

# Dams Package Demo

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This document provides examples on how to obtain and extract data using the dams package and how to create summary graphics of the extracted data.

## 1 Data Attributes

If you have not already done so, load the package along with ggplot and maps (for graphics).

```
> require(dams)
> require(ggplot2)
> require(maps)
> require(mapproj)
```

## 2 Entire Dataset

Get the entire dataset. This might take a few moments.

```
> dams_all <- nid_cleaned
> dim(dams_all)
```

```
[1] 74096    61
```

```
> head(dams_all, 3)
```

		Dam_Name	Other_Dam_Name	NID_ID	Num_Separate_Struct	Other_Structure_ID	Latitude	County	River	Owner_Type	Private_Dam	Dam_Designer	Dam_Type	Core	Four
1		NIX MILL POND DAM	NIX MILL DAM	AL00106		0									
2		LIGHTSEY S MILL POND DAM	MILL POND DAM	AL00533		0									
3		ODUMS MILL DAM	ODOMS MILL POND	AL00890		0									
1	34.3483	FRANKLIN	EDGAR BRANCH	Not Listed		N							Rockfill		
2	32.9100	BIBB	LIGHTSEY S BRANCH	Private		N							Earth		
3	33.9566	WALKER	BLACKWATER CREEK	Private		N							Gravity		
		Primary_Purpose	All_Purposes	Year_Completed	Year_Modified	Dam_Length	Dam_Height								
1		Other	Other	1800		60	NA								
2		Recreation	Recreation	1890		350	NA								

3	Other Recreation, Other	1850	125	NA
	Structural_Height	Hydraulic_Height	NID_Height	Max_Discharge
1	25	25	25	140
2	13	10	13	250
3	12	12	12	NA
	Max_Storage	Normal_Storage	NID_Height	Max_Discharge
1	55	55	25	140
2	80	80	13	250
3	180	150	12	NA
	Surface_Area	Drainage_Area	EAP	Inspection_Date
1	NA	NA	N	Inspection_Frequency
2	NA	NA	N	Spillway_Type
3	NA	NA	N	Spillway
	Outlet_Gates	Volume	Num_Locks	Length_Locks
1	NA	NA	0	Width_Locks
2	NA	NA	0	Permitting_Authority
3	NA	NA	0	Inspection_Aut
	Enforcement_Authority	Jurisdictional_Dam	State_Reg_Dam	State_Reg_Agency
1	N	N	N	Fed_Funding
2	N	N	N	Fed_De
3	N	N	N	
	Fed_Construction	Fed_Regulatory	Fed_Inspection	Fed_Operation
1				Fed_Owner
2				Fed_Other
3				Source_Ag
	State	Submit_Date	Url_Address	Congress_Rep
1	AL	01\02\2013	NA Robert B. Aderholt (R)	Political_Party
2	AL	01\02\2013	NA Spencer Bachus (R)	Congress_District
3	AL	01\02\2013	NA Robert B. Aderholt (R)	

### 3 Summary Graphics

Data for graphics.

```
> gfx_data <- dams_all[, c("Year_Completed", "State")]
> head(gfx_data)
```

	Year_Completed	State
1	1800	AL
2	1890	AL
3	1850	AL
4	1880	AL
5	1881	AR
6	1877	CA

Counts of number of dams built per decade or other time period of interest.

```
> gfx_data$Year <- cut(gfx_data$Year_Completed,
+                       breaks = c(0, 1850, seq(1900, 2000, 10), 2014),
+                       labels = c("<1850", "1850-1900", "1910", "1920", "1930",
```

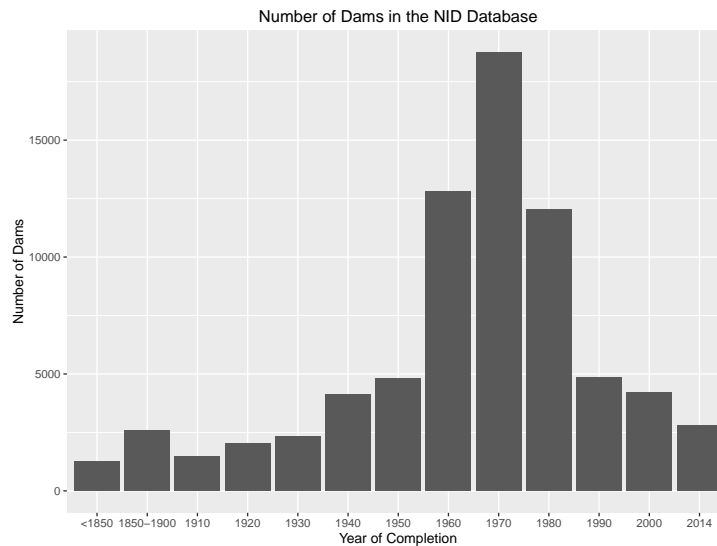


Figure 1: Number of Dams by Year of Completion

```
+ "1940", "1950", "1960", "1970", "1980", "1990",
+ "2000", "2014"))
> table(gfx_data$Year)
```

