Wilderness Vegetation Database

Frank Church River of No Return
Selway-Bitterroot
Gospel Hump
Sawtooth

Compiled by:
Calvin Farris and Leon Neuenschwander

University of Idaho

Contains GIS themes (ARC/INFO grid format) of vegetation type, life form, canopy cover, tree size slope, elevation, and aspect.

Main Salmon Complex Fire, 1998 (photo courtesy of Salmon Challis National Forest)

VEGETATION DATABASE FOR CENTRAL IDAHO WILDERNESS AREAS: A SUMMARY

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INTRODUCTION

Spatial vegetation data is an important component of any resource management database. The use of satellite imagery provides a powerful tool to map and analyze vegetation characteristics across large spatial scales. This technology can be particularly useful for developing vegetation inventories in large wilderness areas where remote, rugged terrain has traditionally hampered data collection. Digital vegetation maps derived from satellite imagery are easily incorporated with additional digital data sources (such as digital elevation models and hydrologic layers) into GIS databases and can be used to address and analyze a variety of natural resource management scenarios.

In 1997, the Wildlife Spatial Analysis Lab at the University of Montana (Redmond et al. 1997) classified vegetation and land cover for an approximately eight million acre area in central Idaho using Landsat Thematic Mapper (TM) satellite imagery. The boundaries of Idaho's four major wilderness areas were included within the analysis area (Frank Church River of No Return, Gospel Hump, Selway-Bitterroot, and Sawtooth). One major advantage of this project was the creation of a single, uniform vegetation classification that extends across all wilderness areas and their surrounding landscapes.

To make this data more readily available and useable for students and faculty, vegetation and land cover attributes were extracted from the raw classified images and combined with topographic data into one convenient database on a CD. This data can be useful to quantify broad-scale landscape patterns, supplement plot-level field inventories, analyze ecological phenomena related to vegetation patterns, and to stratify existing environmental conditions during the study design process. This purpose of this report is to provide a brief overview of this database, including the data and directory structure, and present a tabular and spatial (map) summary of the vegetation and topographic data for each wilderness unit.

DATA STRUCTURE

The following vegetation and land cover attributes were classified for each wilderness area: cover type (e.g., vegetation type), canopy cover, tree size, and life form (general land cover type). Canopy cover is divided into four broad categories: open (10-33%), moderate (34-66%), dense (>67%), and not forested. Tree size is divided into four categories: sapling tree (<5 in. dbh), small conifer (5-8 in dbh), medium conifer (9-21 in. dbh), and large (>21 in. dbh). A complete list of attribute definitions for cover type and the classification decision rules are available in the final report by the Wildlife Spatial Analysis Lab (Redmond 1997). A readme file (readme.txt) containing more detailed information is included on the CD.

All classified data was obtained from the Wildlife Spatial Analysis Lab in the form of a composite GIS (ARC/INFO) GRID. Each unique spectral cluster was assigned a unique internal "region" identity (starting from the upper left corner) and included approximately 28 attributes which summarized the TM signatures, statistical probability, classification probability, and raw digital numbers. As a result, these grids were extremely large and contained much ancillary data that was not directly useable for most purposes.

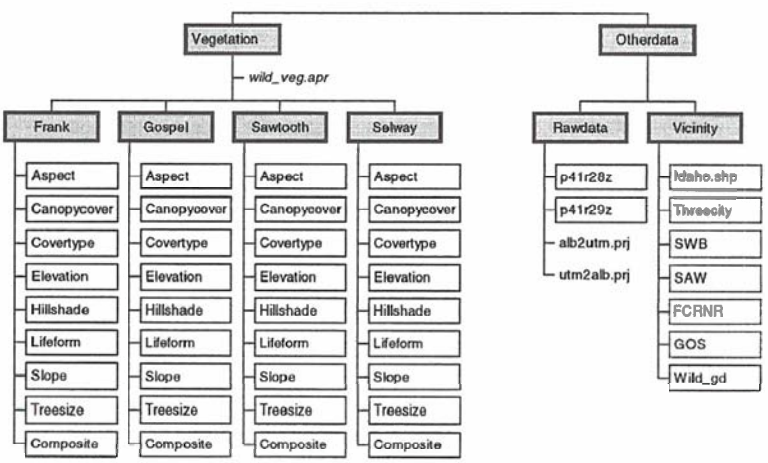
To simplify this data into a more easily useable format, each GRID was resampled using a sequential clustering AML which extracted only a single attribute from each GRID and assigned it a vegetation attribute corresponding to the value attribute table. This process was done for all four vegetation and land cover attributes (covertype, canopycover, treesize, and lifeform). The result is a separate GIS GRID for each attribute. This greatly reduced the size of the coverage and allowed easier display and manipulation of each type of data. All original data is included on the CD in the "rawdata" directory.

Rather than repeat this process for topography, 30 minute digital elevation models (DEM) were acquired. This was done because the topographic data in the raw grids was reported as the mean value for each spectral cluster, or the majority value in the case of aspect. The raw DEM's were classified into integer slope and aspect grids using basic GRID functions. All GRIDs were projected to UTM zone 11 to correspond with existing GIS data layers in this area.

DIRECTORY STRUCTURE

The overall directory structure is outlined in Figure 1. All data for each wilderness was placed into a separate directory. The raw region group GRID's from which the data was extracted are included in the "rawdata" directory. General vicinity information such as the state boundary and individual wilderness boundaries are included under the "vicinity" directory.

