industrialization	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale non-extractive enterprises involved in the production or delivery of goods and services. Includes factories, mills, large scale real estate development (e.g., hotels, golf courses), urban housing projects, etc. Does not include factory farms (see “Industrial Agriculture”) or sports facilities and stadiums (see “Infrastructure”).
		Infrastructure	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited structures that form the system of public works of a country, state, or region. Includes dams, roads, railways, pipes, electrical grid, power-generation facilities, telecommunications towers, transportation facilities, hospitals, schools, sports facilities, etc. Does

			not include churches or other religious institutions (see “Other”) or tourism facilities (see “Industrialization”).
		Land Claims	Protected area downgrading, downsizing, or degazettement resulting from legal restoration of full or partial rights to indigenous peoples or other local residents previously displaced or divested of *de jure* or *de facto* rights as a result of protected area establishment or management. Includes rights of access, withdrawal, management, exclusion, and alienation (Mascia and Claus 2009, Schlager and Ostrom 1992). Does not include excision of human settlements from protected areas (see “Rural Settlements”).
		Mining	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale mining operations. Includes open-pit mines, underground mines, riverbed mines, quarrying, subsurface mines, and related activities for the extraction of metals, minerals, coal, rock, stone, sand, and other non-renewable resources, excluding oil and gas. Does not include coal-seam gas (see “Oil and Gas”), peat harvesting (see “Subsistence” or “Other” depending on scale of operation) or artisanal mining (see “Subsistence”).
		Oil and Gas	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited industrial or semi-industrial scale operations for exploration or extraction of fossil fuels other than coal. Includes surveying and exploration, onshore and offshore drilling, and related activities. Does not include oil and gas refineries and other petrochemical operations (see “Industrialization”) or gas pipelines (see “Infrastructure”).
		Refugee Accommodation	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited camps for the accommodation of refugees or Internally Displaced Persons (IDPs). Does not include temporary refugee accommodation.
		Rural Settlements	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited rural human habitation. Includes settlements associated with migration to frontier regions. Does not include refugee accommodation (see “Refugee Accommodation”) or restoration of rights to displaced persons (see “Land Claims”).
		Shifting Sovereignty	Protected area downgrading, downsizing, or degazettement resulting from changes in sovereignty over/ownership of a parcel of land among nation-states, states/provinces, or local political jurisdictions. Includes changes in sovereignty as a result of shifting geopolitical boundaries, war or other armed conflicts, or related events.
		Subsistence	Protected area downgrading, downsizing, or degazettement resulting from the legal authorization of previously prohibited non-commercial or small-scale commercial, artisanal, or non-industrial (non-mechanized) extraction or production activities. These activities are often (but not always) for

			local or personal consumption. Includes small holder farming and grazing, non-timber forest product harvesting, fuel wood harvesting, hunting, fishing, artisanal mining, and related activities.
		Other	Any proximate cause of downgrading, downsizing, or degazettement that cannot be classified in any other category.
		Multiple Causes	A PADDD event may be related to more than one proximate cause as stated in the primary legal document. If so, please select "Multiple Causes" and specify the causes in the Supporting field.
		unk	Proximate cause is unknown.
Areaaffect[1]	Area affected by PADDD	Area values (km^2)	• *For enacted PADDD*: area no longer protected due to downsizing or degazettement; area of reduced restrictions due to downgrading. • *For proposed PADDD*: proposed area would no longer be protected due to downsizing or degazettement; proposed area that would have reduced restrictions due to downgrading. • When a PADDD event affects both terrestrial and marine areas, the total area affected should be recorded. If known, the area affected in the ocean and the area affected on land portions should be recorded separately in the Supporting field.
Size_Pre[1]		Area values (km^2)	• *For enacted PADDD*: size of protected area before PADDD event. • *For proposed PADDD*: size of protected area when PADDD was proposed.
Size_Post[1]		Area values (km^2)	• *For enacted PADDD*: size of protected area after PADDD event. • *For proposed PADDD*: size of protected area if PADDD proposal were enacted. • Size post-PADDD may be larger than Size pre-PADDD if the protected area was increased in size at the same time that another portion was downsized (see "Offset").
IUCN_pre[1]	IUCN category before PADDD (Dudley 2008)	Ia	Strict Nature Reserve: Strictly protected for biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.
		Ib	Wilderness Area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.

		II	National Park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
		III	Natural Monument or Feature: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.
		IV	Habitat/Species Management Area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.
		V	Protected Landscape/Seascape: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value; and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated conservation and other values.
		VI	Protected area with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims.
		unk	IUCN category unknown or not assigned.
IUCN_post[1]	IUCN category before PADDD (Dudley 2008)	Ia	Strict Nature Reserve: Strictly protected for biodiversity and also possibly geological/geomorphological features, where human visitation, use and impacts are controlled and limited to ensure protection of the conservation values.
		Ib	Wilderness Area: Usually large unmodified or slightly modified areas, retaining their natural character and influence, without permanent or significant human habitation, protected and managed to preserve their natural condition.
		II	National Park: Large natural or near-natural areas protecting large-scale ecological processes with characteristic species and ecosystems, which also have environmentally and culturally compatible spiritual, scientific, educational, recreational and visitor opportunities.
		III	Natural Monument or Feature: Areas set aside to protect a specific natural monument, which can be a landform, sea mount, marine cavern, geological feature such as a cave, or a living feature such as an ancient grove.

		IV	Habitat/Species Management Area: Areas to protect particular species or habitats, where management reflects this priority. Many will need regular, active interventions to meet the needs of particular species or habitats, but this is not a requirement of the category.
		V	Protected Landscape/Seascape: Where the interaction of people and nature over time has produced a distinct character with significant ecological, biological, cultural and scenic value; and where safeguarding the integrity of this interaction is vital to protecting and sustaining the area and its associated conservation and other values.
		VI	Protected area with sustainable use of natural resources: Areas which conserve ecosystems, together with associated cultural values and traditional natural resource management systems. Generally large, mainly in a natural condition, with a proportion under sustainable natural resource management and where low-level non-industrial natural resource use compatible with nature conservation is seen as one of the main aims.
		unk	IUCN category unknown or not assigned.
Reversal[1]	Was the PADDD event later reversed?	Y N	• *For enacted PADDD*: was the legal change later reversed? • *For proposed PADDD*: was the proposal later cancelled, withdrawn, or voted against? • Includes both partial and complete cancellations of PADDD events (see Rev_Type below). • In general, PADDDtracker considers reversals to PADDD events that have occurred at least two years after the original legal change. This rule assists in accounting, as a PADDD event may be enacted in December of year 1, with a follow-up legal change in January of year 2 which may simply refine the original ruling (e.g., an offset or correction) instead of reverse it. However, if legal and/or secondary documentation is sufficiently detailed to confirm reversals occurring <2 years after the original legal change, the information should be included. • If the reversal status is known, populate the field with “Y” or “N”. Otherwise, fill in “unk” if there is no evidence of a reversal in legal or secondary documents. Reversal status may require updating.
YR_Reversal[1]	Year PADDD event was reversed, if applicable	1872 – present NA	• *For enacted PADDD*: the year when the PADDD event was reversed. • *For proposed PADDD*: the year when the PADDD proposal was withdrawn or voted against. • Includes partial and complete reversals of a downgrade, downsize, or degazettement event • PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).

Offset[1]	Were restrictions or extent under protection increased to explicitly compensate for the PADDD event?	Y N	• *For enacted PADDD*: were protections expanded to explicitly offset PADDD (**spatial offset**)? Were restrictions increased within an existing protected area to explicitly offset PADDD (regulatory offset)? • *For proposed PADDD*: is there a formal proposal under consideration to expand protections to explicitly offset PADDD (spatial offset)? Is there a formal proposal under consideration to increase restrictions within an existing protected area to explicitly offset PADDD (regulatory offset)? • Note that the offset may not be the same size as the PADDD event (i.e., may be smaller or larger).
Systemic[1]	PADDD events that affect multiple protected areas simultaneously	Y N	• *For enacted PADDD*: was this instance of PADDD a part of a legal change that affected multiple (more than one) protected areas at the same time? • *For proposed PADDD*: is this instance of proposed PADDD part of a legal proposal that would affect multiple (more than one) protected areas at the same time if enacted? • Systemic (i.e., system-wide) PADDD events typically affect all protected areas within a certain category or type simultaneously, and usually emerge from a change to national or sub-national laws or regulations.
System_Code[1]	Unique identifier assigned to each set of systemic PADDD events	Unique identifier for each PADDD event: 8-digit alphanumeric code (e.g., 4Y57D9H2) NA	When a PADDD event affects more than one PA (a systemic change), assign a unique identification code to each of the events that are part of that systemic change.
Supporting	Detailed notes about the PADDD event		Wherever possible, use direct quotes from sources. Supporting details should include, but need not be limited to: • Direct quotes from legal and/or secondary documents describing the event and its context. • Detailed explanation of the cause(s) of the PADDD event. • Notes on reversals, offsets, or systemic changes associated with the PADDD event. Report all available information. In cases of conflicting accounts of the same event, report all accounts.

			Example (that would be classified as a downsize): • Rio Mequéns State Sustainable Yield Forest was degazetted in 2010, as part of an agreement between the Governor of Rondônia and the President which changed the size and status of multiple protected areas in the State of Rondônia, in order to develop the Jirau Hydroelectric Complex in the region (Bernard et al. 2014, Imazon 2010). During the degazettement, however, a portion (508 km2) of the reserve was incorporated into Parque Estadual Corumbiara. See following explanation from the current PE Corumbiara website: http://uc.socioambiental.org/en/uc/2210
Sources	All relevant sources that provide information about the PADDD event		This should include all sources used in the Supporting field, as well as other relevant sources that may not have been directly used in Supporting. All citations should be in MLA style. Examples: • Bernard, E., Penna, L., & Araújo, E. (2014). Downgrading, Downsizing, Degazettement, and Reclassification of Protected Areas in Brazil. Conservation Biology. https://conbio.onlinelibrary.wiley.com/doi/abs/10.1111/cobi.12298 • Estado de Rondônia. 2010. Diario Oficial no. 1520. Jul 20. Retrieved from http://diof.ro.gov.br/doe/doe_30_06_10.pdf • Instituto Socioambiental. 2010. O estica e encolhe das Unidades de Conservação de Rondônia. Jul 28. Retrieved from http://site-antigo.socioambiental.org/nsa/detalhe?id=3135 • Instituto Socioambiental. 2010. Termina a novela da hidrelétrica de Jirau e a permute de UCs em Rondônia. July 20. Retrieved from http://www.socioambiental.org/nsa/detalhe?id=3130 • Globo Rural. 2011. Unidades de Conservação desaparecem em RO. April 11. Retrieved from http://g1.globo.com/economia/agronegocios/noticia/2011/04/unidades-de-conservacao-da-floresta-amazonica-desaparecem-em-ro.html • Veríssimo, A., Rolla, A., Vedoveto, M., & Futada, S. de M. (2011). áreas Protegidas na Amazônia Brasileira: avanços e desafios (p. 87). Belém/São Paulo: Imazon e ISA. Retrieved from http://www.imazon.org.br/publicacoes/livros/areas-protegidas-na-amazonia-brasileira-avancos-e/6-pressapso-sobre-as-areas-protegidas-na-amazania

Map_Details	Supporting details for map of PADDD event		Sufficient detail to understand how the map was created. Was it derived from an existing shapefile, created using coordinates, or digitized from a paper map? Was it estimated using a description in legislation? Was it placed on the capital city? (e.g., in the case of an unknown location in a degazette)? If the map was digitized from a paper map, please report on the quality of the map and the accuracy of the digitization. • What reference points did the map include (e.g., coordinates, political boundaries, coastline, rivers, roads, cities, etc.)? Was the map hand-drawn or computer generated? Provide other supporting descriptions about the map's quality. • What was the scale of the map? • If available, what was the projection of the map? • What was the Root Mean Squared Error (RMSE) reported and the projecting method during the georeferencing process? (Note that the ideal RMSE value is zero and values should not exceed 1.) • When tracing the map, how many vertices did tracing require?
Map_Source	Map source information		All sources used in the map supporting details (Map_Details) field as well as other relevant sources which may not have been directly used in Map_Details. All citations should be in MLA Style.
Notes	Additional notes or sources that would benefit the entry		
Date_Add	Date added to database		
Last_Update	Date of most recent changes (if any since last version of data release)		

AddedBy	Name of person who added the data		
isLatestVe	Whether data (spatial extent, attributes, both) up to date	Y N	
Data_Status	Whether data included in previous data release or newly added	New data Updated No change	Events classified as Updated or No change were included in the previous data release.
Peer_Reviewed	Data included in a peer-reviewed study	Y N	
Study_Link	Recent study or studies in which a PADDD event was included	Full citation(s), including DOI and url (if available)	Includes peer-reviewed papers, white papers, and/or data reports[3]
Off_Type	Offset type	Spatial Regulatory Both NA	• A spatial offset is the expansion of the spatial extent of protection to explicitly compensate for PADDD. Lands may be added to the protected area that was downgraded or downsized, added to a separate protected area, or designated as a new protected area. • A regulatory offset is the instatement of additional restrictions within an existing protected area to explicitly compensate for PADDD. These may be restrictions enacted within the protected area that was downgraded or downsized or within another protected area. • Offsets may include both spatial and regulatory components. • Note that the offset's compensatory area or restrictions may not match those of the PADDD event.

