

## **Appendix E. Habitat Standards and Monitoring Protocol**

### **Introduction**

The 1998 baseline reflects the best available habitat measures representing ground conditions inside the Primary Conservation Area (PCA) as of 1998. Habitat standards identified in the Conservation Strategy pertain to secure habitat, developed sites, and livestock grazing allotments. The standards demand that all three of these habitat parameters are to be maintained at or improved upon conditions that existed in 1998. The 1998 baseline represents the best estimate of what was known to be on the ground at the time and establishes a benchmark against which future improvements and/or impacts can be assessed. It also provides a clear standard for agency managers to follow when considering project effect analysis. This appendix documents estimates for baseline values so that current and future habitat conditions throughout the PCA can be evaluated for compliance with habitat standards as formalized in the Conservation Strategy. In theory, the 1998 baseline should be a static measurement bound to a single point in time. In reality, this baseline continues to evolve as more reliable information is acquired; errors in the baseline are identified and corrected; and as new geoprocessing tools are developed to more accurately model secure habitat and estimate road densities. Since the release of the 2007 Conservation Strategy, new information has become available and some errors in the 1998 baseline have been identified. Consequently, baseline values have been adjusted where necessary to more accurately reflect 1998 ground conditions. The 1998 baseline database will continue to be improved upon when and if legitimate errors are identified. Features found to be erroneously excluded from the 1998 baseline will be reviewed as to their actual status in 1998. If reliable information is made available to substantiate the existence of these features in 1998 then corrections to the baseline will be made. All corrections made to the baseline will be documented, tracked, and reported in the Interagency Grizzly Bear Study Team (IGBST) annual reports. Baseline values presented in this appendix represent the best available information at this time and will serve as a basis for monitoring and evaluating improvements in habitat conditions and identifying any need for mitigation measures in the future.

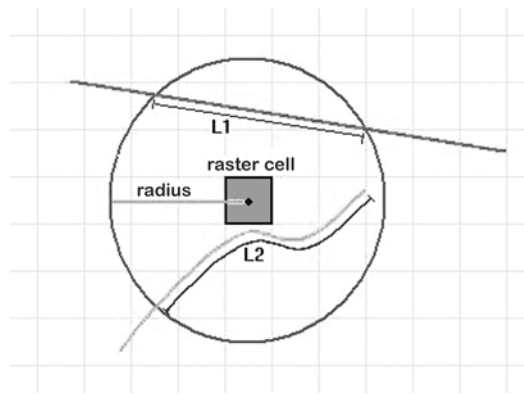
### **Secure Habitat and Motorized Access Route Density**

Maintaining or improving secure habitat at or above 1998 levels inside the PCA is a required habitat standard. To monitor compliance with this standard, secure habitat is annually measured and compared against 1998 levels for each bear management subunit. There are no mandatory standards for motorized route density, however, monitoring protocol requires that open motorized access route density (OMARD) and total motorized access route density (TMARD) inside the PCA be measured, monitored, and compared against 1998 levels annually.

Secure habitat is any contiguous area greater than 10 acres in size and more than 500 meters (m) from an open or gated motorized route. OMARD measures the density of all motorized routes (roads and trails) that are open to the public for one or more days during the non-denning portion of the year when grizzly bears are active (March 1 – November 30). TMARD measures the density of motorized routes open to the public and/or administrative personnel for one or more days during the non-denning season. Hence, routes that are gated to the public year-round and accessible only to administrative staff contribute to TMARD but do not count toward OMARD. OMARD is reported at levels  $> 1.6$  kilometer (km) per square kilometer (sq km) ( $> 1$  mile (mi) per square mile (sq mi)) while TMARD is reported at levels  $> 3.2$  km per sq km ( $> 2$  mi per sq mi). State, county, and private roads occurring on federal lands are included in these calculations; however, roads occurring on private inholdings reflect 1998 conditions and are not updated in the motorized access database through time.

Calculations for percentage of secure habitat, OMARD, and TMARD are generated using the Motorized Access Model, a suite of customized geoprocessing tools compatible with ArcGIS software. Algorithms built into the model generate a 500 meter buffer around all relevant motorized features. Areas larger than 10 acres in size that fall outside this buffer are designated secure habitat. Methods for measuring route density have greatly improved with advancements in geoprocessing tools since earlier versions of the Conservation Strategy were released. Starting in 2009 a more accurate method for measuring line density was implemented into the ArcGIS software, which led to improved estimates for the 1998 baseline values of motorized route density. The new baseline measurements provide a more accurate and realistic estimate of road densities and do not reflect changes in the configuration of 1998 motorized routes. Instead, only

the method from which road density is calculated has changed. Route density values are stored in a 30 m raster format and cell values correspond to densities within a 1.6 sq km (1 sq mi) moving window. In previous methods, the total length of motorized routes within the moving window was based on a simple absence or presence of motorized routes within a given cell. Cells containing one or more route segments were summed and then multiplied by 30 m (length of single cell) to get the total length of motorized routes within the moving window. This method tended to under-estimate route density in some cases, and over-estimate in others. The current algorithm instead accounts for all route segments within a cell and accurately measures the total length of routes intersecting the 1.6 sq km (1 sq mi) moving window based on actual line geometry (Figure 1).



***Figure 1 Measurement of route density based on total length of routes within 1.6 sq km (1 sq mi) moving window.***

The most current values for 1998 baseline levels of secure habitat, OMARD, and TMARD are presented in Table 1. These values, which are based on the best methods available, supersede those presented in the 2007 Conservation Strategy and comprise the benchmark against which all future change is to be measured.

#### *Exceptions to the 1998 Baseline for Secure Habitat*

Three subunits, Gallatin #3, Henrys Lake #2, and Madison #2, were targeted in previous versions of the Conservation Strategy as needing improvement in secure habitat with respect to 1998 levels. The specific areas with potential for improvement identified in these three subunits fall

within the Gallatin National Forest boundary and hence, the quantity and timing of improvements was to be determined by the Gallatin National Forest Travel Management Plan (TMP). A primary factor contributing to impoverished secure habitat levels in these three subunits was motorized access on private land inholdings. Since 1998, the Gallatin National Forest conducted several land exchanges under the *Gallatin Range Consolidation and Protection Act* in areas inside and outside the PCA. These land exchanges resulted in the acquisition of formerly private parcels which are now administered as part of the Gallatin National Forest. With implementation of the 2006 Gallatin TMP, many roads inherited from these exchanges have been permanently decommissioned. Non-system routes that are not maintained by the Forest Service have subsequently been closed, with a high priority given to road decommissions in the three subunits identified as in need of improvement. With full implementation of the Gallatin TMP very near completion, measurable increases in secure habitat with respect to 1998 baseline levels have been realized in the three targeted subunits. Consequently, the Gallatin National Forest has proposed via a Travel Plan Amendment that the improved levels of secure habitat resulting from full implementation of the TMP constitute new baseline levels for these 3 subunits. This amendment effectively raises the bar for baseline conditions in the 3 identified subunits. These enhanced levels of secure habitat for the 3 targeted subunits will constitute new measures against which future change will be made (Table 1).