Figure 1. *Directory structure of the wilderness vegetation CD ROM. Grey shaded boxes are data directories, clear boxes with solid outlines are GIS ARC/INFO GRID coverages located under each directory, and clear boxes with dotted outlines are ARC/INFO vector coverages. All other files are denoted by their extension (*.apr = arcview project; *.prj = projection files).*



DATA SUMMARY

The following tables and graphs summarize the vegetative and topographic attributes of the four wilderness areas. The tabular and graphical data was exported directly from the value attribute tables of each GRID in the database. Vegetation and land cover attributes are shown on both an area (hectares) and percentage basis (proportion of total area). The topographic data was all converted to a percent frequency histogram to show the relative relationships of slope, elevation and aspect between and within each unit. A series of maps are also included to provide a broad spatial overview of vegetative and topographic patterns across the landscape.

Table 1. Vegetation in central Idaho wilderness areas derived from Landsat TM satellite image classification

Gospel Hump Wilderness

Cover Type	*area (ha)*	*% area*
mixed subalpine	22,173	26.59%
mixed mesic forest	10,750	12.89%
lodgepole pine	9,011	10.81%
upland grassland	5,796	6.95%
Douglas fir	5,287	6.34%
mesic shrub	4,612	5.53%
rock	4,440	5.32%
grand fir	3,872	4.64%
Douglas fir/lodgepole pine	3,812	4.57%
montana/subalpine grassla	2,903	3.48%
mixed whitebark pine	2,461	2.95%
ponderosa pine	1,891	2.27%
barren	1,655	1.99%
altered grassland	1,442	1.73%
Douglas fir/ponderosa pine	1,062	1.27%
mixed broadleaf/conifer	615	0.74%
sagebrush	491	0.59%
aspen	417	0.50%
conifer riparian	376	0.45%
shrub riparian	180	0.22%
water	60	0.07%
grass riparian	51	0.06%
broadleaf riparian	25	0.03%
Total	*83,382*	*100%*

Selway-Bitterroot Wilderness

Cover Type	*area (ha)*	*% area*
mixed subalpine	88,722	20.03%
mixed mesic forest	81,786	18.46%
lodgepole pine	57,820	13.05%
mesic shrub	46,274	10.45%
Douglas fir	34,296	7.74%
rock	28,003	6.32%
grand fir	23,434	5.29%
Douglas fir/lodgepole pine	21,097	4.76%
upland grassland	13,207	2.98%
montana/subalpine grassland	11,974	2.70%
ponderosa pine	8,648	1.95%
Douglas fir/ponderosa pine	6,821	1.54%
barren	5,198	1.17%
mixed whitebark pine	4,465	1.01%
sagebrush	3,164	0.71%
altered grassland	3,076	0.69%
mixed broadleaf/conifer	2,698	0.61%
aspen	1,785	0.40%
shrub riparian	202	0.05%
grass riparian	182	0.04%
broadleaf riparian	166	0.04%
Total	*443,018*	*100%*

Sawtooth Wilderness

Cover Type	*area (ha)*	*% area*
rock	30,121	34.20%
mixed whitebark pine	11,068	12.57%
lodgepole pine	7,686	8.73%
mixed subalpine	7,479	8.49%
montana/subalpine grassland	6,692	7.60%
whitebark pine	6,234	7.08%
Douglas fir	4,312	4.90%
barren	3,562	4.04%
sagebrush	3,527	4.00%
Douglas fir/ponderosa pin	1,385	1.57%
aspen	1,300	1.48%
mesic shrub	1,067	1.21%
mixed xeric forest	1,023	1.16%
mixed broadleaf/conifer	713	0.81%
Douglas fir/lodgepole pine	641	0.73%
ponderosa pine	607	0.69%
upland grassland	501	0.57%
grass riparian	46	0.05%
grassriparian	31	0.03%
grass riparian	27	0.03%
subalpine fir	16	0.02%
rock	10	0.01%
broadleaf riparian	9	0.01%
grass riparian	5	0.01%
montana/subalpine grassland	4	0.00%
grass riparian	3	0.00%
mountain mahogany	1	0.00%
montana/subalpine grasslad	1	0.00%
conifer riparian	0.2	0.00%
Total	*88,073*	*100%*

Frank Church River of No Return Wilderness

Cover Type	*area (ha)*	*% area*
lodgepole pine	161,280	16.86%
mixed subalpine	130,152	13.60%
Douglas fir	111,636	11.67%
mixed whitebark pine	75,131	7.85%
Douglas fir/ponderosa pine	71,089	7.43%
Douglas fir/lodgepole pine	63,974	6.69%
sagebrush	48,884	5.11%
montana/subalpine grassla	34,344	3.59%
mixed xeric forest	33,433	3.49%
rock	28,871	3.02%
barren	27,615	2.89%
ponderosa pine	23,898	2.50%
mixed mesic forest	22,900	2.39%
mesic shrub	22,773	2.38%
upland grassland	22,587	2.36%
whitebark pine	16,856	1.76%
mixed broadleaf/conifer	15,156	1.58%
mountain mahogany	10,162	1.06%
aspen	6,670	0.70%
conifer forest	5,245	0.55%
high intensity fire	5,198	0.54%
grand fir	4,083	0.43%
Douglas fir/grand fir	3,782	0.40%
altered grassland	2,989	0.31%
moderate fire	2,693	0.28%
conifer riparian	1,818	0.19%
shrub riparian	1,667	0.17%
water	1,114	0.12%
broadleaf riparian	533	0.06%
grass riparian	97	0.01%
broadleaf/conifer riparian	65	0.01%
cloud	15	0.002%
cloud / shadow	14	0.001%
Total	*956,726*	*100%*