Off_Area	Offset area	Area values (km^2)	Spatial extent of lands added to protection (spatial offset) or for which restrictions are increased (regulatory offset). Note that the offset area may not be the same spatial extent as the PADDD event.
Off_Details	Detailed notes about the offset		Wherever possible, use direct quotes from sources. Supporting details should include but need not be limited to detailed explanation of the cause of the PADDD offset and any context that provides relevant insights. Report all available information (in cases of conflicting accounts of the same event, report all accounts).
Off_Source	Sources/supporting documentation that provide information about the offset		Includes all sources used in Off_Details as well as other relevant sources that may not have been directly used in Off_Details. All citations should be in MLA Style. This may be the same source provided in the Supporting field.
Rev_Type	Type of reversal	Full Partial NA	For a downsize or degazette, a full reversal occurs if the original area that was removed from the protected area is completely re-protected. For a downgrade, a full reversal occurs if the original restriction was completely reinstated. All other reversals are partial.
Rev_Area	Reversal area	Area values (km^2)	• *For enacted PADDD*: the size of the parcel of land for which PADDD was reversed. • *For proposed PADDD*: the size of the parcel of land in which a proposed PADDD event was cancelled, withdrawn, or voted against. • Note that the reversal area may not be the same size as the PADDD event.
Rev_Details	Detailed notes about the PADDD reversal		Wherever possible, use direct quotes from sources. Supporting details should include but need not be limited to detailed explanations of the cause of the PADDD reversal and any context that provides relevant insights. Report all available information (in cases of conflicting accounts of the same event, report all accounts).
Rev_Source	Sources/supporting documentation that provide information about the reversal		Includes all sources used in Rev_Details as well as other relevant sources which may not have been directly used in Rev_Details. All citations should be in MLA Style.

Legal_Type	The legal process by which the PADDD event happened. For instance, was it enacted or proposed as legislation, an agency regulation, or presidential decree?		Legal types will vary by country, but may include, among others: • Legislation • Provisional measure • Bill • Supreme or Ministerial Decree • Presidential proclamation • Judicial decision
Marine[1]	Code noting whether the PADDD event was terrestrial, coastal, or marine	0 = terrestrial 1 = coastal (both marine and terrestrial) 2 = marine	Using the World Vector Shoreline, 3rd Edition (Wessel and Smith 1996) base map layer: if 10% or less of the area of a PADDD event overlaps with the marine portion of the base layer, the PADDD event should be assigned a value of "0" for "terrestrial". If the overlap is greater than 10% and less than 90%, the PADDD event should be assigned a value of "1" for "coastal". If the overlap is 90% or more, the PADDD event should be assigned a value of "2" for "marine". Follows approach taken by Protected Planet (*UNEP-WCMC* 2019).
Marine_ZID[1]	Primary key – unique identifier assigned to each applicable marine PADDD event zone	Unique identifier for each PADDD event: ISO + 4-digit alphanumeric code (e.g., AUS1T4G) NA	Zoning changes with the same event ID are associated with the same PADDD event in the PADDDtracker database.

[1]Indicates field is used in GIS attribute table

[2]Indicates field is required (no null values permitted)

[3]All data in the PADDDtracker 2.1 data release has been peer-reviewed except for new PADDD events in Brazil and the United States included with high confidence. See section below ("Overview of non-peer-reviewed data")

If a value is unknown for any field in which a null value is permitted, it is attributed as <unk>

Archived Fields

Two fields from the PADDDtracker 2.0 data release were archived for the PADDDtracker 2.1 data release, as they are out-of-date identifiers. Fields and attribute values are retained in PADDDtracker archives and may be available upon request:

- PADDDIDOld
- GID_String

Updates to Spatial Data from prior data release

Relevant files:

- PADDDtracker_DataReleaseV2_1_2021_Pts.shp
- PADDDtracker_DataReleaseV2_1_2021_Poly.shp

Table 2: Updated and newly added PADDD event records

	Updated PADDD Event Records		Added PADDD Event Records	
Countries	Points	Polygons	Points	Polygons
Australia	8	34	0	18
Bhutan	0	4	3	24
Brazil	24	121	75	40
Cambodia	4	18	0	0
Costa Rica	0	1	0	0
Croatia	0	1	0	0
Dominican Republic	0	1	0	0
Gabon	1	0	0	0
Jamaica	0	1	0	0
Malaysia*	48	55	18	0
Palau	0	0	0	1
Uganda	3	0	0	0
United Kingdom	0	3	0	0
South Africa	0	1	17	102
United States	2	0	11	229
Total	42	185	106	414
Total (with Malaysia)	90	240	124	414

*Malaysian PADDD events data are excluded from the public release of this dataset due to restricted permissions. Moreover, 38 are classified as non-spatial: 20 existing events, 18 new events.

Removed PADDD events (archived):

- Bhutan = 1 (confirmed to not meet PADDD definitions; (Dorji et al., 2019))
- Brazil = 2 (duplicate events)

- South Africa = 4 (confirmed to not meet PADDD definitions (Vos et al., 2019))

PADDD Events with Reversals Database

Relevant files:

- PADDDtracker_DataRelease_V2_1_2021_Pts_Reversals.shp
- PADDDtracker_DataRelease_V2_1_2021_Poly_Reversals.shp

A. Introduction

If a protected area (PA) has experienced a downgrade, downsize, or degazettement (PADDD) event, protections may be restored through a PADDD event ***reversal***. A PADDD event reversal may be **full** or **partial**:

(1) **full** for a downsize or degazette if spatial protections are completely restored;

(2) **full** for a downgrade if regulatory protections are completely reinstated;

(3) **partial** in all other cases.

If a PADDD event has been enacted, a PADDD event reversal is a ratified (i.e. enacted) legal change. If a PADDD event has been proposed, a PADDD event reversal is either the countering of a proposed PADDD event through a negative vote, or the expiration of a PADDD event (e.g. the proposal is not voted upon within the legislative session and "dies"). Reversals may have implications for maintaining or expanding biodiversity conservation objectives across landscapes. For example, Golden Kroner et al., (2016) found that in Yosemite National Park, on lands in which PADDD events were later fully or partially reversed, ecological connectivity was higher than on lands in which PADDD events were not reversed. Further research is needed to determine the range of ecological and socioeconomic implications of reversals to PADDD events. This database supplements the primary PADDDtracker Version 2.1 database to inform multiscale spatiotemporal analyses and better assess the impacts of reversals.

This section describes features unique to the PADDDtracker Version 2.1 Reversals database (file names: PADDDtracker_DataRelease_V2_1_2021_Pts_Reversals.shp; PADDDtracker_DataRelease_V2_1_2021_Poly_ Reversals.shp), including its description, relationship to other databases, accuracy, update frequency, attribute table composition, and minimum attributes. PADDD reversal information is new to this data release, and is supplementary to the primary PADDD events data. Spatial information is not comprehensive.

B. Database Structure

1. Database Description

This database is used to display data on reversals to PADDD events and associated attributes. It is supplementary to the PADDDtracker Version 2.1 database. The data enables an additional layer of spatial analysis for PADDD events. Spatial data for reversals are collected through the same data standards as for PADDD events. Spatial data are only available for reversals which can be confirmed and for which spatial data (e.g. polygons) already exist; hence, some PADDD events with reversals may currently lack reversal points or polygons in the PADDDtracker Reversals database.

2. Relationship to Other Databases

This database is dependent on the PADDD 2.1 database. It only contains records created when specific attribute values are input in the primary database (if Reversal = Y).

3. Accuracy

As with other PADDD spatial data, it uses a WGS_1984_Web_Mercator_Auxiliary_Sphere projected coordinate system with a Mercator_Auxiliary_Sphere projection and an XY Tolerance set at 0.001 meter.

4. Update Frequency

This database is updated on an as needed basis, concurrently with future data releases.

5. Minimum Attributes

The minimum required fields to identify a reversal area include: (1) **PADDDtrackerID**; (2) **GeoDataType** (point or polygon); (3) **primarynam** (the PA name); (4) **EventType** (downgrade, downsize, or degazettement); (5) **EventPro** (whether a PADDD event is enacted or proposed); and (6) **YearPADDD** (the year in which a PADDD event occurred). All of these attributes are required to enter a new record. Null values are permitted for other fields if necessary (using <unk>). Each time a record is generated, this automatically populates the PADDDReversalID*, a 6-digit alphanumeric unique identifier internal to the PADDD Reversals database. For further information, please consult the data standard attribute definitions below (Table 2), or the PADDD Technical Guide (Mascia et al. 2020).

6. Offsets and Reversals

In the rare scenario that each PADDD decision uses an area from a previous PADDD event to offset a new PADDD event, this may count as a reversal of the previous PADDD event.

Table 3: PADDD Events with Reversals Database (tab in Excel: PADDDreversals)

Attribute Name	Attribute Definition	Values Entered	Definitions and Clarifications
PADDDtrackerID[1]	PADDDtracker ID. Unique identifier for each PADDD event	PADDD event hexadecimal code (same as PADDD 2.1 dataset)	This field is used to link the Excel sheet with the shapefiles/spatial information
GeoDataType[1]	Type of spatial data	Point Polygon	
Region	Region of the world in which the PADDD event was enacted or proposed	Africa Asia Europe LAC Northern America Oceania	
Country	Country in which the PADDD event was enacted or proposed	Country Names	
ISO3166	Three letter country code	ISO codes	
WDPAID	ID number assigned to the protected area by the WDPA	ID number provided by WDPA website	
primarynam[1]	Name of the protected area at the time	Protected Area Names	
allnames	All other names associated with the protected area	Protected Area Names	
EventType[1]	Type of legal change affecting the protected area	Downgrade Downsize Degazette	
EnactedPro[1]	The status of a downgrade, downsize, or degazettement	Enacted Proposed	
YearPAGaze[1]	The year in which the protected area was legally established (i.e., gazetted, inscribed)	1872 - present	• If a protected area was downgraded to a different classification or its name was changed (e.g., National Park to National Game Reserve), the year gazette is the original year in which the protected area was established under its original designation. • If a protected area was degazetted, then regazetted in later years, the year gazetted is the year in which the protected area was first established, and not the year in which it was re-established. • Note that the WDPA attribute for “Status Year” may differ from the original year that the protected area was gazetted. “Status Year” represents the year that the protected area’s

			current status was assigned (e.g., as a National Park), so does not always capture the year that the protected area was first established. • PADDDtracker records the original legal gazettement or inscription date, according to the legal document, although the protected area may be implemented or definitively categorized at a later date, consistent with the WDPA status of "designated" (as distinct from proposed, or established, *UNEP-WCMC* 2019). • PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
YearPADDD[1]	The year in which PADDD was enacted or proposed	1872 - present	PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
Areaaffect	Area affected by PADDD	Area values (km^2)	• *For enacted PADDD*: area no longer protected due to downsizing or degazettement; area of reduced restrictions due to downgrading. • *For proposed PADDD*: proposed area would no longer be protected due to downsizing or degazettement; proposed area that would have reduced restrictions due to downgrading. • When a PADDD event affects both terrestrial and marine areas, the total area affected should be recorded. If known, the area affected in the ocean and the area affected on land portions should be recorded separately in the Supporting field.
Size_Pre	Size of protected area before PADDD	Area values (km^2)	
Size_Post	Size of protected area after PADDD	Area values (km^2)	
Date_Add[2]	Date added to database	Day/Month/Year	
Location_Rev_K	Is the location of the reversal area known?	Y N	
Rev_Type	Type of reversal	Full Partial NA	For a downsize or degazette, a full reversal occurs if the original area that was removed from the PA is completely re-protected. For a downgrade, a full reversal occurs if the original restriction was completely reinstated. All other reversals are partial
Rev_Area	Reversal area	Area values (km^2)	
Rev_Details[2]	Detailed notes about the reversal		
Rev _Source[2]	Sources or supporting documentation providing information about the reversal		
PADDDRevID[1]	PADDD Reversal ID. Unique identifier for each offset area	6-digit alphanumeric code, i.e., Q763H7	This field identifies individual reversal areas, which is useful to differentiate an event area from a reversal area if the reversal area is partial

[1]Indicates field is required (no null values permitted)

[2]Indicates field is excluded from the corresponding spatial dataset

If a value is unknown for any field in which a null value is permitted, attribute as <unk>

Table 4: PADDD Events with Reversals, spatial records updated and added (files: PADDDtracker_DataReleaseV2_1_2021_Pts_Reversals.shp; PADDDtracker_DataReleaseV2_1_2021_Poly_Reversals.shp)

	Updated PADDD Event Records, with Reversals		**Added PADDD Event Records, with Reversals**	
Country	**Points**	**Polygons**	**Points**	**Polygons**
Bhutan	0	5	0	0
Brazil	0	15	0	1
Colombia	0	250	0	0
Ecuador	0	2	0	0
Peru	4	30	0	0
Total	4	302	0	1

PADDD Events with Offsets Database

A. Introduction

When an agency enacts or proposes a protected area (PA) downgrading, downsizing, or degazettement (PADDD) event, the decision may be accompanied by one or more ***offsets.*** An **offset to a PADDD event is a compensatory expansion or upgrade of protections that is explicitly associated with (e.g. occurs at the same time and/or in the same legal document and/or otherwise connected) the PADDD event.**

An offset to a PADDD event may be **spatial** (an increase in area under protection, or expansion), **regulatory** (an increase in restrictions, or upgrade), or **both** spatial and regulatory. A PADDD event offset may apply to: (1) upgrade or expand a PA experiencing the PADDD event; (2) upgrade or expand one or more other existing PAs; (3) create one or more new PAs; or (4) some combination of 1, 2, and/or 3. If a PADDD event is accompanied by a spatial offset that is larger than the PADDD event (e.g. a downsize), the size of the PA following PADDD may be larger than the PA before PADDD. If a PADDD decision explicitly includes an offset, its spatial extent is included in the PADDDtracker Offsets database. The offset should be included in this database if enough information is available to meet the minimum attributes (see below for details).