#### *Protocol for measuring Open Motorized Road Density (OMARD)*

Previous to this version of the Conservation Strategy, OMARD was measured for two distinct non-denning grizzly bear seasons; Season 1 (March 1 – July 15) and Season 2 (July 16 – November 30). However, the timing of seasonal route closures on National Forest lands throughout the ecosystem does not typically correspond with grizzly bear seasons. Technically, if a motorized route is open to the public for even one day in a given season, the road contributes to that seasonal measurement of OMARD. For most motorized routes on Forest land, the period open to public motorized use overlaps some portion of both seasons, and hence, there is very little measurable difference between seasonal route densities. For this reason, seasonal differences in OMARD are no longer tracked and reported. Instead, a single measurement of

OMARD for the entire non-denning season of the year (March 1 – November 30) is to be measured, monitored, and reported annually per bear management subunit.

### *Cumulative Effects Model*

With previous versions of the Conservation Strategy, the Cumulative Effects Model (CEM) was the requisite tool for estimating effectiveness and quality of habitat when evaluating project impacts. With this version of the Conservation Strategy the CEM will no longer serve as the requisite tool for evaluating impacts of competing project scenarios. Instead, the current tool for conducting project impact analyses is the Motorized Access Model which was established concurrent with the CEM.

The CEM was a computerized model designed in stages during the 1980s and 1990s as a tool for evaluating relative change in grizzly bear habitat quality due to human activities. The model led to construction of useful spatial data layers reflecting various habitat components and delineating management boundaries relevant for monitoring secure habitat. Some of these layers were subsequently incorporated into the Motorized Access Model. The CEM was considered the best available science at the time; however, the utility of the CEM has since been questioned and is no longer the endorsed protocol for reporting habitat metrics. The rationale for this change in protocol is many-fold, least not is the inability to verify or ground truth in a statistically defensible manner the validity of numerous numerical coefficients residing at the core of the model (Boyce *et al.* 2001, Borkowski 2006). Furthermore, the process for developing vegetation coefficients described by Mattson *et al.* (2004) proves to be highly technical and complex, making it difficult to interpret and implement. Therefore, updating the vast array of coefficients with any reasonable degree of reliability poses a daunting challenge as the grizzly bear population expands, broad landscape changes occur, or new information becomes available. In addition, many of the CEM geospatial datasets are approaching three decades in age and there is no operative mechanism in place to systematically update all existing data layers to reflect current conditions. Collectively, neither the vegetation spatial data nor the multitude of coefficients have proven accurate enough for site-specific project analyses, as past modeling efforts have shown (Dixon 1997). Finally, the format of GIS datasets designed to interface with the CEM are now obsolete and the program code would need to be completely re-vamped to

accommodate current geospatial data formats. This is especially problematic since few members of the CEM technical modeling team remain employed in the GYE and there is no technical documentation of the underlying source code for the CEM algorithms (Dixon 1997). In short, the CEM is a high maintenance operation that is difficult to execute and interpret. The Motorized Access Model will instead continue to be used to calculate and monitor secure habitat and motorized route density inside and outside the PCA.

### **Developed Sites on Public Lands**

Developed sites include all sites on public land developed or improved for human use or resource development. Examples of developed sites include, but are not limited to, campgrounds, trailheads, lodges, administrative sites, service stations, summer homes, restaurants, visitor's centers, and permitted resource development sites such as oil and gas exploratory wells, production wells, plans of operation for minerals activities, work camps, etc. Developed sites on public lands inside the PCA are currently inventoried and tracked in existing GIS databases. Table 2 displays the number of developed sites for each administrative unit by bear management unit (BMU) subunit as of 1998.

Activities based in statutory rights, such as oil and gas leases and mining plans of operation under the *1872 General Mining Law* are also tracked as part of the developed site monitoring effort. Mining claims and or oil and gas leases do not in and of themselves constitute a site development, but have the potential to be developed sometime in the future. It is important to note that one mining claim does not necessarily mean a potential for one operating plan. In 1998, approximately 1,354 mining claims associated with 28 plans of operation had been filed throughout nine BMU subunits; however, no oil and gas leases existed inside the PCA. Claims are often staked around known mineral deposits to protect the original claim and a single operating plan can sometimes encompass hundreds of claims. Furthermore, a number of filed claims, upon detailed exploration, do not have enough mineralization to be economically developed and consequently are never acted upon. Approved operating plans associated with mining claims or claim groups are included as a separate category in the developed site baseline

(Table 2). A detailed itemized list of all developed sites (names and types) compromising the 1998 baseline is documented in Table 3.

### Livestock Grazing

The livestock allotment standard established in the Conservation Strategy requires that there be no net increase in the number or acreage of active commercial livestock grazing allotments or in permitted sheep animal months (AMs) inside the PCA from that which existed in 1998. Existing sheep allotments will be monitored, evaluated, and phased out as the opportunity arises with willing permittees. Sheep animal months (AMs) are calculated by multiplying the permitted number of sheep times the months of permitted use.

In 1998 there were 101 active or vacant commercial livestock grazing allotments and 23,900 permitted sheep animal months (AMs) inside the PCA (Table 4). Of these, 83 were cattle and/or horse allotments and the remaining 18 were for sheep. Operational status of allotments is categorized as active, vacant, or closed. An active allotment is one with a current grazing permit, although a “no-use” permit can be granted on a year-by-year basis when a permittee chooses not to graze livestock. Vacant allotments are those without an active permit but may be used periodically by other permittees at the discretion of the land management agency to resolve resource issues or other concerns. Reissuance of permits for vacant cattle allotments may result in an increase in the number of permitted cattle but the number and acreage of active allotments inside the PCA must remain at or below 1998 baseline levels. Combining or dividing existing allotments is allowed as long as net acreage in active allotments does not increase above 1998 levels. Any such use of vacant cattle allotments resulting in an increase in cattle numbers will only be allowed after an analysis to evaluate impacts on grizzly bears. Where chronic conflicts occur on cattle allotments inside the PCA, and an opportunity exists with a willing permittee, one alternative for resolving the conflict may be to phase out cattle grazing or to move the cattle to a currently vacant allotment where there is less likelihood of conflict.