Table 2. Vegetative characteristics in four central Idaho wilderness areas derived from satellite image analysis.

a) Life Form

LIFEFORM	Gospel Hump	%	Selway-Bitterroot	%	Sawtooth	%	Frank Church	%
Tree	61,751	74%	331,672	75%	43,998	50%	755,593	79%
Shrub	5,284	6%	49,640	11%	4,467	5%	83,487	9%
Grass	10,192	12%	28,439	6%	7,278	8%	60,017	6%
Barren	**1,655**	**2%**	**5,198**	**1%**	**3,141**	**4%**	**27,615**	**3%**
Rock	4,440	5%	28,003	6%	28,368	32%	28,871	3%
Water	60	0.1%	65	0.0%	889	1.0%	1,114	0.1%
Total	83,382	100%	443,018	100%	88,142	100%	956,697	100%

b) Tree Size

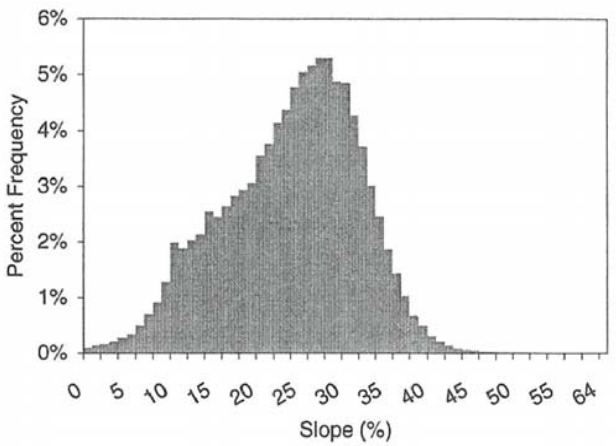
TREESIZE	Gospel Hump	%	Selway-Bitterroot	%	Sawtooth	%	Frank Church	%
not conifer	23,064	28%	118,480	27%	49,266	56%	233,266	24%
sapling tree (<5 in dbh)	4,504	5%	29,249	7%	3,318	4%	55,614	6%
small tree (5-8 in dbh)	27,209	33%	109,893	25%	28,797	33%	387,630	41%
medium tree (9-21 in dbh)	26,071	31%	168,092	38%	4,725	5%	179,901	19%
large tree (>21 in dbh)	2,535	3%	17,327	4%	2,036	2%	100,315	10%
Total	83,382	100%	443,040	100%	88,142	100%	956,726	100%

c) Forest Canopy Cover

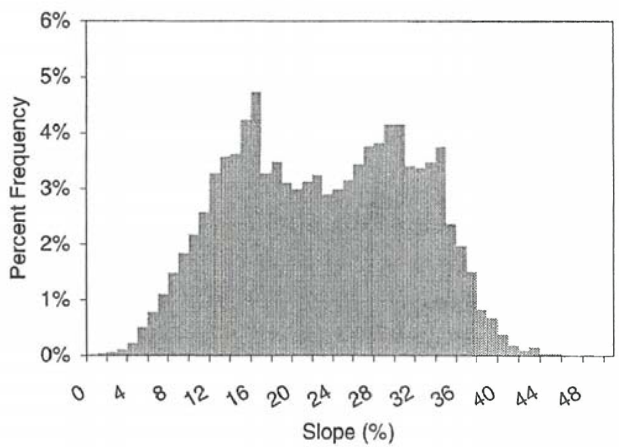
CANOPY COVER	Gospel Hump	%	Selway-Bitterroot	%	Sawtooth	%	Frank Church	%
not forested or shrubs	16,928	20%	118,183	27%	43,573	49%	129,620	14%
open	31,263	37%	76,015	17%	18,703	21%	428,828	45%
moderate	15,206	18%	159,987	36%	1,634	2%	155,235	16%
dense	19,984	24%	88,306	20%	24,231	27%	243,043	25%
Total	83,382	100%	443,040	100%	88,142	100%	956,726	100%