Among known PADDD events to date, offsets to PADDD events are relatively rare; approximately 3.8% of enacted and 2.7% of proposed events include some form of compensatory protection (Golden Kroner et al. 2019).

This section describes features unique to the **PADDDtracker Version 2.1 Offsets database (**file name: PADDDtracker_DataRelease_V2_1_2021_Poly_Offsets.shp**)**, including its description, relationship to other databases, accuracy, update frequency, details regarding how to calculate the offset area affected, attribute table composition (fields and definitions), and minimum attributes. PADDD offset information is new to this data release and is supplementary to the primary PADDD events data. Spatial information is not comprehensive

B. Database Structure

1. Database Description

This database is used to display data on offsets to PADDD events and associated attributes. It is supplementary to the PADDDtracker Version 2.1 database. The data enables an additional layer of geospatial analysis for PADDD events. Spatial data for offsets is collected through the same data standards as for PADDD events. Spatial data is only available for offsets which can be confirmed and for which spatial data (e.g. polygons) already exists; hence, some PADDD events with offsets may currently lack offset polygons in the PADDDtracker Offsets database.

2. Relationship to Other Databases

This database is dependent on the PADDDtracker Version 2.1 database. It only contains records for PADDD events with confirmed offsets (Offset = Y).

3. Accuracy

As with other PADDD spatial data, it uses a WGS_1984_Web_Mercator_Auxiliary_Sphere projected coordinate system with a Mercator_Auxiliary_Sphere projection and an XY Tolerance set at 0.001 meter.

4. Update Frequency

This database is updated on an as needed basis, concurrently with future data releases.

5. Minimum Attributes

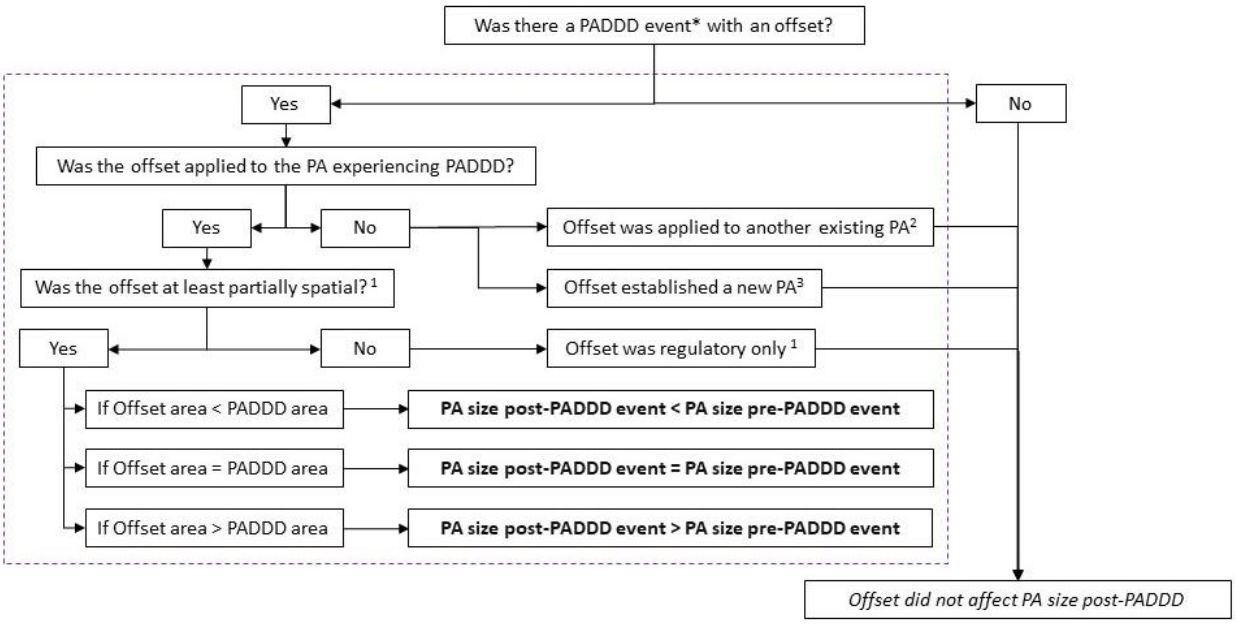
The minimum required fields to identify an offset area include: (1) **PADDDtrackerID**; (2) **GeoDataType** (point or polygon); (3) **primarynam** (the PA name); (4) **EventType** (downgrade, downsize, or degazettement); (5) **EnactedPro** (whether a PADDD event is enacted or proposed); and (6) **YearPADDD** (the year in which a PADDD event occurred). All of these attributes are required to enter a new record. Null values are permitted for other fields if necessary (using <unk>). Each time a record is generated, this automatically populates the PADDDOffsetID*, a 6-digit alphanumeric unique identifier internal to the PADDDtracker Offsets database. For further information, please consult the data standard attribute definitions below (Table 5), or the PADDD Technical Guide (Mascia et al. 2020).

6. Offsets and Reversals

In the rare scenario that each PADDD decision uses an area from a previous PADDD event to offset a new PADDD event, this may count as a reversal of the previous PADDD event.

7. Calculating Area Affected by PADDD and PADDD Offsets

The PADDD event area value (**Areaaffect**) excludes offset area values; offsets are calculated separately. Notably, the PA spatial extent after PADDD (**Size_Post**) is affected by both PADDD and PADDD offsets, if applicable. To operationalize accounting for offsets for Size_Post attribute values in the PADDD database, we applied the following decision tree:



Notes:
*A PADDD event is *enacted when downgrading, downsizing, or degazettement* has been legally executed by a relevant government authority. A PADDD event is considered enacted when the downgrade, downsize, or degazettement has been authorized (e.g., legislation signed, regulation promulgated), even if the legal decision has not been implemented. A PADDD event is *proposed when a plan to downgrade, downsize, or degazette* is under formal consideration by a relevant government authority.
**While only an offset applied to the PA experiencing a PADDD event that is fully or partially spatial[1] affects the PA size post-PADDD event, all offset types[2,3] are included in the PADDD Events with Offsets Database.

Figure 1: Decision tree to calculate Size_Post Values when a PADDD event is offset

An offset area applies toward the net change of PA only if part of or an entire offset applies directly to the PA experiencing PADDD. Depending on whether an offset is spatial or regulatory (or both), this could yield negative, positive, or no change to Size_Post value as compared to Size_Pre value, as shown in these proposed downsize scenarios:

- Example A: If PA *x* is 100 km^2 and a proposed downsize would remove 20 km^2, but would also offset that downsize by simultaneously expanding the PA by 15 km^2 = a **net loss** of 5 km^2. (where *x* = 100: *x* - 20 + 15 = 95). For values in the database: Size_Pre = 100; Areaaffect = 20; Off_area = 15; Size_Post = 95.
- Example B: If PA y is 100 km^2 and proposed downsize would remove 20 km^2 but would also offset that downsize by expanding the PA by 20 km^2 of area *z* nearby = **no net change**. (where *y* = 100: *y* - 20 + 20 = 100). For values in the database: Size_Pre = 100; Areaaffect = 20; Off_area = 20; Size_Post = 100.
- Example C: If PA *z* is 100 km^2 and proposed downsize would remove 20 km^2 but would also offset that downsize by simultaneously expanding the PA by 30 km^2 = a **net gain** of 10 km^2. (where *x* = 100: *x* - 20 + 30 = 110). For values in the database: Size_Pre = 100; Areaaffect = 20; Off_area = 30; Size_Post = 110.

Table 5: PADDD Events with Offsets Database Structure and Definitions (file: PADDDtracker_DataRelease_V2_1_2021_Poly_Offsets.shp)

Attribute Name	Attribute Definition	Values Entered	Definitions and Clarifications
PADDDtrackerID[1]	PADDDtracker ID. Unique identifier for each PADDD event	PADDD event hexadecimal code (same as PADDD 2.1 dataset)	This field is used to link the Excel sheet with the shapefiles/spatial information
GeoDataType[1]	Type of spatial data	Point Polygon Non-spatial	
Region	Region of the world in which the PADDD event was enacted or proposed	Africa Asia Europe LAC Northern America Oceania	
Country	Country in which the PADDD event was enacted or proposed	Country Names	
ISO3166	Three letter country code	ISO codes	
WDPAID	ID number assigned to the protected area by the WDPA		
primarynam[1]	Name of the protected area at the time	Protected Area Names	
allnames	All other names associated with the protected area	Protected Area Names	
EventType[1]	Type of legal change affecting the protected area	Downgrade Downsize Degazette	
EnactedPro[1]	The status of a downgrade, downsize, or degazettement	Enacted Proposed	
YearPAGaze[1]	The year in which the protected area was legally established (i.e., gazetted, inscribed)	1872 - present	• If a protected area was downgraded to a different classification or its name was changed (e.g., National Park to National Game Reserve), the year gazette is the original year in which the protected area was established under its original designation. • If a protected area was degazetted, then regazetted in later years, the year gazetted is the year in which the protected area was first established, and not the year in which it was re-established.

			• Note that the WDPA attribute for “Status Year” may differ from the original year that the protected area was gazetted. “Status Year” represents the year that the protected area’s current status was assigned (e.g., as a National Park), so does not always capture the year that the protected area was first established. • PADDDtracker records the original legal gazettement or inscription date, according to the legal document, although the protected area may be implemented or definitively categorized at a later date, consistent with the WDPA status of “designated” (as distinct from proposed, or established, *UNEP-WCMC* 2019). • PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
YearPADDD[1]	The year in which PADDD was enacted or proposed	1872 - present	PADDDtracker begins collecting data in 1872 to correspond with the establishment of the first modern-era national park (Yellowstone).
Areaaffect	Area affected by PADDD	Area values (km^2)	• *For enacted PADDD*: area no longer protected due to downsizing or degazettement; area of reduced restrictions due to downgrading. • *For proposed PADDD*: proposed area would no longer be protected due to downsizing or degazettement; proposed area that would have reduced restrictions due to downgrading. • When a PADDD event affects both terrestrial and marine areas, the total area affected should be recorded. If known, the area affected in the ocean and the area affected on land portions should be recorded separately in the Supporting field.
Size_Pre	Size of protected area before PADDD	Area values (km^2)	
Size_Post	Size of protected area after PADDD	Area values (km^2)	
Date_Add[2]	Date added to database	Day/Month/Year	
Location_Off_K	Is the location of the offset area known?	Y N	
Off_Area	Offset area	Area values (km^2)	
Off_Details[2]	Detailed notes about the offset		
Off_Source[2]	Sources or supporting documentation providing information about the offset		
PADDDOffID[1]	PADDD Offset ID. Unique identifier for each offset area	6-digit alphanumeric code, i.e., Q763H7	This field identifies individual offset areas, especially for events with two or more offset areas

[1]Indicates field is required (no null values permitted)
[2]Indicates field is excluded from the corresponding spatial dataset
If a value is unknown for any field in which a null value is permitted, attribute as <unk>

Table 6: PADDD Events with Offsets, spatial records updated and added (File: PADDDtracker_DataReleaseV2_1_2021_Poly_Offsets.shp)

	Updated PADDD Event Records, with Offsets		**Added PADDD Event Records, with Offsets**	
Country	**Points**	**Polygons**	**Points**	**Polygons**
Australia	0	10	0	10
Brazil	0	4	0	1
Ecuador	0	2	0	0
French Guiana (France)	0	2	0	0
Peru	0	3	0	0
Palau	0	0	0	1
United States	0	0	0	2
Venezuela	0	3	0	0
Total	0	24	0	14

PADDD Events with MPA Zones Database

A. Introduction

This guidance was created to accompany the MPAzones tab as part of the PADDDtracker Data Release Version 2.1. For marine protected areas, some PADDD events (e.g. downgrades) are caused by changes to zoning (for instance, a change from a zone that prohibits commercial fishing to a zone that does not prohibit commercial fishing).