**Table 1. 1998 Baseline values (and exceptions) for percentage of open motorized access route density (OMARD), total motorized access route density (TMARD), and secure habitat for all 40 bear management unit (BMU) subunits in the Primary Conservation Area.**

<b>BMU subunit name</b>	<b>1998 % OMARD (&gt; 1 mi / mi<sup>2</sup>)</b>	<b>1998 % TMARD (&gt; 2 mi / mi<sup>2</sup>)</b>	<b>% 1998 Secure Habitat</b>	<b>Subunit area (mi<sup>2</sup>) (excluding lakes)</b>
Bechler/Teton	17.0	5.8	78.1	534.3
Boulder/Slough #1	3.2	0.3	96.6	281.9
Boulder/Slough #2	2.1	0.0	97.7	232.4
Buffalo/Spread Creek #1	11.5	5.3	88.3	219.9
Buffalo/Spread Creek #2	15.6	12.7	74.3	507.6
Crandall/Sunlight #1	19.3	7.2	81.1	129.8
Crandall/Sunlight #2	16.6	11.7	82.3	316.2
Crandall/Sunlight #3	19.2	10.6	80.4	221.8
Firehole/Hayden #1	10.4	1.7	88.3	339.2
Firehole/Hayden #2	9.0	1.5	88.4	172.2
Gallatin #1	3.6	0.5	96.3	127.7
Gallatin #2	9.5	4.5	90.2	155.2
<b>Gallatin #3*</b>	46.0*	22.9*	55.3*	217.6
Hellroaring/Bear #1	23.1	15.8	77.0	184.7
Hellroaring/Bear #2	0.1	0.0	99.5	228.9
Henry's Lake #1	49.0	31.2	45.4	191.2
<b>Henry's Lake #2*</b>	49.9*	35.2*	45.7*	140.2
Hilgard #1	29.0	15.3	69.8	201.2
Hilgard #2	21.0	13.6	71.4	140.5
Lamar #1	9.9	3.8	89.4	299.9
Lamar #2	0.0	0.0	100.0	180.8
Madison #1	29.5	12.5	71.5	227.9
<b>Madison #2*</b>	33.7*	24.0*	66.5*	149.4
Pelican/Clear #1	2.0	0.5	97.8	108.4
Pelican/Clear #2	5.4	0.4	94.1	251.6
Plateau #1	22.2	12.9	68.8	286.3
Plateau #2	8.5	3.5	88.7	419.9
Shoshone #1	1.5	1.1	98.5	122.2
Shoshone #2	1.3	0.7	98.8	132.4
Shoshone #3	3.9	2.1	97.0	140.7
Shoshone #4	5.3	2.9	94.9	188.8
South Absaroka #1	0.6	0.1	99.2	163.2
South Absaroka #2	0.0	0.0	99.9	190.6
South Absaroka #3	2.4	2.7	96.8	348.3
Thorofare #1	0.0	0.0	100.0	273.4
Thorofare #2	0.0	0.0	100.0	180.1
Two Ocean/Lake #1	3.5	0.3	96.3	371.9



<b>BMU subunit name</b>	<b>1998 % OMARD (&gt; 1 mi / mi<sup>2</sup>)</b>	<b>1998 % TMARD (&gt; 2 mi / mi<sup>2</sup>)</b>	<b>% 1998 Secure Habitat</b>	<b>Subunit area (mi<sup>2</sup>) (excluding lakes)</b>
Two Ocean/Lake #2	0.0	0.0	100.0	124.9
Washburn #1	16.1	4.2	83.0	178.3
Washburn #2	7.4	1.1	92.0	144.1
<b>Mean for PCA/Total sq. miles</b>	<b>12.7</b>	<b>6.7</b>	<b>85.6</b>	<b>9025.4</b>
<i>* Baseline values for the three subunits identified as in need of improvement (Gallatin #3, Henrys Lake #2, and Madison #2) will no longer be based on 1998 levels, but rather on improved levels based on full implementation of 2006 Travel Management Plan. See appended table below.</i>				
<b>Exceptions to 1998 Baseline (baseline values based on 2006 Gallatin National Forest Travel Management Plan levels)</b>				
<b>BMU subunit name</b>	<b>% OMARD (&gt; 1 mi / mi<sup>2</sup>)</b>	<b>% TMARD (&gt; 2 mi / mi<sup>2</sup>)</b>	<b>% Secure Habitat</b>	<b>Subunit area (mi<sup>2</sup>) (excluding lakes)</b>
Gallatin #3	28.6	12.7	70.7	217.6
Henrys Lake #2	41.5	30.6	51.7	140.2
Madison #2	32.0	21.6	67.5	149.4

**Table 2. The 1998 baseline for numbers of developed sites on public lands in each bear management subunit in the GYE<sup>1</sup>.**

Subunit	Administrative units <sup>2</sup>	Summer home complexes <sup>3</sup>	Developed campgrounds <sup>4</sup>	Trailheads	Major developed sites and lodges	Administrative or maintenance	Other <sup>5</sup>	Plans of operation <sup>5</sup>	Total sites per subunit
Bechler/Teton	CTNF	0	1	5	2	4	16	0	60
	YNP	0	0	2	0	2	2	0	
	GTNP	0	8	3	1	4	10	0	
Boulder/Slough #1	CGNF	0	1	7	0	1	3	8	20
Boulder/Slough #2	CGNF	0	0	0	0	2	0	0	9
	YNP	0	1	3	0	2	1	0	
Buffalo/Spread Creek #1	B-TNF	0	1	1	0	0	2	0	18
	GTNP	0	0	7	2	2	3	0	
Buffalo/Spread Creek #2	BTNF	1	4	3	3	5	5	1	22
Crandall/Sunlight #1	SNF	0	2	5	1	1	5	0	23
	CGNF	0	2	2	0	0	5	0	
Crandall/Sunlight #2	SNF	0	5	4	1	2	5	1	18
	CGNF	0	0	0	0	0	0	0	
Crandall/Sunlight #3	SNF	0	2	3	0	1	2	0	11
	WG&F	0	2	0	0	1	0	0	
Firehole/Hayden #1	YNP	0	1	5	1	6	13	0	26
Firehole/Hayden #2	YNP	0	1	3	1	2	8	0	15
Gallatin #1	YNP	0	0	3	0	1	0	0	4
Gallatin #2	YNP	0	2	5	1	12	1	0	21
Gallatin #3	CGNF	0	2	9	0	0	6	0	17
	YNP	0	0	0	0	0	0	0	
Hellroaring/Bear #1	CGNF	0	5	11	0	3	7	8	36
	YNP	0	0	1	0	0	1	0	
Hellroaring/Bear #2	CGNF	0	0	1	0	1	0	0	4
	YNP	0	0	0	0	2	0	0	
Henrys Lake #1	CTNF	2	3	1	0	3	10	1	20
Henrys Lake #2	CTNF	0	0	1	0	1	1	1	18
	CGNF	5	3	4	0	0	2	0	
Hilgard #1	BDNF	0	0	0	0	3	0	0	14
	CGNF	0	0	6	1	2	2	0	