Slope Distribution of central Idaho wilderness areas

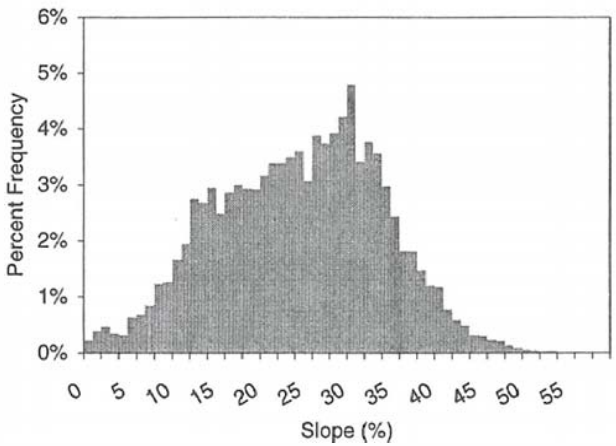
Frank Church River of No Return



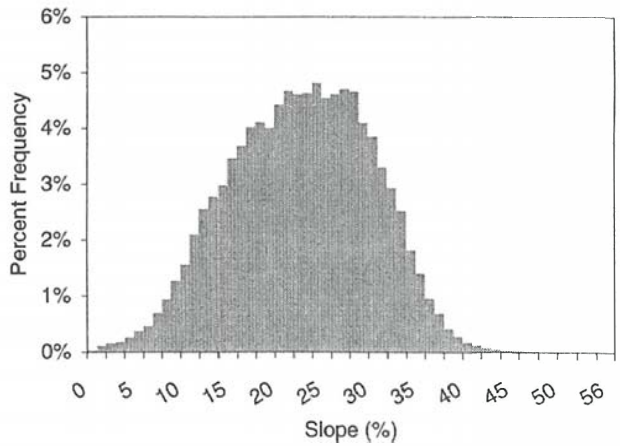
Gospel Hump



Sawtooth

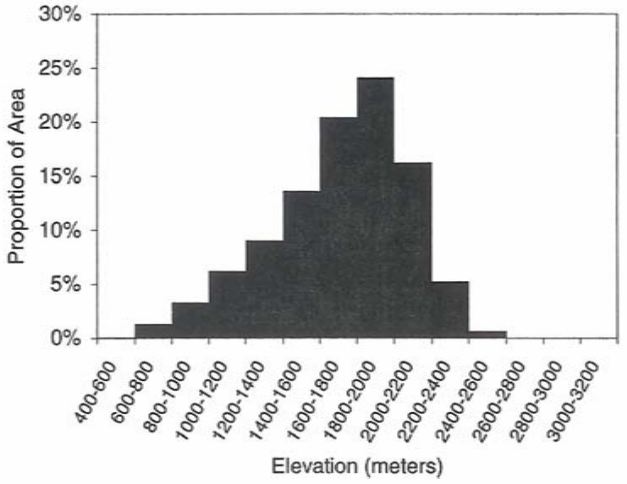


Selway-Bitterroot

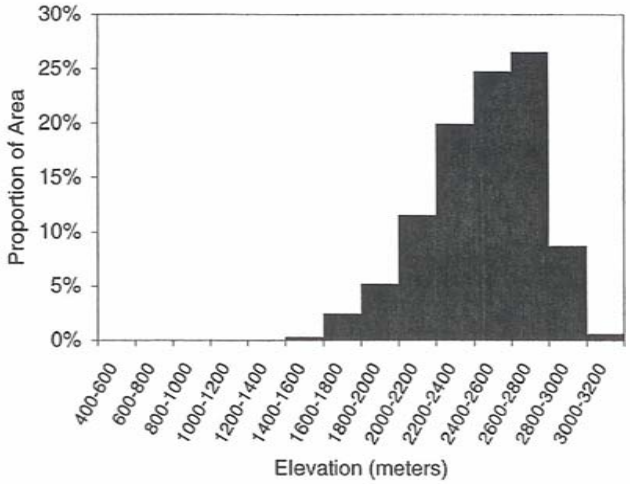