The zone data layer and this accompanying guidance were created to enable the tracking of the multiple zoning changes that are part of a single PADDD event, where applicable. For further context: in the PADDD database (PADDDevents), the unit of analysis (each row of the database) is one protected area, while in the MPA Zones Database (MPAzones) the unit of analysis is one zone whose status has changed. MPA zones information is new to this data release, and is supplementary to the primary PADDD events data.

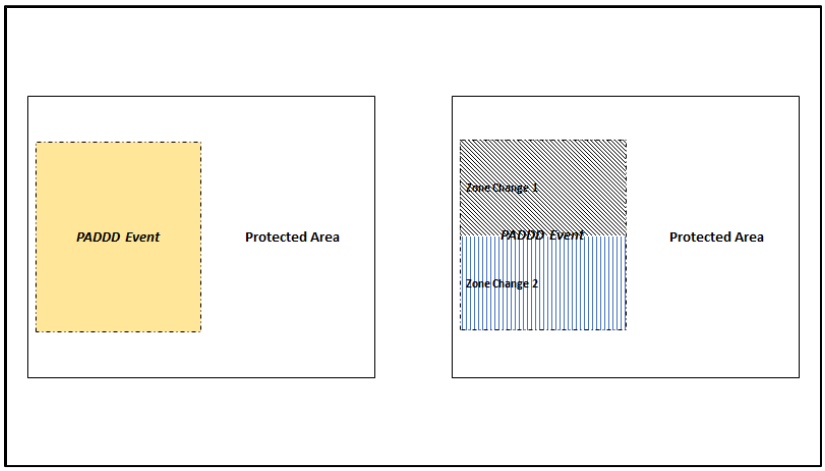


Figure 2: General figure illustrating zoning change within a PADDD event

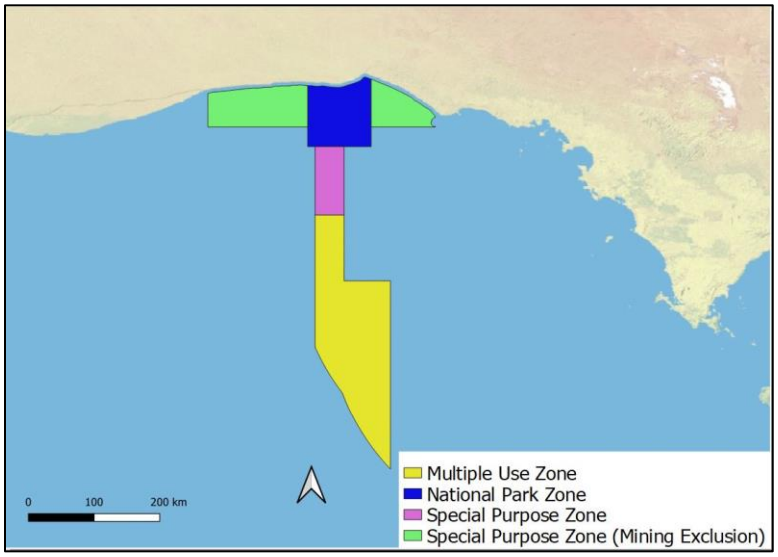


Figure 3. A marine protected area with zones indicated by various colors. In the PADDD database, the marine protected area is the unit of analysis. In the MPA Zones Database, the areas shown in various colors (zones) are the unit of analysis.

The zone layer provides more detailed information on the extent to which and how each zone has changed. Please note that the zone names (zone_pre, zone_post fields, Table 7) were created for the Australian marine protected area context; the name values can be expanded to accommodate names in other countries. Please see Albrecht et al. 2021 for more information.

Table 7 below describes additional attribute fields used in the MPA zones database. Except for those noted, all other attribute fields and values (e.g., Cause, IUCN_pre, IUCN_post, etc.) in the MPA zones database match the corresponding PADDD event in the PADDD database. The “Notes” column in the MPA zones database was used to capture proximate causes at the level of each zoning change.

Table 7: Additional attribute fields for MPA zones database

Attribute Name	Attribute Definition	Values Entered	Definitions and Clarifications	Notes on how/why this field was devised
offset_paddd	Indicates whether the zoning change constitutes a downgrade, offset, or downgrade with an offset	paddd	Zoning change constitutes a downgrade	Allows data to be filtered by zoning changes that constitute downgrades, offsets, or downgrades with offsets. Allows areas for these zoning changes to be summed (see "area_affect" below)
		offset	Zoning change constitutes an offset	
		both	Zoning change simultaneously removes restrictions for some activities and increases restrictions for other activities within the same zone (downgrade with an offset).	
Marine_ZID	Marine _ZID - unique number assigned to each PADDD event	ISO + 4-digit alphanumeric code (e.g., AUS1T4G) NA	Zoning changes with the same Marine_ZID are associated with the same PADDD event in the PADDD database	Allows zoning changes to be grouped together by PADDD event, (e.g., uses same logic as "system_code")
zone_pre	Indicates zone name before PADDD event.	cpz	Conservation Park Zone	Allows data to be filtered by zoning change. Zone names listed here are specific to Australian MPAs; names can be tailored to each context as appropriate.
		guz_carp	General Use Zone (Carpentaria)	
		guz	General Use Zone	
		hpz_coral_sea	Habitat Protection Zone (Coral Sea)	
		hpz_seamounts	Habitat Protection Zone (Seamounts)	
		hpz	Habitat Protection Zone	
		muz	Multiple Use Zone	
		npz	National Park Zone	
		spz_oge	Special Purpose Zone (Oil and Gas Exclusion)	
		spz_ports	Special Purpose Zone (Ports)	
		spz	Special Purpose Zone	
		sz	Sanctuary Zone	
zone_post	Indicates zone name post PADDD event	hpz	Habitat Protection Zone	Allows data to be filtered by zoning change. Zone names listed here are specific to Australian MPAs; names can be tailored to each context as appropriate.
		hpz_reefs	Habitat Protection Zone (Reefs)	
		muz	Multiple Use Zone	

		npz	National Park Zone	
		spz	Special Purpose Zone	
		spz_me	Special Purpose Zone (Mining Exclusion)	
		spz_norfolk	Special Purpose Zone (Norfolk)	
		spz_trawl	Special Purpose Zone (Trawl)	
		other	*Other zone change naming conventions possible (especially with future efforts in other countries)*	
Location_Zone_K	Is the location of the MPA zone area known?	Y N		
Zone_UID	Unique identifier for each marine zone	6-digit alphanumeric code (e.g., FY86TV) NA		

Table 8: Attribute recorded differently for MPAzones database (relative to PADDDevents database)

Attribute Name	Attribute Definition		Definitions and clarifications
Areaaffect	**Area affected by zoning change**	Area values (km^2)	Area in which zoning change: - decreased restrictions (see “paddd” in “offset_paddd”), OR - increased restrictions (see “offset” in “offset_paddd”), OR - both increased and decreased restrictions simultaneously (see “both” in “offset_paddd”) - - - Note: Area affected by PADDD (“Areaaffect”) and offset area (“Off_Area”) values in PADDD database are determined by summing the value(s) in this column as appropriate for a given PADDD event. In PADDD database: “Areaaffect” = sum of all values in this column in which “offset_paddd” = “paddd” and/or “both” for zoning changes with the same Marine_ZID “Off_area” = sum of all values in this column in which “offset_paddd” = “offset” and/or “both” for zoning changes with the same Marine_ZID

Table 9: MPA Zone Changes within PADDD Event Records (with spatial data only; file name: PADDDtracker_DataReleaseV2_1_2021_Poly_MPAZones.shp)

Country	Added PADDD Event Records, with MPA Zones
Australia	111
Total	111

Demonstrating This Guidance for “Example Marine Park” (6 km2)

Note: Zone descriptions below have been simplified for the purpose of demonstration. For a full description of which activities are allowed in each zone, see Albrecht et al. 2021 Supplementary materials, Table S2C.

Zone Descriptions

- Sanctuary Zone: Allows authorized scientific research and monitoring only.
- National Park Zone: Allows non-extractive activities (e.g., boating).
- Habitat protection Zone: Allows some extractive activities (e.g., certain commercial fishing activities).
- Special Purpose Zone: Allows specific activities (e.g., demersal trawling).
- Multiple Use Zone: Allows most extractive activities (e.g., most commercial fishing activities, mining).

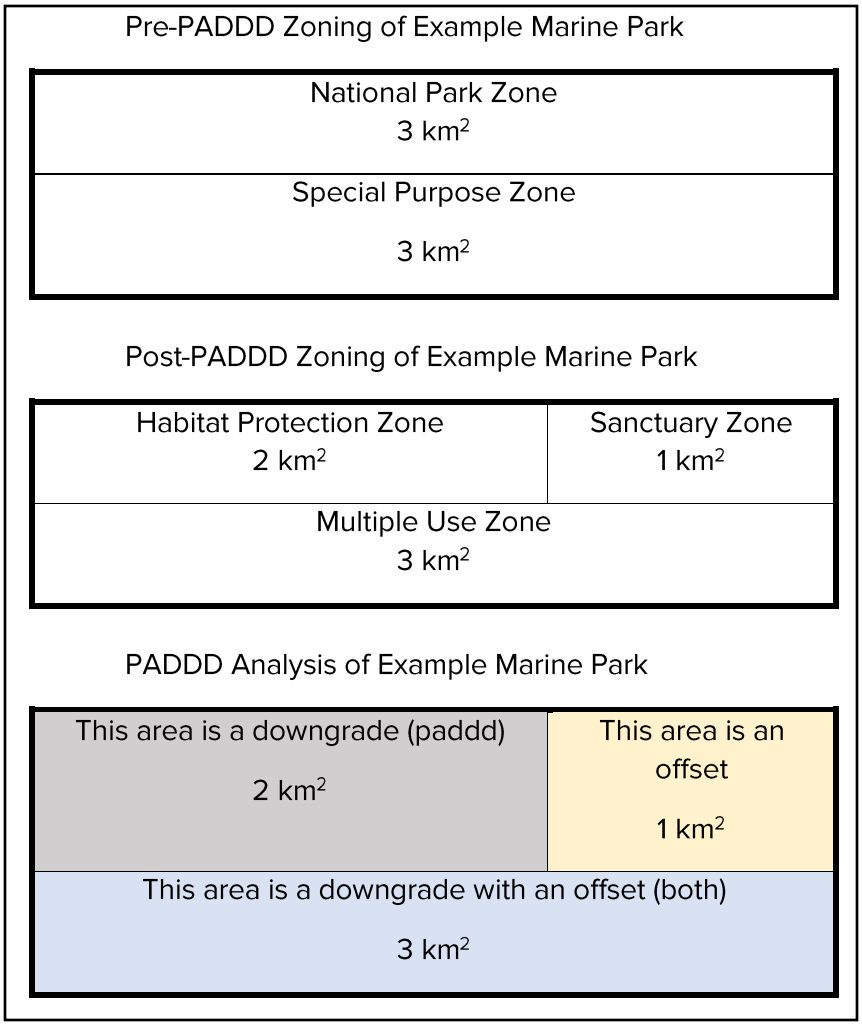


Figure 4: PADDD Analysis of Example Marine Park Pre- and Post-PADDD Zoning

The following attributes are shown here (Table 10) to illustrate how to apply the guidance above. All other columns in the MPA zones database (those not shown here) were populated using PADDDtracker technical guidance.

Table 10: Marine Zone Database for Example Marine Park (Zone change as unit of analysis)

primarynam	**zone_pre**	**zone_post**	**offset_paddd**	**Areaaffect**	**Notes**	**Marine_ZID**
Example Marine Park	npz	hpz	paddd	2	npz-hpz: downgrade to commercial fishing activities	AUS2QW1*
Example Marine Park	npz	sz	offset	1	npz-sz: offset to boating	AUS2QW1*
Example Marine Park	spz	muz	both	3	spz-muz: downgrade to mining activities, offset to commercial fishing activities (demersal trawling)	AUS2QW1*

*Marine ZID is the same for each of these zone changes because they are all associated with the same MPA

The following attributes are shown here (Table 11) to illustrate how information from the MPA zones database (Table 7) crosswalks to the PADDD database for relevant fields.