Subunit	Administrative units <sup>2</sup>	Summer home complexes <sup>3</sup>	Developed campgrounds <sup>4</sup>	Trailheads	Major developed sites and lodges	Administrative or maintenance	Other <sup>5</sup>	Plans of operation <sup>5</sup>	Total sites per subunit
Hilgard #2	CGNF YNP	0 0	0 0	4 3	0 0	1 0	1 0	0 0	9
Lamar #1	YNP CGNF SNF	0 0 0	1 2 0	5 7 0	0 0 0	3 6 0	2 3 0	0 8 0	37
Lamar #2	YNP	0	0	0	0	4	0	0	4
Madison #1	CGNF YNP	0 0	1 0	11 0	0 0	1 0	8 0	0 0	21
Madison #2	CGNF YNP	8 0	2 0	1 1	1 0	4 2	5 1	0 0	25
Pelican/Clear #1	YNP	0	0	2	0	0	0	0	2
Pelican/Clear #2	YNP	0	1	4	1	4	3	0	13
Plateau #1	CTNF CGNF YNP	1 0 0	0 0 0	0 0 0	0 0 0	0 0 1	1 0 0	0 0 0	3
Plateau #2	CTNF YNP	0 0	0 0	1 0	0 0	1 4	1 0	0 0	7
Shoshone #1	SNF	1	2	0	0	0	6	0	9
Shoshone #2	SNF	0	0	1	1	0	0	0	2
Shoshone #3	SNF	2	0	1	1	0	0	0	4
Shoshone #4	SNF	3	3	3	6	0	8	0	23
South Absaroka #1	SNF	0	0	0	0	0	0	0	0
South Absaroka #2	SNF	0	0	0	0	2	0	0	2
South Absaroka #3	SNF	1	3	4	1	1	5	0	15
Thorofare #1	BTNF YNP	0 0	0 0	0 0	0 0	0 4	0 0	0 0	4
Thorofare #2	BTNF YNP	0 0	0 0	0 0	0 0	2 0	0 0	0 0	2
Two Ocean/Lake #1	YNP B-TNF GTNP	0 0 0	2 1 0	3 0 1	1 0 0	3 0 0	2 0 1	0 0 0	14

Subunit	Administrative units <sup>2</sup>	Summer home complexes <sup>3</sup>	Developed campgrounds <sup>4</sup>	Trailheads	Major developed sites and lodges	Administrative or maintenance	Other <sup>5</sup>	Plans of operation <sup>5</sup>	Total sites per subunit
Two Ocean/Lake #2	YNP BTNF	0 0	0 0	0 0	0 0	2 1	0 1	0 0	4
Washburn #1	YNP	0	2	8	2	7	6	0	25
Washburn #2	YNP	0	1	6	0	1	4	0	12
<b>Primary Conservation Area</b>	<b>All</b>	<b>24</b>	<b>67</b>	<b>161</b>	<b>28</b>	<b>117</b>	<b>168</b>	<b>28</b>	<b>593</b>

<sup>1</sup>Note, figures in this table represent the most current information available on the number of developed sites for each administrative unit as of 1998. This table replaces Figure 125 in Appendix A of the USDA Forest Service, Forest Plan Amendment for Grizzly Bear Habitat Conservation for The Greater Yellowstone Area National Forests, Final Environmental Impact Statement (USDA Forest Service 2006) and Table 4 in Appendix F of the 2007 Final Conservation Strategy for the Grizzly Bear in the Greater Yellowstone Area (U.S. Fish and Wildlife Service 2007).

<sup>2</sup> Abbreviations for administrative units: BDNF = Beaverhead-Deerlodge National Forest, BTNF = Bridger-Teton National Forest, CTNF = Caribou-Targhee National Forest, CGNF = Custer- Gallatin National Forest, GTNP = Grand Teton National Park, SNF = Shoshone National Forest, WG&F = Wyoming Game and Fish, YNP = Yellowstone National Park.

<sup>3</sup>Single permitted recreation residences are classified as other developed sites in this table.

<sup>4</sup> Campgrounds with trailheads are sometimes combined and treated as single developed sites.

<sup>5</sup> Includes developed recreation sites, as well as community infrastructure sites, dams, and other miscellaneous facilities.

<sup>6</sup>Includes mining claims with plans of operation. Currently, not all sites have active projects.