Elevation Distribution of central Idaho wilderness areas

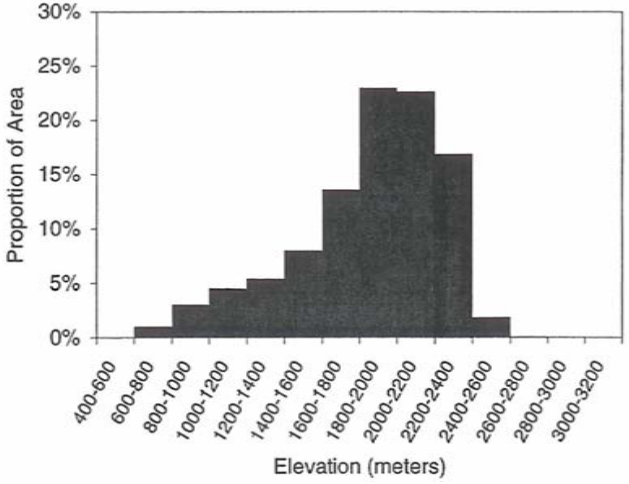
Sel tterroot



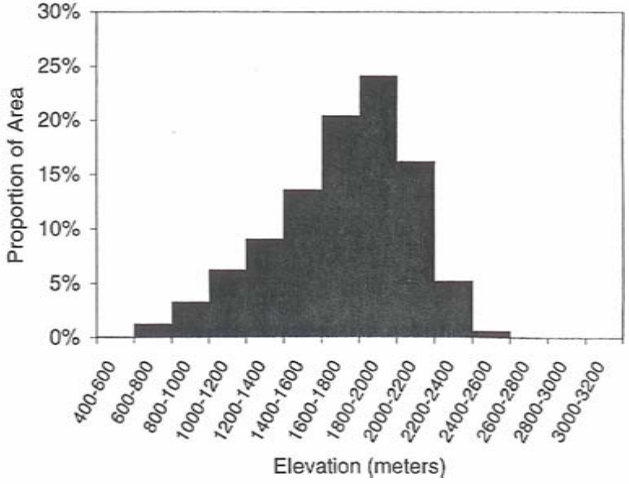
Sawtooth



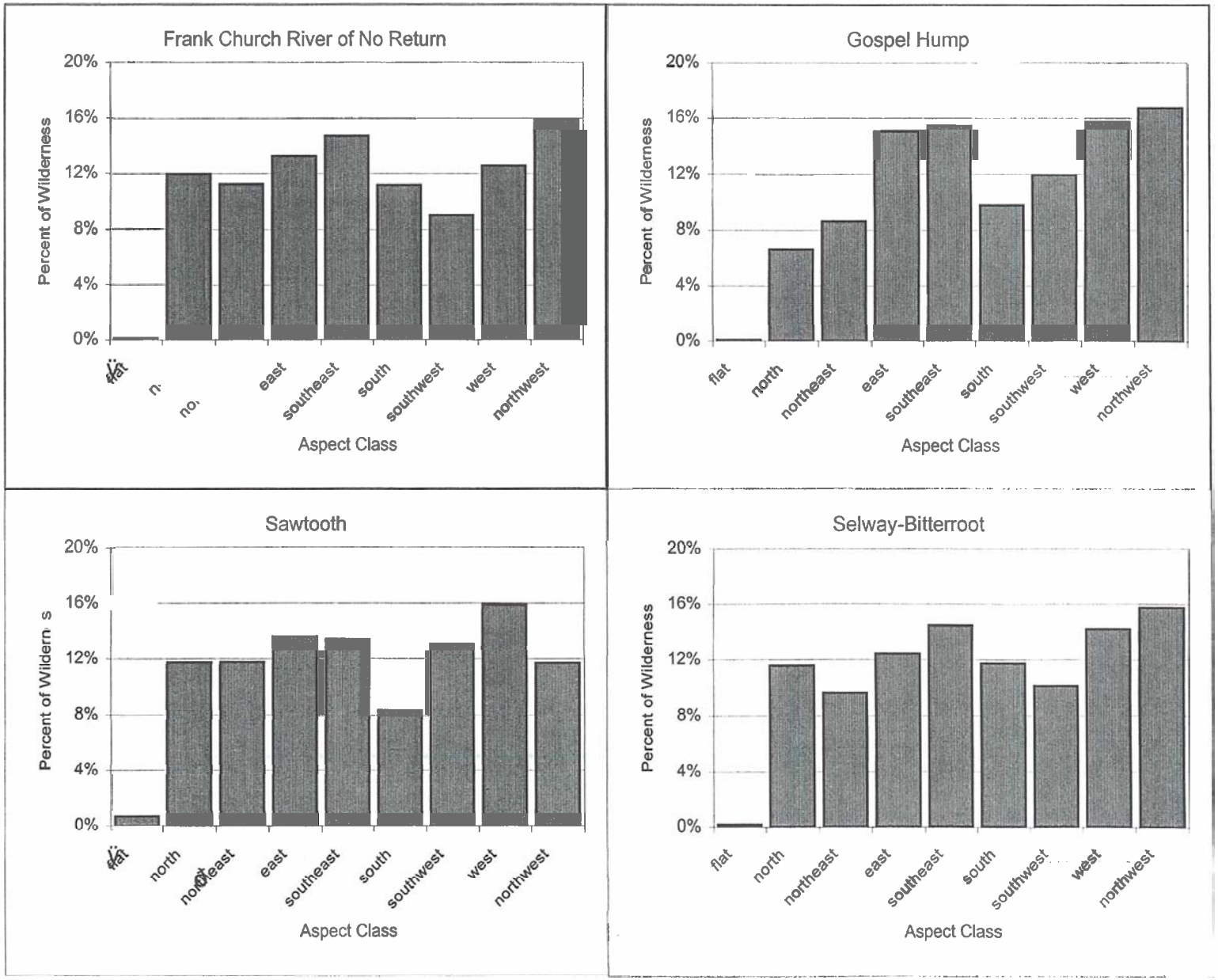
Gospel Hump



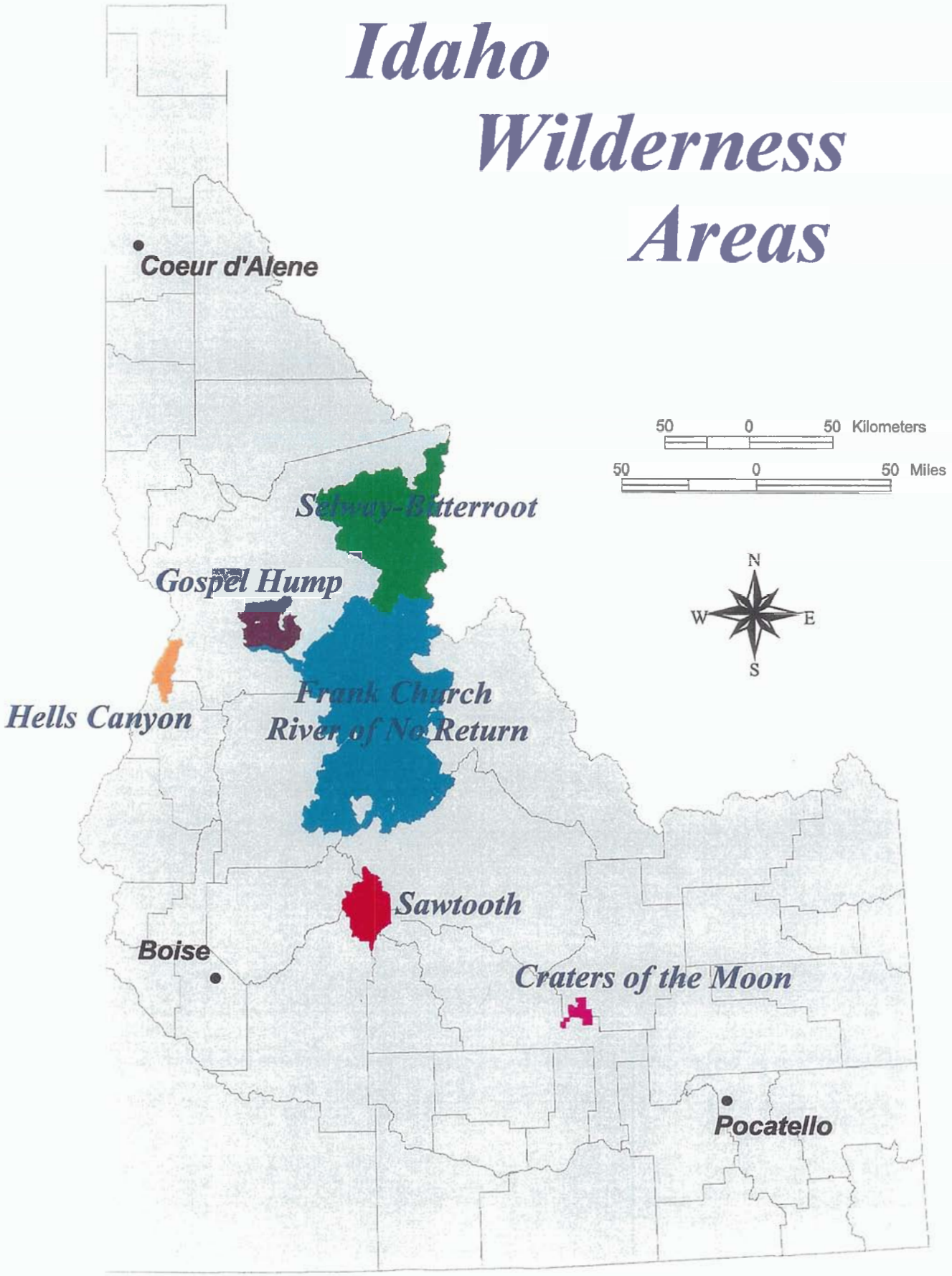