Table 11: PADDD Database for Example Marine Park (MPA as unit of analysis)

primarynam	Areaaffect	Off_Area	Off_Details	Notes
Example Marine Park	5	4	National Park Zone to Sanctuary Zone: - Boating newly prohibited Special Purpose Zone to Multiple Use Zone: - Demersal trawling newly prohibited	2 PADDD Polygons – National Park Zone to Habitat Protection Zone, Special Purpose Zone to Multiple Use Zone 2 Offset Polygons – National Park Zone to Sanctuary Zone, Special Purpose Zone to Multiple Use Zone

Overview of PADDD events data that are not yet peer-reviewed

PADDDtracker Data Release 2.1 includes information on known legal changes that temper restrictions, reduce boundaries, or eliminate protected areas, known as protected area downgrading, downsizing, and degazettement (PADDD) events (Mascia and Pailler et al. 2011; Mascia et al. 2020, Golden Kroner et al. 2019). Data included in all prior PADDDtracker data releases (e.g. CI and WWF 2019) were validated through peer-reviewed publications prior to their release.

For this data release, 353 PADDD events that are not yet peer-reviewed were also included: 114 from Brazil and 239 from the United States. These represent 7% of the data included in the release (n = 5,089). These data are indicated in the database (Excel) through the Peer_Review attribute (with a value of N).

We have high confidence in these data for several reasons, including: extensive prior data collection and analyses in both Brazil and the United States (Pack et al. 2016, Golden Kroner et al. 2019), maturity of databases from both counties, consistency of methodological approach (Mascia et al. 2020), availability of primary (i.e. legal) documents and spatial data to confirm and identify PADDD events, and collaboration with in-country experts.

In this section, we provide an overview of the PADDD events data from the United States and Brazil that are not yet peer-reviewed and included in PADDDtracker Data Release V2.1, including the methodology used to generate them, and associated descriptive statistics.

Methods to generate data

We documented PADDD events in Brazil and the United States that were not included in prior PADDD data releases (CI and WWF 2019), including newly enacted or proposed events, and historical events. As in all other PADDD research (Golden Kroner and Albrecht 2020), we applied methods from Mascia et al. (2020) to obtain sources of information with which to identify and confirm potential PADDD events.

For Brazil, we reviewed legal documents from the Instituto Socioambiental (ISA) Unidades de Conservação (UC) no Brasil web database (https://uc.socioambiental.org/en#pesquisa) as well as various Brazilian federal or state government websites.

For the United States, we reviewed the recent National Parks Index to identify any PADDD events missing from the 2019 database (NPS 2016); we followed up on each lead by searching for legal documents and maps, including through the National Park Service (NPS) Integrated Resource Management Applications (IRMA) Data Store (https://irma.nps.gov/DataStore/), Library of Congress archives (https://www.loc.gov/law/help/statutes-at-large/), and GovTrack (https://www.govtrack.us/). To obtain information for missing proposed PADDD events, we searched GovTrack with key terms (“boundary” “national park” “national monument” “wildlife refuge”), between 2000 – 2020. We reviewed the bills that specifically referenced national

parks, monuments, or wildlife refuges or had “boundary” in the name. Through this screening we also found three events enacted during this period.

Using standardized decision trees, we confirmed potential events, and if confirmed, categorized each as a downgrade, downsize, or degazettement (Mascia et al. 2020). We added each confirmed event to the database, and populated attributes using primary and secondary sources of information whenever available. We then collected spatial data in ArcMap 10.8.1.

To the extent available, we included spatial data from existing sources (ISA 2021, MMA 2019, UNEP-WCMC and IUCN 2021, USGS 2020). If spatial data for a confirmed PADDD event was not available through another spatial database, we manually created maps based on available information, including the use of coordinates in legal documents, or digitization of map images. For Brazil, we created some maps using XY coordinates; projections or coordinate systems varied across level of government, institution, and/or year of PADDD. We input these coordinates into GIS as vertices, and converted them from points, to lines, and finally to polygons. For the U.S., we used the public land survey system (PLSS) (BLM 2021) legal land descriptions and corresponding projection and coordinate system as a reference to digitize maps. After we digitized features in accordance with the appropriate coordinate system, we reprojected these polygon features to WGS_1984_Web_Mercator_Auxiliary_Sphere with a Mercator_Auxiliary_Sphere projection in accordance with the rest of the database.

In some cases, legal documents insufficiently described boundary change coordinates (Brazil) or legal land descriptions (the U.S.) but secondary sources provided maps containing PADDD event areas. We then digitized these areas by manually georeferencing PNG images of these maps. These polygons approximate but do not precisely delineate PADDD event areas. See Map_Source and Map_Details attributes for information on the source of each spatial feature and how it was generated.

Data summary

We include here descriptive statistics of PADDD in the United States and Brazil overall, broken down to show all data, and separately, data that are not yet peer-reviewed. For summaries and descriptive statistics of peer-reviewed data only, please see (Dorji et al., 2019; Golden Kroner et al., 2019; Vos et al., 2019). For further analyses of these data, please filter the PADDDevents database by the Peer_Review attribute.

Brazil PADDD data

Enacted PADDD events in Brazil

Table 12: Enacted PADDD events in Brazil (1971 – May 2021)

Enacted PADDD Events (Brazil)		**Downgrade**	**Downsize**	**Degazettement**	**Total**
Peer Reviewed	Number of Events	13	57	15	85
	Area Affected (km^2)	17455.2212	87208.0673	12864.5	117527.7885
Not Peer-Reviewed	Number of Events	0	6	1	7
	Area Affected (km^2)	0	2917.8725	186.08	3103.9525
Overall (V2.1)	Number of Events	13	63	16	92
	Area Affected (km^2)	17455.2212	90125.9398	13050.58	120631.741

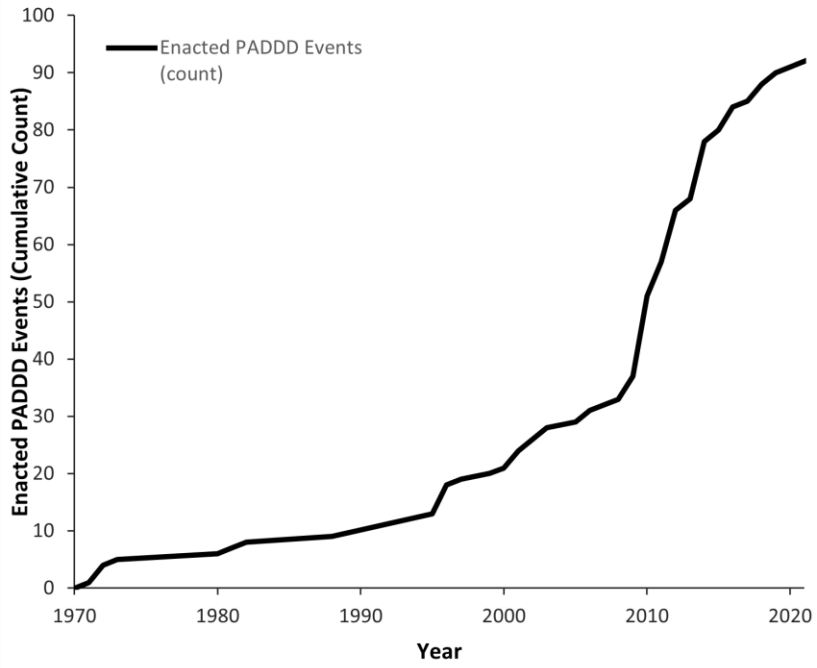


Figure 5: Temporal trends of enacted PADDD events in Brazil (1971 – May 2021), all data

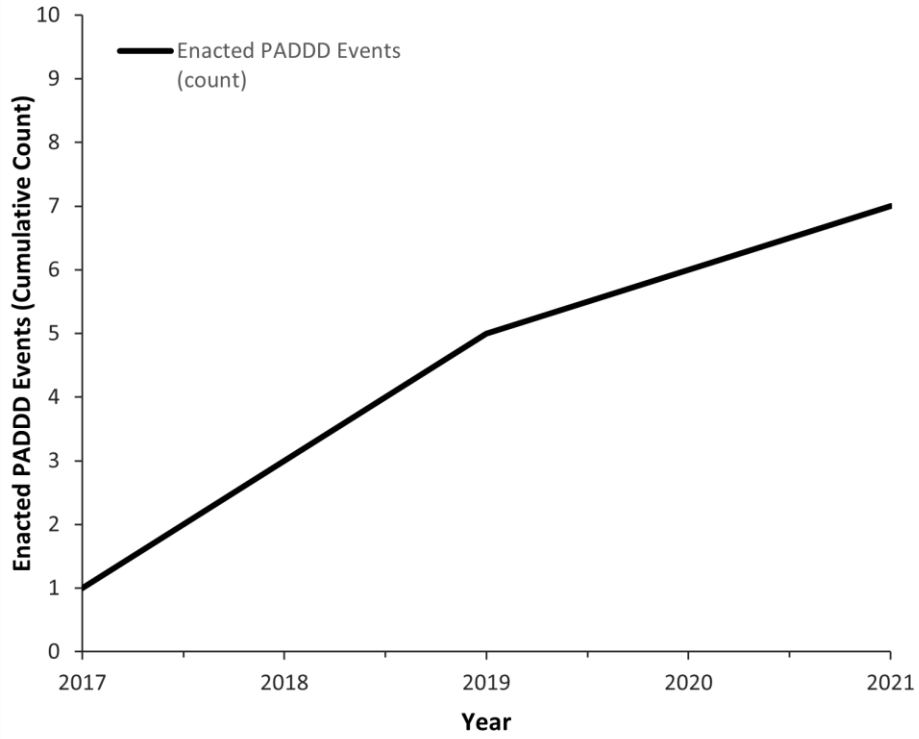


Figure 6: Temporal trends of enacted PADDD events in Brazil (2017 – May 2021), data that are not peer-reviewed

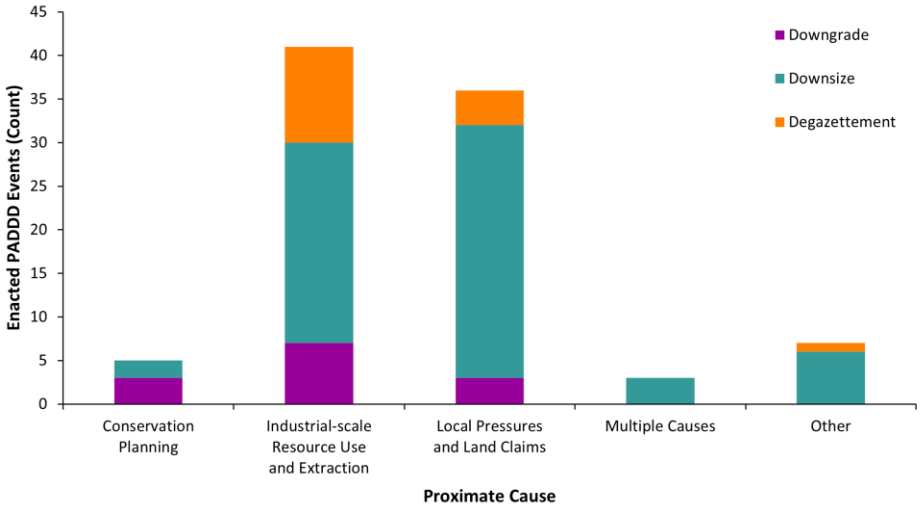


Figure 7: Proximate causes of enacted PADDD events in Brazil (1971 – May 2021), all data

Table 13: Distribution of proximate causes of enacted PADDD events in Brazil (1971 – May 2021), all data

Enacted PADDD Events (Brazil)	Cause	Downgrade	Downsize	Degazettement
Conservation Planning		3	2	0
Industrial-scale Resource Use and Extraction	Degradation	0	1	0
	Industrial Agriculture	0	2	0
	Industrialization	2	1	0
	Infrastructure	4	16	11
	Mining	1	3	0
Local Pressures and Land Claims	Land Claims	0	15	0
	Rural Settlements	1	14	4
	Subsistence	2	0	0
Multiple Causes		0	3	0
Other		0	6	1
Total		**13**	**63**	**16**

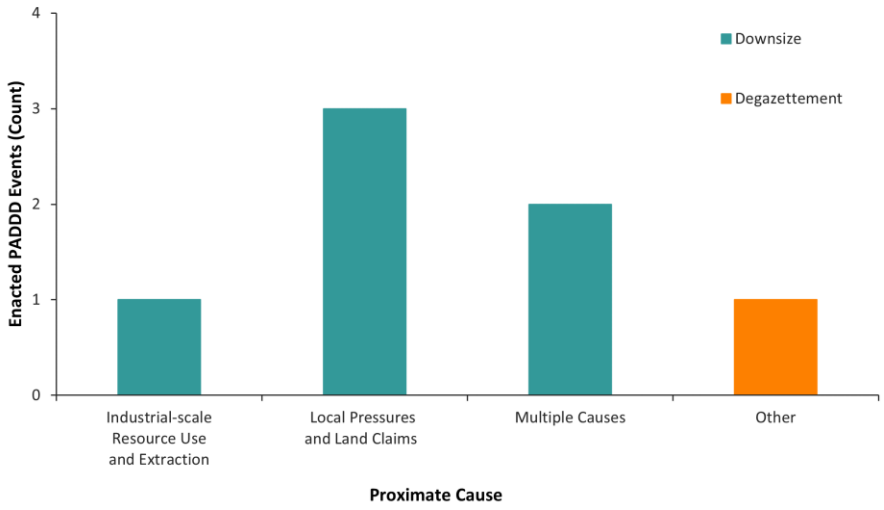


Figure 8: Proximate causes of enacted PADDD events in Brazil (2017 – May 2021), data that are not peer-reviewed

Table 14: Distribution of proximate causes of all enacted PADDD events in Brazil (2017 – May 2021), data that are not peer-reviewed

Enacted PADDD Events (Brazil)	Cause	Downgrade	Downsize	Degazettement
Industrial-scale Resource Use and Extraction	Mining	0	1	0
Local Pressures and Land Claims	Land Claims	0	3	0
Multiple Causes		0	2	0
Other		0	0	1
Total		**0**	**6**	**1**

Proposed PADDD events in Brazil

Table 15: Proposed PADDD events in Brazil (1991 – 2019). Note: Proposed downsize areas (Area Affected (km^2)) likely represent an underestimate; in 2019, a systemic downsize was proposed to reduce 60 PAs for infrastructure development, but spatial extent dimensions remain unknown.