**Table 3. Developed sites (type and name) comprising the 1998 baseline per Bear Management Subunit inside the PCA.**

Bear Management subunit	Admin Unit	Name and type of developed sites
Bechler/Teton #1	CTNF	<b>Developed Campgrounds:</b> Cave Falls. <b>Trailheads:</b> Coyote Meadows, Hominy Peak, S. Boone Creek, Fish Lake, Cascade Creek. <b>Major Developed Sites:</b> Loll Scout Camp, Idaho Youth Services Camp. <b>Administrative or Maintenance Sites:</b> Squirrel Meadows Guard Station/Cabin, Porcupine Guard Station, Badger Creek Seismograph Site, Squirrel Meadows GS/WY Game & Fish Cabin. <b>Other Developed Sites:</b> Grassy Lake Dam, Tillery Lake Dam, Indian Lake Dam, Bergman Res. Dam, Loon Lake Disperse sites, Horseshoe Lake Disperse sites, Porcupine Creek Disperse sites, Gravel Pit/Target Range, Boone Creek Disperse Sites, Tillery Lake O&G Camp, Calf Creek O&G Camp, Bergman O&G Camp, Granite Creek Cow Camp, Poacher's TH, Indian Meadows TH, McRenolds Res. TH/Wildlife Viewing Area/Dam.
	YNP	<b>Trailheads:</b> 9K1 and Cave Falls. <b>Administrative or Maintenance Sites:</b> South Entrance, Bechler Ranger Stations. <b>Other Developed Sites:</b> Union Falls, Snake River picnic areas.
	GTNP	<b>Developed Campgrounds:</b> Grassy Lake Road campsites (8 individual car camping sites). <b>Trailheads:</b> Glade Creek, Lower Berry Creek, Flagg Canyon. <b>Major Developed Sites:</b> Flagg Ranch (lodge, cabins and campground including remote cistern and sewage treatment plant sites). <b>Administrative or Maintenance Sites:</b> Flagg Ranch Ranger Station, employee housing, maintenance yard, Snake River pit road construction staging area. <b>Other Developed Sites:</b> 3 Backcountry cabins (Upper Berry, Lower Berry, and Moose Basin), 5 Backcountry campsites {Berry Designated Horse Camp, 4 Jackson Lake designated campsites (1 group and 3 individual)}, 2 boat launches (Flagg Ranch and Yellowstone South Entrance).
Boulder/Slough #1	CGNF	<b>Developed Campgrounds:</b> Hicks Park. <b>Trailheads:</b> Goose Lake/Grasshopper Glacier, Upsidedown Creek, Independence, Sheep Creek, Copper Creek, Bridge Creek, Box Canyon. <b>Administrative or Maintenance Sites:</b> Box Canyon. <b>Other Developed Sites:</b> 2 recreation residences (Rasnick and Mandeville), Independence Mine Site (no plan of operations). <b>Plans of Operation:</b> Carolyn, Cray, East Iron Mtn Beartooth Plateau 1, East Iron Mtn Beartooth Plateau 2, Iron Mountain Idaho Construction Metal, Crescent Creek Pan Palladium, Crescent Creek Chromium Corp America, Crescent Creek Beartooth Platinum.
Boulder/Slough #2	CGNF	<b>Administrative or Maintenance Sites:</b> Slough Creek, Buffalo Fork Cabins.
	YNP	<b>Developed Campgrounds:</b> Slough Creek. <b>Trailheads:</b> Specimen ridge, Slough Creek, Lamar Ford. <b>Administrative or Maintenance Sites:</b> Elk Tongue, Lower Slough patrol cabins. <b>Other Developed Sites:</b> Yellowstone River picnic area.
Buffalo/Spread Creek #1	BTNF	<b>Developed Campgrounds:</b> Pacific Creek CG/TH. <b>Trailheads:</b> Colter Dump. <b>Other Developed Sites:</b> Teton Horseback Adventures, Shoal Creek Outfitters Base Camp.
	GTNP	<b>Trailheads:</b> Grand View Point, Two Ocean Lake, Christian Pond, Arizona Creek #1, Pilgrim Creek, Arizona Lake, Arizona Creek #2. <b>Major Developed Sites:</b> Moran Entrance Station housing, Jackson Lake housing. <b>Administrative or Maintenance Sites:</b> Moran Entrance Ranger Station, Jackson Lake Ranger Station. <b>Other Developed Sites:</b> Moran Post Office, Moran School, Colter Bay storage/staging area.

Bear Management subunit	Admin Unit	Name and type of developed sites
Buffalo/Spread Creek #2	BTNF	<b>Summer Home Complex:</b> Turpin Meadows. <b>Developed Campgrounds:</b> Box Creek CG/TH, Hatchet, Turpin Meadows, Angles CG/TH. <b>Trailheads:</b> Turpin Meadows, Lava Creek, Clear Creek. <b>Major Developed Sites:</b> Heart Six Ranch, Turpin Meadows Ranch, Togwotee Lodge. <b>Administrative or Maintenance Sites:</b> Buffalo Ranger District Office, Buffalo Ranger District Compound (Includes a gravel pit), Enos Lake Patrol Cabin, Nowlin Meadows Patrol Cabin, Hatchet administrative site. <b>Other Developed Sites:</b> UW Forestry Walk VIS, Four Mile Picnic Area, Lost Lake Info Station, Togwotee Overlook, Historic ranger station. <b>Plans of Operation:</b> 1 gravel pit
Crandall/Sunlight #1	SNF	<b>Developed Campgrounds:</b> Beartooth, Island Lake. <b>Trailheads:</b> Beartooth Lake, Island Lake, Clay Butte, Muddy Creek, Morrison Jeep. <b>Major Developed Sites:</b> Top of the World Store complex. <b>Administrative or Maintenance Sites:</b> YNP highway maintenance site (includes 2 summer residences). <b>Other Developed Sites:</b> Island Lake Boat Ramp, Beartooth Lake Boat Ramp, Clay Butte Lookout, Pilot/Index Overlook, Beartooth Lake Picnic Area.
	CGNF	<b>Developed Campgrounds:</b> Chief Joseph, Ovis Lake Road Camp. <b>Trailheads:</b> Broadwater, Clarks Fork Foot Trailhead. <b>Other Developed Sites:</b> Arbor Day Watchable Wildlife site, Kersey Lake rental cabin and boat dock, Round Lake rental cabin/warming hut, Clarks Fork fishing platform and interpretive exhibit, 1 recreation residence (summer home).
Crandall/Sunlight #2	SNF	<b>Developed Campgrounds:</b> Fox Creek, Lake Creek, Hunter Peak, Crazy Creek, Lily Lake Campsites. <b>Trailheads:</b> Pilot Creek, Clarks Fork, North Crandall, Crazy Creek. <b>Major Developed Sites:</b> K-Z Lodge. <b>Administrative or Maintenance Sites:</b> Crandall admin site (2 residences, office, shop and bunkhouse), Crandall Game and Fish Cabin. <b>Other Developed Sites:</b> Crandall waste transfer site, Clarks Fork Overlook, Lily Lake Boat ramp, Swamp Lake Boat Ramp, Reef Creek Picnic Area. <b>Plan of Operations:</b> Commercial sale gravel pit at Ghost Creek for Beartooth Hwy Construction.
	CGNF	<b>No Developed Sites.</b>
Crandall/Sunlight #3	SNF	<b>Developed Campgrounds:</b> Dead Indian, Little Sunlight. <b>Trailheads:</b> Little Sunlight trailhead and corrals, Dead Indian, Hoodoo Basin/Lamar. <b>Administrative or Maintenance Sites:</b> Sunlight Ranger Station. <b>Other Developed Sites:</b> Sunlight Picnic Area, Sunlight Bridge Overlook.
	WG&F	<b>Developed Campgrounds:</b> Sunlight Unit Campground #1, Sunlight Unit Campground #2. <b>Administrative or Maintenance Sites:</b> Sunlight Unit Complex.
Firehole/Hayden #1	YNP	<b>Developed Campgrounds:</b> Madison Junction. <b>Trailheads:</b> Nez Perce Cr, 7-Mile Bridge, Fountain freight road, Lone Star, OK5. <b>Major Developed Sites:</b> Old Faithful. <b>Administrative or Maintenance Sites:</b> Norris employee/gov't area, Norris hot mix plant, Madison employee/gov't site, Mesa Pit site, Mary Lake patrol cabin, Nez Perce patrol cabin. <b>Other Developed Sites:</b> Norris, Gibbon Meadows, Tuft Cliffs, Gibbon Falls, Madison, Buffalo Ford, Cascade, Firehole Canyon, Nez Perce, Feather Lake, Goose Lake, Excelsior picnic areas, Norris Geyser Basin Museum.
Firehole/Hayden #2	YNP	<b>Developed Campgrounds:</b> Bridge Bay. <b>Trailheads:</b> Divide, Beach Lake, DeLacy Creek. <b>Major Developed Sites:</b> Lake. <b>Administrative or Maintenance Sites:</b> Lake gov't area, Bridge Bay Marina. <b>Other Developed Sites:</b> Gull Point, Sand Point picnic areas with 6 additional lakeshore picnic areas.
Gallatin #1	YNP	<b>Trailheads:</b> WK2, WK3, and WK6. <b>Administrative or Maintenance Sites:</b> Daly Creek patrol cabin.