Frank Church River of No Return



Aspect class distribution of central Idaho wilderness areas



Idaho Wilderness Areas



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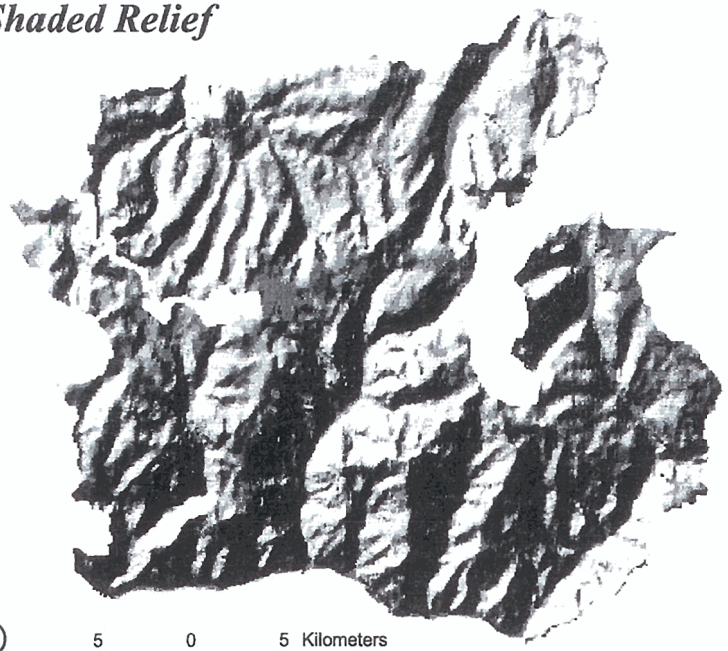
Topographic Profile of the Gospel Hump Wilderness, Idaho