<1850	1850-1900	1910	1920	1930	1940	1950	1960	1970
1264	2588	1464	2015	2329	4130	4825	12816	18770
1990	2000	2014						
4853	4221	2794						

NV	DE	RI	MD	AZ	VT	IL	WV	ID	LA	NC	NM	NJ	NH	ME	UT	CT	FL
43	51	174	305	319	358	391	413	431	441	444	453	510	590	597	617	700	781
OR	IN	MI	MN	KY	TN	WI	AR	MA	OH	VA	PA	CA	WY	CO	NY	MS	AL
839	847	914	1005	1025	1113	1116	1243	1244	1261	1307	1311	1500	1607	1704	1761	1981	2135
SD	MT	GA	IA	OK	MO	KS	TX										
2510	3236	3724	3913	4756	5002	5692	7253										

Map of dams per state in the US mainland.

```

> state_counts <- as.data.frame(table(gfx_data$State), stringsAsFactors = FALSE)
> colnames(state_counts) <- c("state", "Count")
> # add long names of states
> state_names <- data.frame(state = state.abb,
+                           name = state.name,
+                           stringsAsFactors = FALSE)
> gfx_data <- merge(state_counts, state_names, by = "state")
> # change state name to lower case to be consistent with ggplot
> gfx_data$name <- tolower(gfx_data$name)
> # geo reference data on states from ggplot
> geo_state <- map_data("state")
> # merge data with above for graphics
> gfx_data <- merge(geo_state, gfx_data, by.x = "region", by.y = "name")
> gfx_data <- gfx_data[order(gfx_data$order), ]
> # discretize state counts
> color_breaks <- c(0, 100, 500, 1000, 2000, 3000, 4000, 5000, 7500)
> color_labels <- c("<100", "100 - 500", "500 - 1000", "1000 - 2000", "2000 - 3000",
+                  "3000 - 4000", "4000 - 5000", "5000 - 7500")
> gfx_data$dams <- cut(gfx_data$Count,
+                     breaks = color_breaks,
+                     labels = color_labels)
> gfx_map <- ggplot(data = gfx_data)
> gfx_map <- gfx_map + geom_polygon(aes(x = long, y = lat, group = group, fill = dams))
> gfx_map <- gfx_map + geom_path(data = geo_state, aes(x = long, y = lat, group = group,
+                                                     fill = NA))
> gfx_map <- gfx_map + labs(list(title = "Number of Dams in the NID Database",
+                               x = NULL, y = NULL))
> gfx_map <- gfx_map + guides(fill = guide_legend(title = "Number of Dams"))
> gfx_map <- gfx_map + scale_fill_brewer(palette = "Accent")
> gfx_map <- gfx_map + coord_map()
> plot(gfx_map)

```

## 4 Other Analyses: Flood Control Dams

A number of interesting analyses could be performed with the dataset. Of interest to water resources managers and hydrologists is the location of flood

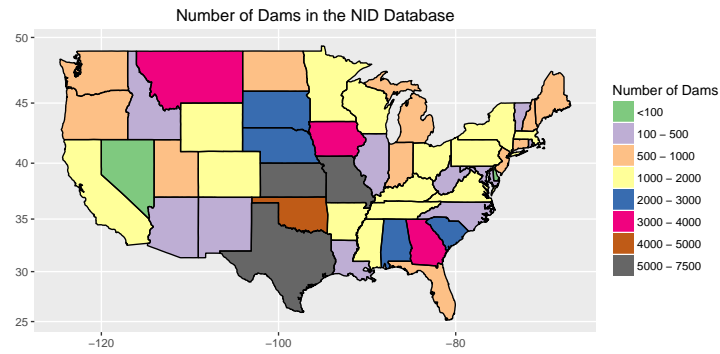


Figure 2: Number of Dams by State

control dams. It is interesting to see a few states like Texas have a large number of flood control dams.

```
> flood_dams <- subset(dams_all, Primary_Purpose == "Flood Control")
> table(flood_dams$State)
```

AK	AL	AR	AZ	CA	CO	CT	DE	FL	GA	HI	IA	ID	IL	IN	KS	KY	LA	1
4	131	221	91	190	230	20	2	171	369	6	369	12	49	147	1905	223	40	
ME	MI	MN	MO	MS	MT	NC	ND	NE	NH	NJ	NM	NV	NY	OH	OK	OR	PA	
113	28	305	897	596	98	79	91	950	43	33	208	12	139	112	2340	20	195	
SC	SD	TN	TX	UT	VA	VT	WA	WI	WV	WY								
112	89	209	2260	125	199	15	109	123	178	100								