Bear Management subunit	Admin Unit	Name and type of developed sites
Gallatin #2	YNP	<b>Developed Campgrounds:</b> Mammoth, Indian Creek. <b>Trailheads:</b> Rescue Creek, Lava Creek, Golden Gate, Bunsen Peak, Fawn Pass. <b>Major Developed Sites:</b> Mammoth. <b>Administrative or Maintenance Sites:</b> Stephens Creek area, Gardiner gravel crusher/asphalt site, Xanterra headquarters site in Gardiner, Lower Mammoth employee housing area, YCC employee housing area, Indian Creek pit site, Deaf Jim patrol cabin, North Entrance Ranger Station, Fawn Pass patrol cabin, Winter Creek patrol cabin, Bunsen Peak radio repeater site, Mt Holmes fire lookout. <b>Other Developed Sites:</b> Sheepeater picnic area.
Gallatin #3	CGNF	<b>Developed Campgrounds:</b> Tom Miner, Red Cliff. <b>Trailheads:</b> Buffalo Horn, Sphinx Creek, Elkhorn, Wilson Draw, Tom Miner, Tom Miner Horse Facilities, Sunlight, Twin Cabin, Tepee Creek. <b>Other Developed Sites:</b> Corwin Spring fishing and boat access, Yankee Jim fishing access and boat ramp, Elkhorn River Ford (horse access), Windy Pass rental cabin, Yankee Jim picnic area, Porcupine Creek recreation residence.
	YNP	<b>No Developed Sites.</b>
Hellroaring/Bear #1	CGNF	<b>Developed Campgrounds:</b> Eagle Creek campground, Eagle Creek horse facility, Bear Creek, Timber Camp, Canyon. <b>Trailheads:</b> Cedar Creek, LaDuke, Little Trail Creek, Pine Creek, Palmer Mt. (3 trailheads), North Fork of Bear Creek, Joe Brown, Bear Creek, Sixmile. <b>Administrative or Maintenance Sites:</b> OTO Ranch, Blanding Station house and barn (horse facility), Hayes/McPherson property. <b>Other Developed Sites:</b> LaDuke picnic area, LaDuke bighorn sheep watchable wildlife site, 1 recreation cabin, Lonesome Pond camping area, McConnell fishing and boat access, Watchable Wildlife-Big Game Winter Range, Watchable Wildlife Site-fish. <b>Plans of Operation:</b> Counts (1), Mineral Hill Mine (3), and (2), Independence (1), Livingston (1).
	YNP	<b>Trailheads:</b> Crevice. <b>Other Developed Sites:</b> Crevice Cabin.
Hellroaring/Bear #2	CGNF	<b>Trailheads:</b> West Fork Mill Creek. <b>Administrative or Maintenance Sites:</b> Hellroaring cabin and tack shed.
	YNP	<b>Administrative or Maintenance Sites:</b> Buffalo Plateau and Hellroaring patrol cabins.
Henry's Lake #1	CTNF	<b>Summer Home Complexes:</b> Big Springs SHA North, Big Springs SHA South. <b>Developed Campgrounds:</b> Big Springs, Flat Rock, Upper Coffee Pot. <b>Trailheads:</b> Howard Creek. <b>Administrative or Maintenance Sites:</b> Sawtelle Peak Electronics Site, Keg Springs Seismograph Site, Big Springs Fire Tower. <b>Other Developed Sites:</b> Big Springs Interpretive Trail, Big Springs Bridge Fish Viewing, Johnny Sack Cabin, Big Springs Boat Ramp, Big Springs Snow Park/Warming Hut, Macks Inn Water Treatment Plant, Macks Inn Substation, County/State Sheds Complex, FAA Maintenance Sheds, Cold Springs Substation. <b>Plans of Operation:</b> Willow Creek Mining Site.
Henry's Lake #2	CTNF	<b>Trailheads:</b> Targhee Creek. <b>Administrative or Maintenance Sites:</b> Defosses Cabin. <b>Other Developed Sites:</b> Howard Springs Family Picnic/Wayside Area. <b>Plans of Operation:</b> Turquoise Mountain Mine.
	CGNF	<b>Summer Home Complexes:</b> Clark Springs (8 lots), Rumbaugh Ridge (5), Romsett (9), Lonsomehurst A, Lonsomehurst B. <b>Developed Campgrounds:</b> Lonsomehurst, Cherry Creek, Spring Creek. <b>Trailheads:</b> Basin, Watkins Creek, Targhee Pass, West Denny Creek. <b>Other Developed Sites:</b> Basin rental cabin, Lonsomehurst boat ramp, Reas Pass day use site.
Hilgard #1	BDNF	<b>Administrative or Maintenance Sites:</b> McAtee Cabin, Indian Creek Cow Camp, Shedhorn Cow Camp.
	CGNF	<b>Trailheads:</b> Upper Buck Ridge, Cinnamon, Meadow Creek Cutoff, Cache Creek, Lower Buck Ridge, Taylor Falls/Lightning Creek. <b>Major Developed Sites:</b> Covered Wagon Ranch. <b>Administrative or Maintenance Sites:</b> Cinnamon Cabin, Cinnamon Mountain Lookout. <b>Other Developed Sites:</b> Yellow Mule Rental Cabin, Buck Creek Recreation Residence.