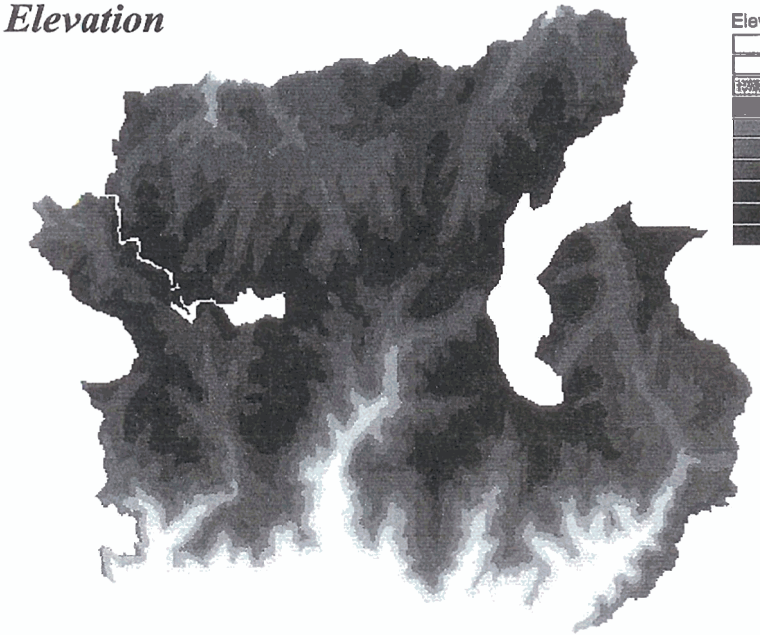
Shaded Relief



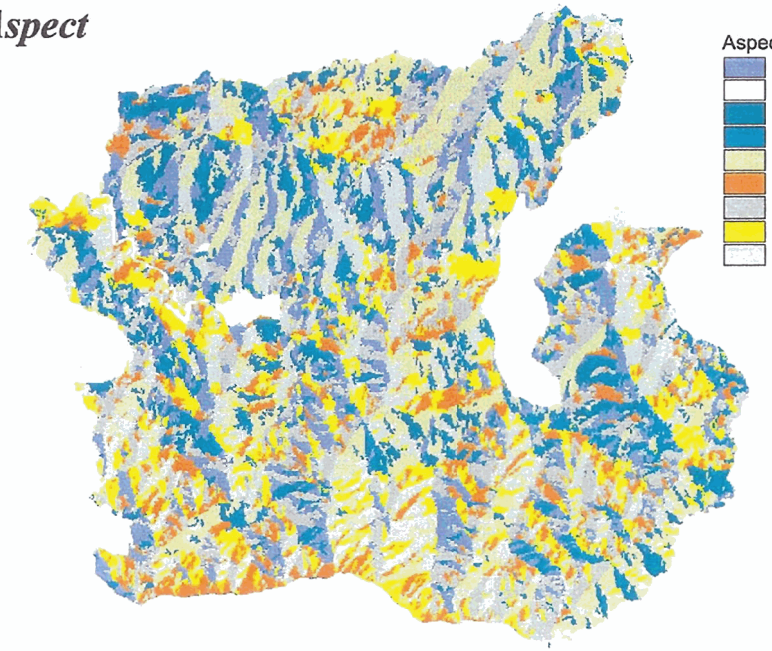
5 0 5 Kilometers

Slope

Elevation



Aspect



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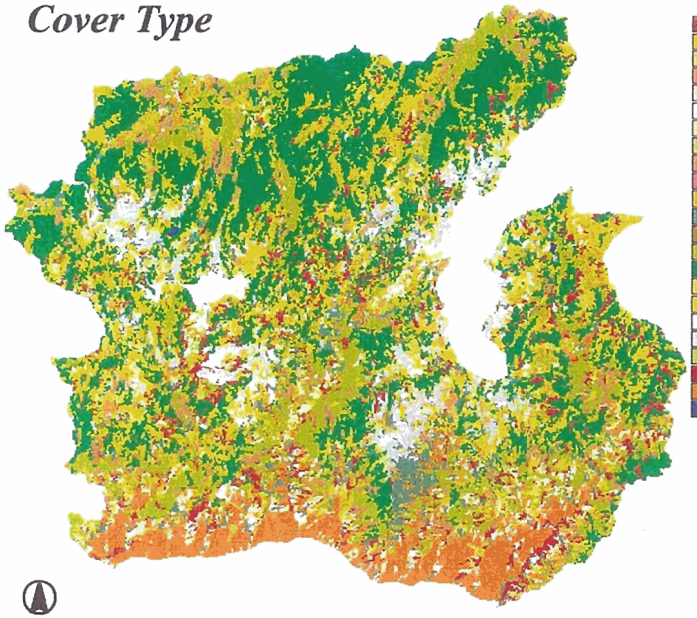
Vegetation Profile of the Gospel Hump Wilderness, Idaho

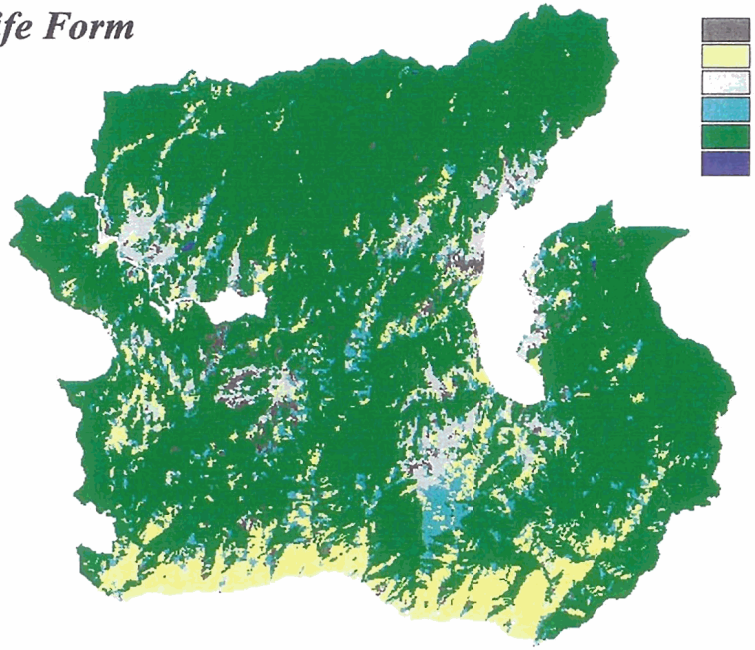
Cover Type



- Douglas fir
- Douglas fir/lodgepole pine
- Douglas fir/ponderosa pine
- altered grassland
- aspen
- barren
- broadleaf riparian
- conifer riparian
- grand fir
- grass riparian
- lodgepole pine
- mesic shrub
- mixed broadleaf/conifer
- mixed mesic forest
- mixed subalpine
- mixed whitebark pine
- montana/subalpine grassland
- ponderosa pine
- rock
- sagebrush
- shrub riparian
- upland grassland
- water