Proposed PADDD Events (Brazil)		**Downgrade**	**Downsize**	**Degazettement**	**Total**
Peer Reviewed	Number of Events	19	23	19	61
	Area Affected (km^2)	20289.4	12003.8707	176235.8	208529.0707
Not Peer-Reviewed	Number of Events	6	74	27	107
	Area Affected (km^2)	13463.6785	13186.39127	34247.21507	60897.28484
Overall (V2.1)	Number of Events	25	97	46	168
	Area Affected (km^2)	33753.0785	25190.26197	210483.0151	269426.3555

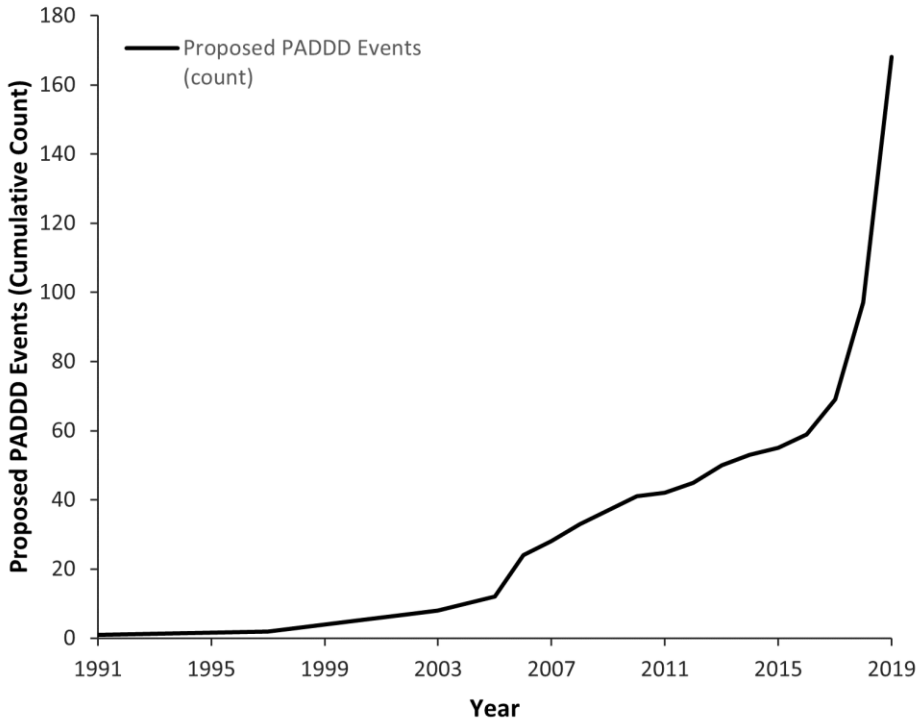


Figure 9: Temporal trends of proposed PADDD events in Brazil (1991 – 2019), all data

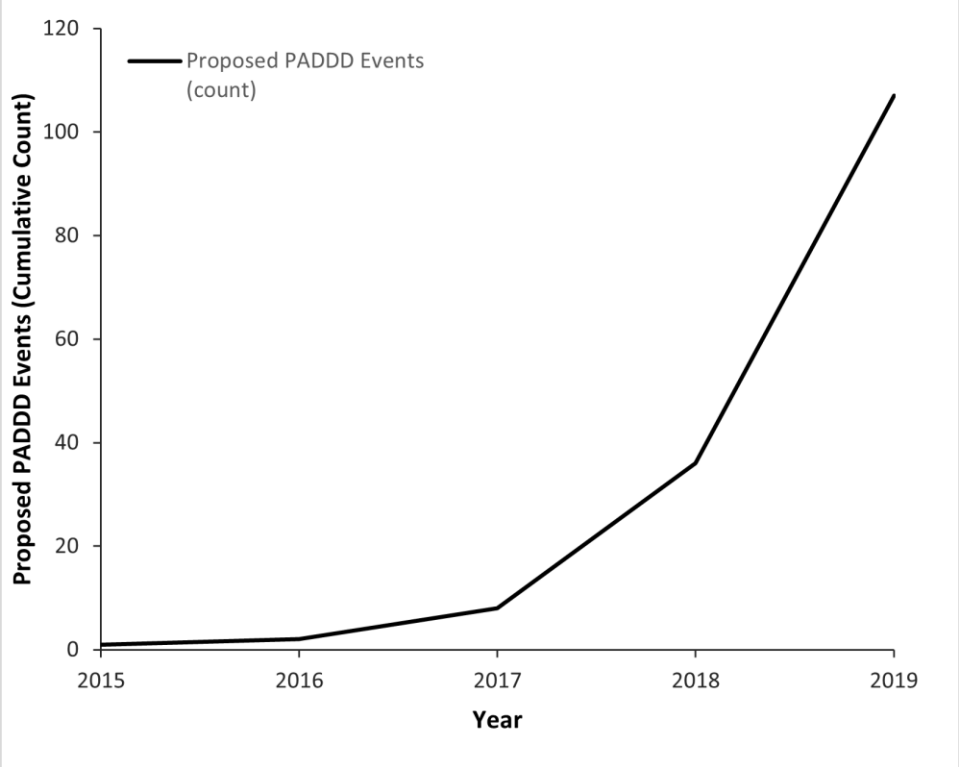


Figure 10: Temporal trends of proposed PADDD events in Brazil (2015 – 2019), data that are not peer-reviewed

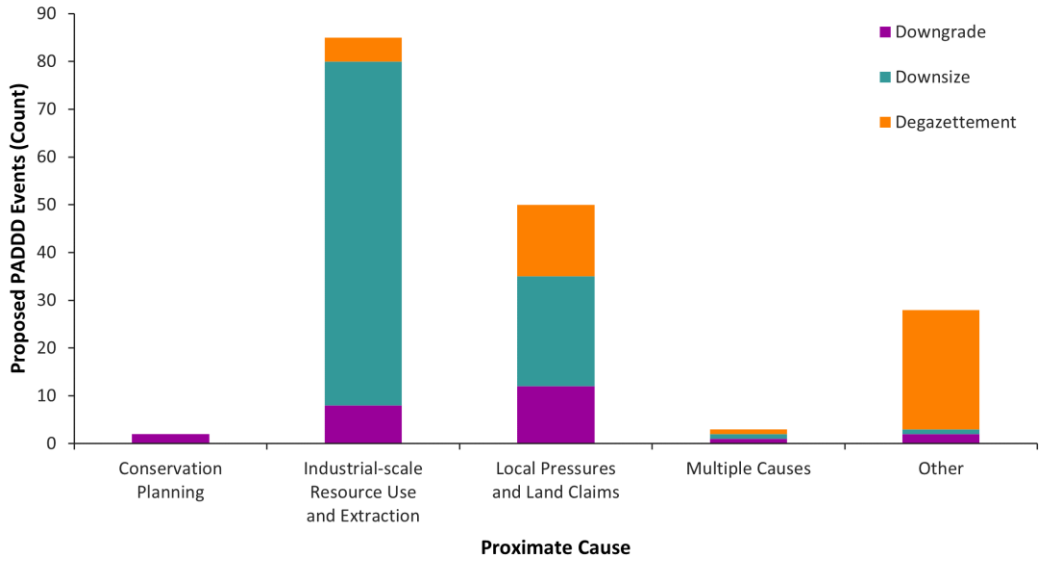


Figure 11: Proximate causes of proposed PADDD events in Brazil (1991 – 2019), all data

Table 16: Distribution of proximate causes of proposed PADDD events in Brazil (1991 – 2019), all data

Proposed PADDD Events (Brazil)	Cause	Downgrade	Downsize	Degazettement
Conservation Planning		2	0	0
Industrial-scale Resource Use and Extraction	Degradation	2	2	0
	Industrial Agriculture	0	1	2
	Industrialization	2	1	1
	Infrastructure	4	64	1
	Mining	0	4	1
Local Pressures and Land Claims	Land Claims	0	7	13
	Rural Settlements	11	16	2
	Subsistence	1	0	0
Multiple Causes		1	1	1
Other		2	1	25
Total		**25**	**97**	**46**

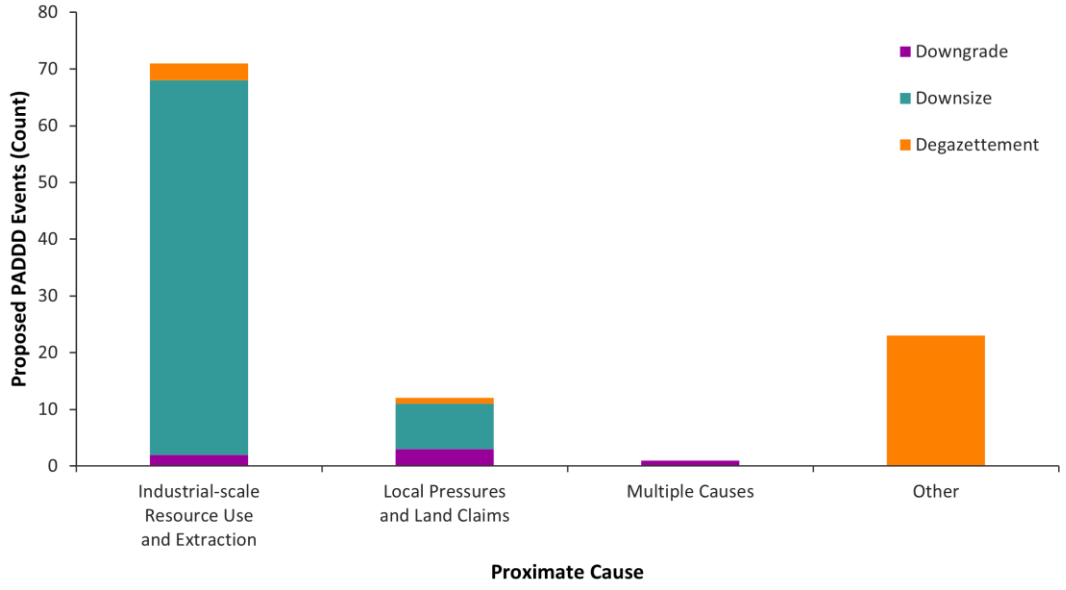


Figure 12: Proximate causes of proposed PADDD events in Brazil (2015 – 2019), data that are not peer-reviewed

Table 17: Distribution of proximate causes of proposed PADDD events in Brazil (2015 – 2019), data that are not peer-reviewed

Proposed PADDD Events (Brazil)	Cause	Downgrade	Downsize	Degazettement
Industrial-scale Resource Use and Extraction	Industrial Agriculture	0	1	0
	Industrialization	0	0	1
	Infrastructure	2	61	1
	Mining	0	4	1
Local Pressures and Land Claims	Land Claims	0	1	1
	Rural Settlements	3	7	0
Multiple Causes		1	0	0
Other		0	0	23
Total		**6**	**74**	**27**

United States PADDD Data

Enacted PADDD in the United States

Table 18: Enacted PADDD events in the United States (1892 – 2020)