Bear Management subunit	Admin Unit	Name and type of developed sites
Hilgard #2	CGNF	<b>Trailheads:</b> Eldridge, Wapiti, Lower Wapiti/Albino Lake, Sage/Elkhorn. <b>Administrative or Maintenance Sites:</b> Eldridge Cabin. <b>Other Developed Sites:</b> Wapiti rental cabin.
	YNP	<b>Trailheads:</b> WK1, WK5, WK4.
Lamar #1	YNP	<b>Developed Campgrounds:</b> Pebble Creek. <b>Trailheads:</b> 3K1, 3K3, 3K4, Trout Lake, Lamar. <b>Administrative or Maintenance Sites:</b> Northeast Entrance Ranger Station and supporting gov't operation, Lamar Buffalo Ranch Ranger Station/Institute, Cache Creek patrol cabin. <b>Other Developed Sites:</b> Warm Creek picnic area, Buffalo Ranch/Lamar River picnic area.
	CGNF	<b>Developed Campgrounds:</b> Soda Butte, Colter. <b>Trailheads:</b> Republic Creek, Lower Lady of Lake with parking lot, Lady of Lake 1, Woody Pass, Daisy Pass, Lost Wolverine, Abundance Lake/upper Stillwater . <b>Administrative or Maintenance Sites:</b> Cooke City guard station and warehouse, 2 <sup>nd</sup> Forest Service warehouse, Highway borrow pit, mine tailings repository, old mine buildings at Woody Pass trailhead, mine reclamation pond. <b>Other Developed Sites:</b> Cooke City dump (SUP), Beartooth Highway Interpretive site (near Silver Gate), Cooke City burn pile. <b>Plans of Operation:</b> 7 distinct New World Mine plans, Cray Placer.
	SNF	<b>No Developed Sites.</b>
Lamar #2	YNP	<b>Administrative or Maintenance Sites:</b> Calfee Creek, Upper Miller Creek, Cold Creek, and Lamar Mountain patrol cabins.
Madison #1	CGNF	<b>Campgrounds:</b> Cabin Creek. <b>Trailheads:</b> Potamogeton, West Fork Beaver Creek, Whit's Lake, Johnson Lake, Tepee Creek (Hebgen RD), Red Canyon, Kirkwood, Cub Creek, Fir Ridge, Hebgen Mountain, Cabin Creek. <b>Administrative or Maintenance Sites:</b> Building Destruction Site. <b>Other Developed Sites:</b> gravel pit, Tepee Creek snowmobile parking area, Watchable Wildlife Site at Beaver Creek, Beaver Creek rental cabin, Cabin Creek rental cabin, Hebgen Dam fishing access and admin site, Yellowstone Holiday picnic area, North Shore picnic area.
	YNP	<b>No Developed Sites.</b>
Madison #2	CGNF	<b>Summer Home Complexes:</b> California (2 lots), Lakeshore A (6), Lakeshore B (8), Lakeshore C (3), Lakeshore E (19), Baker's Hole (3), Railroad (3), Horse Butte (2). <b>Developed Campgrounds:</b> Rainbow Point, Baker's Hole (includes watchable wildlife site). <b>Trailheads:</b> Rendezvous Ski Trail (includes 2 cabins and a biathlon range). <b>Major Developed Sites:</b> Madison Arm Resort. <b>Administrative or Maintenance Sites:</b> West Yellowstone Ranger Station, WY Interagency Fire Center (Includes crew quarters IAFCC, fire control center and mixing site), Bison capture facility (SUP), Game Warden Residence. <b>Other Developed Sites:</b> Solid Waste Transfer Station (SUP), Madison picnic area/boat ramp, Rainbow Point picnic area/boat ramp, Horse Butte Lookout/Picnic Site, South Plateau shooting range.
	YNP	<b>Trailhead:</b> Cable Car. <b>Administrative or Maintenance Sites:</b> West Entrance Ranger Station/housing complex, Cougar Cr patrol cabin. <b>Other Developed Sites:</b> Madison River picnic area.
Pelican/Clear #1	YNP	<b>Trailheads:</b> Lower Falls, Sour Creek.
Pelican/Clear #2	YNP	<b>Developed Campgrounds:</b> Fishing Bridge RV Park. <b>Trailheads:</b> Pelican Valley, 9-mile, Clear Creek, Avalanche Peak. <b>Major Developed Sites:</b> Fishing Bridge store/gas station/employee housing/museum. <b>Administrative or Maintenance Sites:</b> East Gate Ranger Station/housing complex, Fern Lake patrol cabin, Pelican Cone patrol cabin, Pelican Springs patrol cabins. <b>Other Developed Sites:</b> Steamboat Point, Lake Butte, Sylvan Lake picnic areas.



Bear Management subunit	Admin Unit	Name and type of developed sites
Plateau #1	CTNF	<b>Summer Home Complexes:</b> Moose Creek SHA. <b>Other Developed Sites:</b> Lucky Dog Lodge/TNC/SUP
	CGNF	<b>No Developed Sites.</b>
	YNP	<b>Administrative or Maintenance Sites:</b> South Riverside patrol cabin.
Plateau #2	CTNF	<b>Developed Campgrounds:</b> None. <b>Trailheads:</b> Moose Creek/Trail Canyon. <b>Administrative or Maintenance Sites:</b> Warm River Springs GS/Cabin. <b>Other Developed Sites:</b> Snow Creek Pond Disperse sites.
	YNP	<b>Administrative or Maintenance Sites:</b> Cove, Outlet, Three Rivers, and Buffalo Lake patrol cabins.
Shoshone #1	SNF	<b>Summer Home Complexes:</b> Moss Creek (7 lots). <b>Developed Campgrounds:</b> Newton Creek and Rex Hale. <b>Other Developed Sites:</b> One summer home across from Newton Creek Campground (isolated lot E), Fire Memorial, Robbers Roost Cabin (Cow Camp), Newton Springs Picnic Area, Blackwater Pond Picnic/Fishing Area, Palisades Interpretive Site.
Shoshone #2	SNF	<b>Trailheads:</b> Blackwater. <b>Major Developed Sites:</b> Blackwater Lodge.
Shoshone #3	SNF	<b>Summer Home Complexes:</b> Eagle Creek (8 lots), Kitty Creek (14 lots). <b>Trailheads:</b> Kitty Creek. <b>Major Developed Sites:</b> Buffalo Bill Boy Scout Camp.
Shoshone #4	SNF	<b>Summer Home Complexes:</b> Grinnell Creek (2lots), Pahaska (2 lots), Mormon Creek (13 lots). <b>Developed Campgrounds:</b> Eagle Creek, Three Mile, Sleeping Giant. <b>Trailheads:</b> Fishhawk North, Eagle Creek, Pahaska. <b>Major Developed Sites:</b> Elephant Head Lodge, Absaroka Mountain Lodge, Shoshone Lodge, Cross Sabers Lodge, Goff Creek Lodge, Pahaska Tepee. <b>Other Developed Sites:</b> Sleeping Giant ski area, Wyoming Game and Fish cabin, Wayfarers Chapel, 1 summer home near Game and Fish cabin (50 Mile, isolated lot C), summer home lot A, summer home lot B (both lots are across from Eagle Creek summer home complex), West Gateway Interpretive Site, Cody Peak Interpretive Site.
South Absaroka #1	SNF	<b>No Developed Sites.</b>
South Absaroka #2	SNF	<b>Administrative or Maintenance Sites:</b> Venus Creek Cabin, Needle Creek Administrative site (includes 2 cabins).
South Absaroka #3	SNF	<b>Summer Home Complexes:</b> Pinnacles (20 lots). <b>Developed Campgrounds:</b> Brooks Lake, Pinnacles, dispersed campground near Brooks Lake Campground. <b>Trailheads:</b> Long Creek/Dunoir, Brooks Lake, Pinnacles Trailhead, Bonneville. <b>Major Developed Sites:</b> Brooks Lake Lodge. <b>Administrative or Maintenance Sites:</b> Wolf Creek. <b>Other Developed Sites:</b> Brooks Lake boat ramp, transfer corral/Bud Betts, Transfer Corral/Paul Gilroy, Transfer Corral/Bridger Teton Outfitter on Brooks Lake Creek, Winter Cabin/warming hut.
Thorofare #1	BTNF	<b>No Developed Sites.</b>
	YNP	<b>Administrative or Maintenance Sites:</b> Cabin Creek, Howell Creek, Trail Creek, and Thorofare patrol cabins.
Thorofare #2	BTNF	<b>Administrative or Maintenance Sites:</b> Hawk's Rest patrol cabin, <b>WY G&amp;F patrol cabin.</b>
	YNP	<b>No Developed Sites.</b>
Two Ocean/Lake #1	YNP	<b>Developed Campgrounds:</b> Lewis Lake, Grant Village. <b>Trailheads:</b> Shoshone Lake, Heart Lake, Riddle Lake. <b>Major Developed Sites:</b> Grant Village. <b>Administrative or Maintenance Sites:</b> Heart Lake patrol cabin, Harebell patrol cabin, Mt Sheridan fire lookout. <b>Other Developed Sites:</b> West Thumb warming hut, Frank Island picnic area.
	BTNF	<b>Developed Campgrounds:</b> Sheffield Creek Campground/Trailhead.
	GTNP	<b>Trailheads:</b> Sheffield Creek. <b>Other Developed Sites:</b> Snake River Picnic Area.
Two Ocean/Lake #2	YNP	<b>Administrative or Maintenance Sites:</b> Peale Island and Fox Creek patrol cabins.

Bear Management subunit	Admin Unit	Name and type of developed sites
	BTNF	<b>Administrative or Maintenance Sites:</b> Fox Park Patrol Cabin. <b>Other Developed Sites:</b> Huckleberry Lookout Historic Site on edge of Two Ocean Lake #2 and Buffalo/Spread Creek #1.
Washburn #1	YNP	<b>Developed Campgrounds:</b> Tower and Canyon Village. <b>Trailheads:</b> Lower Blacktail, Upper Blacktail, Blacktail Plateau Rd/ski trail, Hellroaring, Wraith Falls, Mount Washburn, Dunraven Pass, Howard Eaton. <b>Major Developed Sites:</b> Canyon Village complex, Roosevelt Lodge complex. <b>Administrative or Maintenance Sites:</b> Frog Rock pit, Grebe Lake pit, Tower Ranger Station (Includes maintenance building and employee housing), Upper Blacktail, Lower Blacktail, and Observation Park patrol cabins; Mount Washburn fire lookout. <b>Other Developed Sites:</b> the Lava Creek, Antelope Creek, Dunraven Pass, Dunraven, and Howard Eaton picnic areas; Yancey's Hole cookout site.
Washburn #2	YNP	<b>Developed Campgrounds:</b> Norris. <b>Trailheads:</b> Bighorn Pass, Winter Creek, Solfatara Creek, Grizzly, Grebe, Ice Lakes. <b>Administrative or Maintenance Sites:</b> Ice Lake gravel pit. <b>Other Developed Sites:</b> Apollinaris Springs, Beaver Lake, Norris Junction, and Virginia Meadows picnic areas.

**Table 5. Number and acreage of commercial livestock grazing allotments and number of sheep animal months inside the Yellowstone Primary Conservation Area (PCA) in 1998.**

Administrative unit	Cattle Allotments		Sheep Allotments		Sheep AMs
	Active	Vacant	Active	Vacant	
Beaverhead-Deerlodge NF	3	2	0	0	0
Bridger-Teton NF	9	0	0	0	0
Caribou-Targhee NF	11	1	7	4	14,163
Custer-Gallatin NF	23	10	2	4	3,540
Shoshone NF	25	0	2	2	5,387
Grand Teton NP	1	0	0	0	0
Total number in PCA	72	13	11	10	23,090
<b>Total area in PCA (acres)</b>	<b>660,845</b>	<b>67,893</b>	<b>148,368</b>	<b>77,665</b>	<b>NA</b>
<b>Total area in PCA (km<sup>2</sup>)</b>	<b>2,674</b>	<b>275</b>	<b>600</b>	<b>312</b>	<b>NA</b>

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