Enacted PADDD Events (U.S.)		Downgrade	Downsize	Degazettement	Total
Peer Reviewed	Number of Events	239	31	0	270
	Area Affected (km^2)	538227.5466	2844.78368	0	541072.3303
Not Peer-Reviewed	Number of Events	32	16	0	48
	Area Affected (km^2)	8918.29	123.3927085	0	9041.682708
Overall (V2.1)	Number of Events	271	47	0	318
	Area Affected (km^2)	550940.9366	2968.17639	0	553909.113

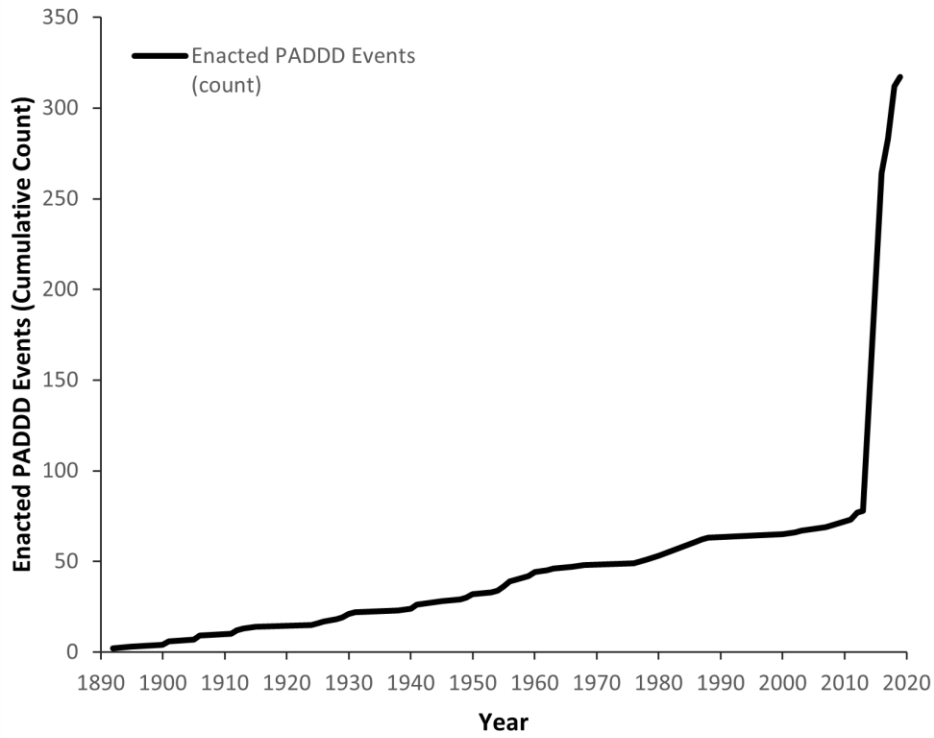


Figure 13: Temporal trends of enacted PADDD events in the United States (1892 – 2020), all data.

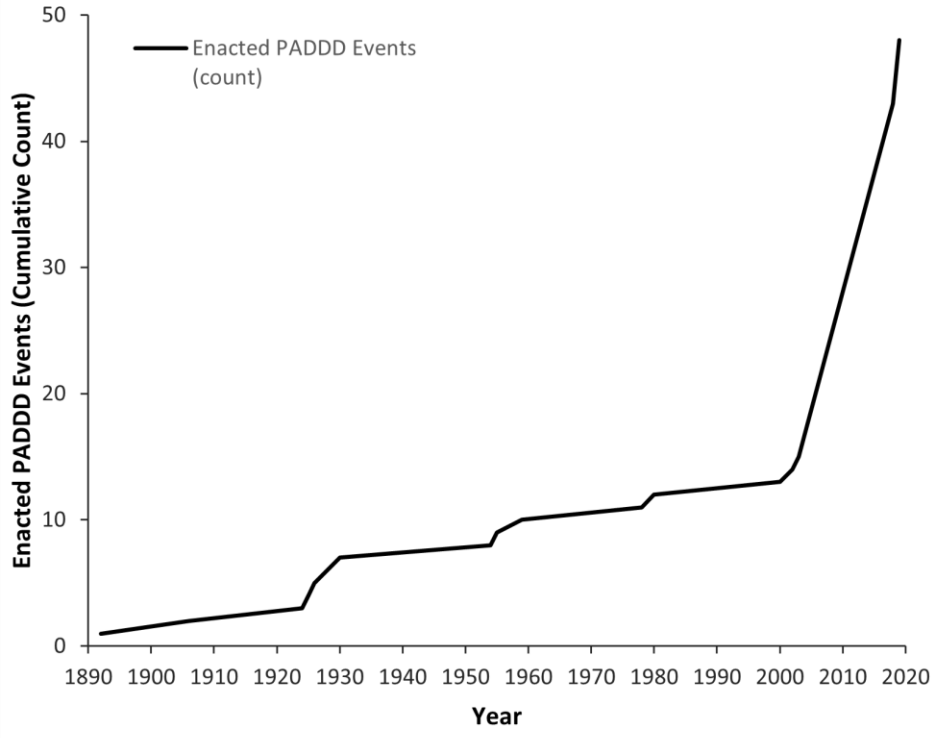


Figure 14: Temporal trends of enacted PADDD events in the US (1892 – 2019), data that are not peer-reviewed

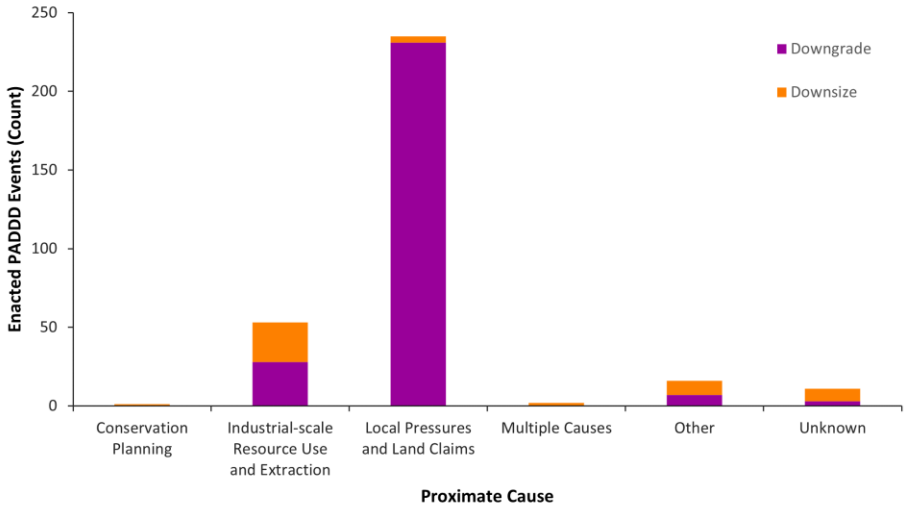


Figure 15: Proximate causes of enacted PADDD events in the United States (1892 – 2020), all data

Table 19: Distribution of proximate causes of proposed PADDD events in the United States (1892 – 2020), all data

Enacted PADDD Events (U.S.)	Cause	Downgrade	Downsize	Degazettement
Conservation Planning		0	1	0
Industrial-scale Resource Use and Extraction	Degradation	2	1	0
	Fisheries	2	0	0
	Forestry	0	5	0
	Industrial Agriculture	0	1	0
	Industrialization	0	1	0
	Infrastructure	20	12	0
	Mining	1	4	0
	Oil and Gas	2	3	0
Local Pressures and Land Claims	Land Claims	0	2	0
	Subsistence	4	0	0
Multiple Causes		7	9	0
Other		230	0	0
Unknown		3	8	0
Total		**271**	**47**	**0**

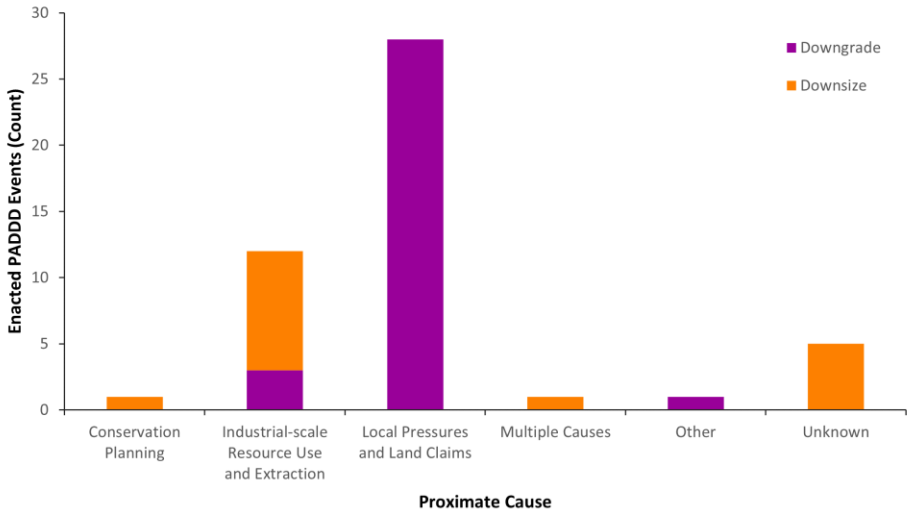


Figure 16: Proximate causes of enacted PADDD events in the United States (1892-2019), data that are not peer-reviewed

Table 20: Distribution of proximate causes of enacted PADDD events in the United States (1892-2019), data that are not peer-reviewed

Enacted PADDD Events (U.S.)	Cause	Downgrade	Downsize	Degazettement
Conservation Planning		0	1	0
Industrial-scale Resource Use and Extraction	Fisheries	1	0	0
	Industrialization	0	1	0
	Infrastructure	1	8	0
	Oil and Gas	1	0	0
Local Pressures and Land Claims	Subsistence	28	0	0
Multiple Causes		0	1	0
Other		1	0	0
Unknown		0	5	0
Total		**32**	**16**	**0**

Proposed PADDD in the United States

Table 21: Proposed PADDD events in the United States (1944 – 2019)

Proposed PADDD Events (U.S.)		**Downgrade**	**Downsize**	**Degazettement**	**Total**
Peer Reviewed	Number of Events	725	11	1	737
	Area Affected (km^2)	1192824.562	12712.41	894.36	1206431.332
Not Peer-Reviewed	Number of Events	185	6	0	191
	Area Affected (km^2)	301465.4754	328.0547635	0	301793.5301
Overall (V2.1)	Number of Events	910	17	1	928
	Area Affected (km^2)	1494290.037	13040.46476	894.36	1508224.862

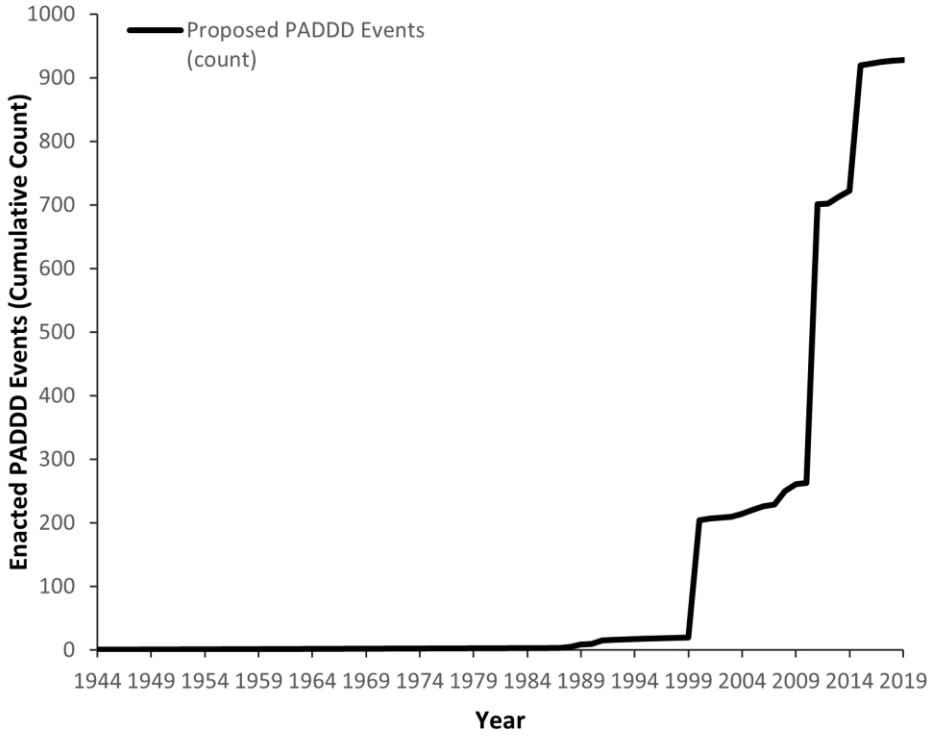


Figure 17: Temporal trends of proposed PADDD events in the United States (1944 – 2019), all data

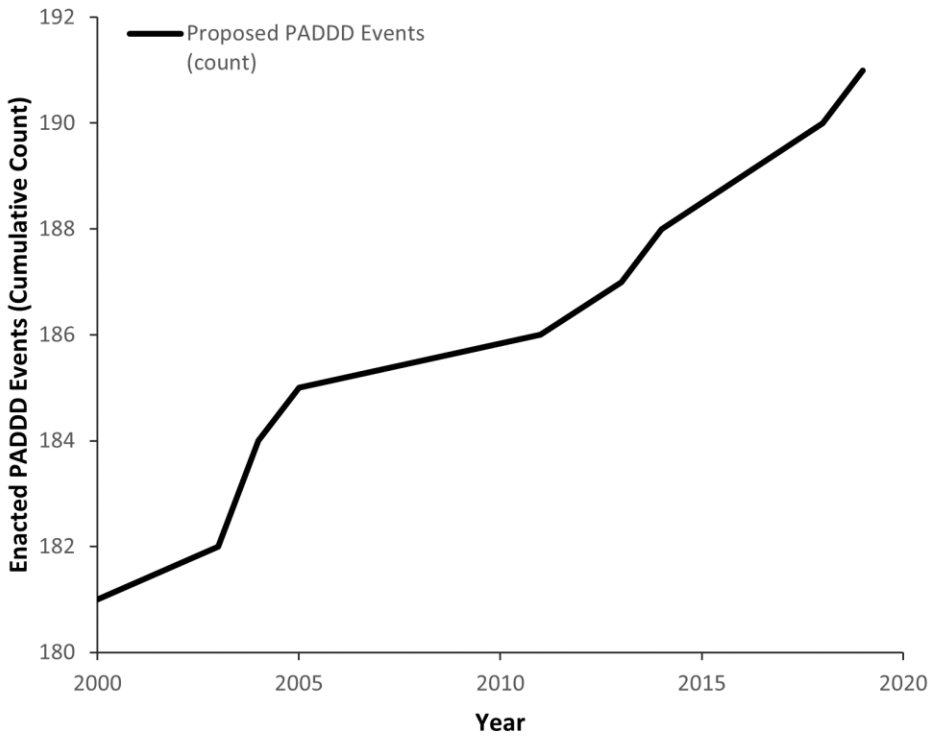


Figure 18: Temporal trends of proposed PADDD events in the United States (2000 – 2019), data that are not peer-reviewed

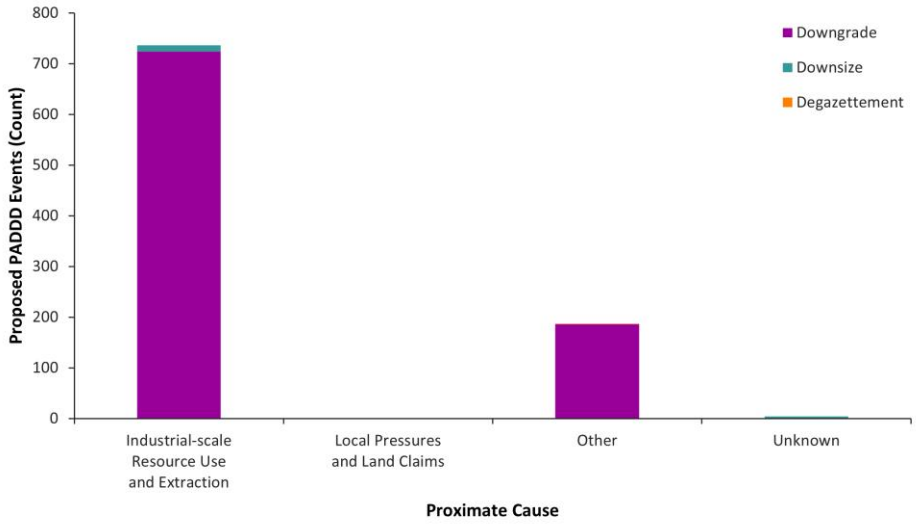


Figure 19: Proximate causes of proposed PADDD events in the United States (1944 – 2019), all data

Table 22: Distribution of proximate causes of proposed PADDD events in the United States (1944 – 2019), all data

Proposed PADDD Events (U.S.)	Cause	Downgrade	Downsize	Degazettement
Industrial-scale Resource Use and Extraction	Forestry	1	0	0
	Industrial Agriculture	1	0	0
	Industrialization	1	0	0
	Infrastructure	610	10	0
	Oil and Gas	111	2	0
Local Pressures and Land Claims	Land Claims	0	1	0
Other		186	0	1
Unknown		0	4	0
Total		**910**	**17**	**1**

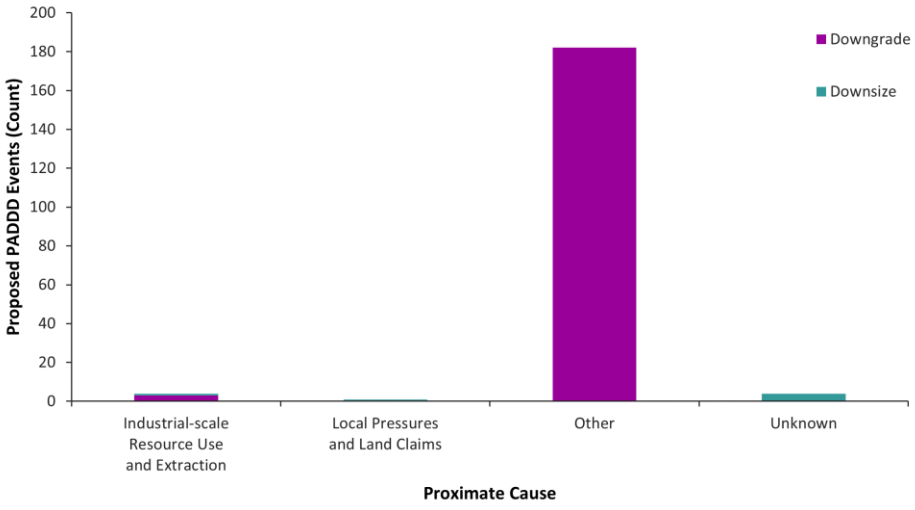


Figure 20: Proximate causes of proposed PADDD events in the US (1944 – 2019), data that are not peer-reviewed

Table 23: Distribution of proximate causes of proposed PADDD events in the United States (2000 – 2019), data that are not peer-reviewed

Proposed PADDD Events (U.S.)	Cause	Downgrade	Downsize	Degazettement
Industrial-scale Resource Use and Extraction	Industrial Agriculture	1	0	0
	Industrialization	1	0	0
	Infrastructure	0	1	0
	Oil and Gas	1	0	0
Local Pressures and Land Claims	Land Claims	0	1	0
Other		182	0	0
Unknown		0	4	0
Total		**185**	**6**	**0**

References

Albrecht, R., Cook, C. N., Andrews, O., Roberts, K. E., Taylor, M. F. J., Mascia, M. B., & Golden Kroner, R. E. (2021). Protected area downgrading, downsizing, and degazettement (PADDD) in marine protected areas. *Marine Policy*, *129*, 104437. https://doi.org/10.1016/j.marpol.2021.104437

Albrecht, R. & Golden Kroner, R.E. (2020). PADDD Annotated Bibliography, Version 1.1 (Version 1.1). *Zenodo*. https://doi.org/10.5281/zenodo.3973671

Conservation International & World Wildlife Fund. (2019). PADDDtracker.org Data Release Version 2.0 (May 2019). Arlington, VA: Conservation International. Washington, DC: World Wildlife Fund. https://doi.org/10.5281/zenodo.3371733

De Vos, A., Clements, H. S., Biggs, D., & Cumming, G. S. (n.d.). The dynamics of proclaimed privately protected areas in South Africa over 83 years. *Conservation Letters*, *0*(0), e12644. https://doi.org/10.1111/conl.12644

Dorji, T., Linke, S., & Sheldon, F. (2019). Half century of protected area dynamism in the country of Gross National Happiness, Bhutan. *Conservation Science and Practice*, *1*(7), e46. https://doi.org/10.1111/csp2.46

Dudley, N. (Editor). (2013), Guidelines for Applying Protected Area Management Categories. Gland, Switzerland: IUCN. x + 86pp (2008). WITH Stolton, S., P. Shadie, & N. Dudley, IUCN WCPA Best Practice Guidance on Recognising Protected Areas and Assigning Management Categories and Governance Types, Best Practice Protected Area Guidelines Series No. 21, Gland, Switzerland: IUCN.

Golden Kroner, R. E., Qin, S., Cook, C. N., Krithivasan, R., Pack, S. M., Bonilla, O. D., Cort-Kansinally, K. A., Coutinho, B., Feng, M., Garcia, M. I. M., He, Y., Kennedy, C. J., Lebreton, C., Ledezma, J. C., Lovejoy, T. E., Luther, D. A., Parmanand, Y., Ruíz-Agudelo, C. A., Yerena, E., Zambrano, V.M., Mascia, M. B. (2019). The uncertain future of protected lands and waters. *Science*, *364*(6443), 881–886. https://doi.org/10.1126/science.aau5525

Golden Kroner, R. E., Krithivasan, R., & Mascia, M. B. (2016). Effects of protected area downsizing on habitat fragmentation in Yosemite National Park (USA), 1864 – 2014. *Ecology and Society*, *21*(3). JSTOR. https://www.jstor.org/stable/26269964

ISA (2021). Unidades de Conservação no Brasil. https://uc.socioambiental.org

Mascia, M. B., & Claus, C. A. (2009). A Property Rights Approach to Understanding Human Displacement from Protected Areas: The Case of Marine Protected Areas. *Conservation Biology*, *23*(1), 16–23. https://doi.org/10.1111/j.1523-1739.2008.01050.x

Mascia, M.B., Pailler, S., Krithivasan, R., Qin, S., Albrecht, R., & Golden Kroner, R.E. (2020). PADDDtracker.org Technical Guide, Version 2. Conservation International, Arlington, VA and World Wildlife Fund, Washington, D.C. DOI: https://doi.org/10.5281/zenodo.3608263

Ministério do Meio Ambiente (MMA). (2019). Brasilia, Brazil. Mapa Temático e Dados Geoestatísticos das Unidades de Conservação Federais. (In Portuguese. (accessed 3 2021) https://www.gov.br/icmbio/pt-br/servicos/geoprocessamento/mapa-tematico-e-dados-geoestatisticos-das-unidades-de-conservacao-federais/mapa-tematico-e-dados-geoestatisticos-das-unidades-de-conservacao-federais

Pack, S. M., Ferreira, M. N., Krithivasan, R., Murrow, J., Bernard, E., & Mascia, M. B. (2016). Protected area downgrading, downsizing, and degazettement (PADDD) in the Amazon. *Biological Conservation*, *197*, 32–39. https://doi.org/10.1016/j.biocon.2016.02.004

Schlager, E., & Ostrom, E. (1992). Property-Rights Regimes and Natural Resources: A Conceptual Analysis. *Land Economics*, *68*(3), 249–262. https://doi.org/10.2307/3146375

UNEP-WCMC (2019). User Manual for the World Database on Protected Areas and World Database on Other Effective Area-based Conservation Measures: 1.6. UNEP-WCMC: Cambridge, UK. Available at: http://wcmc.io/WDPA_Manual

UNEP-WCMC and IUCN (2021), Protected Planet: Brazil; The World Database on Protected Areas (WDPA)/The Global Database on Protected Areas Management Effectiveness (GD-PAME) On-line, 3/2021, Cambridge, UK: UNEP-WCMC and IUCN. Available at: www.protectedplanet.net

U.S. Department of Interior, Bureau of Land Management (BLM), BLM National Public Land Survey System Polygons - National Geospatial Data Asset (NGDA) (2021). Retrieved from https://landscape.blm.gov/geoportal/catalog/search/resource/details.page?uuid=%7BA8E4F937-4653-4542-9554-9FBF308FB624%7D

U.S. Department of Interior, National Park Service (NPS), The National Parks: Index 2012-2016 (2016). Retrieved from: https://www.nps.gov/aboutus/upload/NPIndex2012-2016.pdf

U.S. Department of Interior, U.S. Geological Survey (USGS), Gap Analysis Project (GAP), Protected Areas Database of the United States (PAD-US) 2.1: U.S. Geological Survey data release, (2020). https://doi.org/10.5066/P92QM3NT

Wessel, P., & Smith, W. H. F. (1996). A global, self-consistent, hierarchical, high-resolution shoreline database. *Journal of Geophysical Research: Solid Earth*, *101*(B4), 8741–8743. https://doi.org/10.1029/96JB00104

Acknowledgements:

Thank you to the data providers, contributors, and supporters of the PADDDtracker initiative. Special thanks to Rose James and Kim Myers for contributions to US data collection. Funding support was provided by the Ann and Tom Friedman Fellows for Science Program.