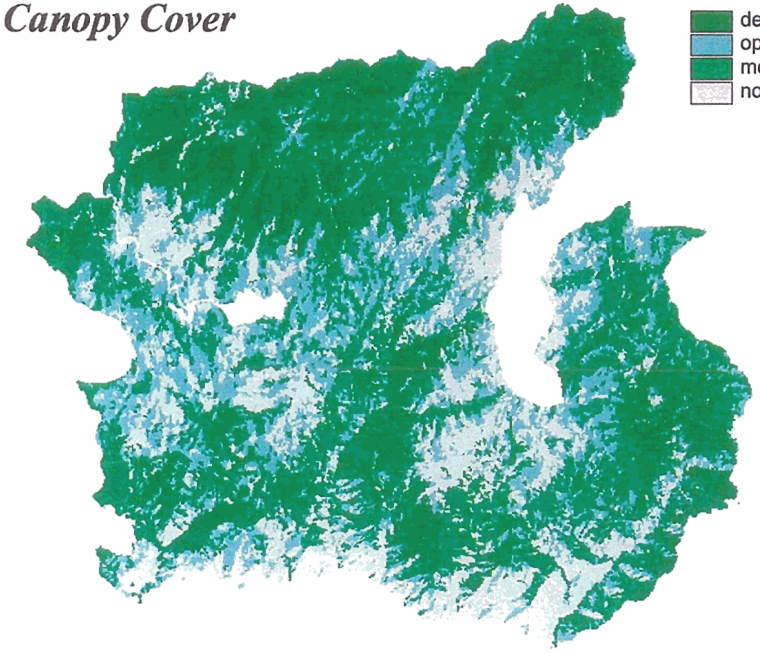
5 0 5 Kilometers

Life Form



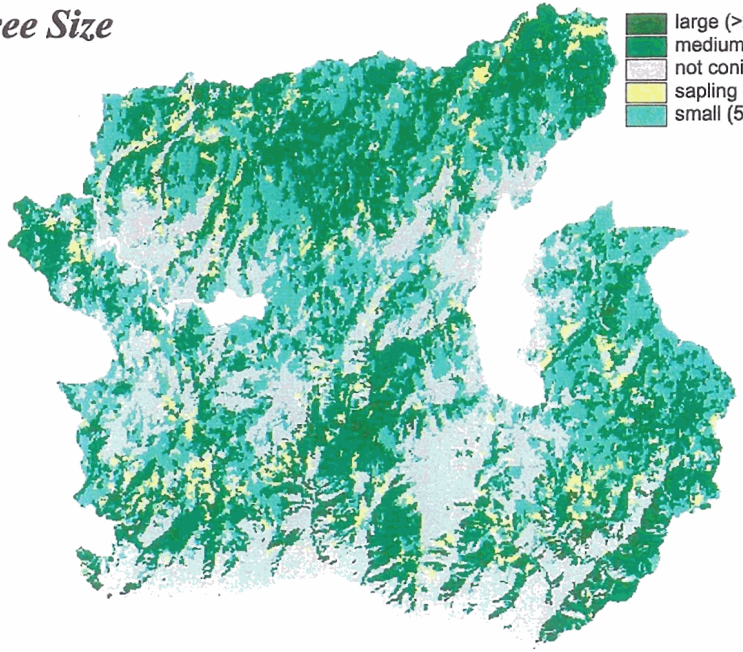
- barren
- grass
- rock
- shrub
- tree
- water

Canopy Cover



- dense
- open
- moderate
- not forested

Tree Size



- large (>21 in dbh)
- medium (9-21 in dbh)
- not conifer
- sapling (<5 in dbh)
- small (5-8 in dbh)

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Topographic Profile of the Sawtooth Wilderness, Idaho

Shaded Relief

10 0 10 Kilometers

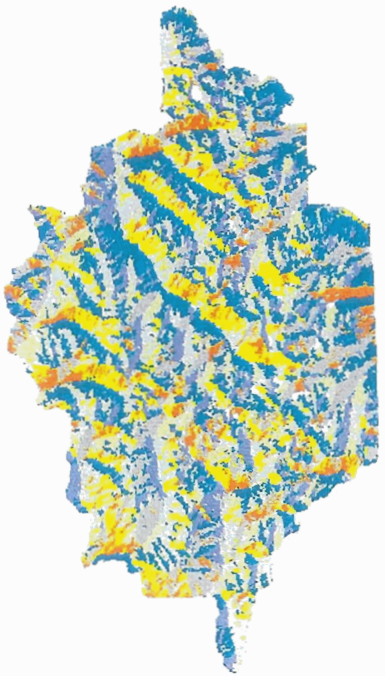
Slope

Slope (degrees)
- 0 - 8
- 9 - 15
- 16 - 20
- 21 - 25
- 26 - 29
- 30 - 34
- 35 - 39
- 40 - 44
- 45 - 61

Elevation

Elevation (meters)
- 1600 - 1800
- 1800 - 1900
- 1900 - 2100
- 2100 - 2300
- 2300 - 2400
- 2400 - 2600
- 2600 - 2800
- 2800 - 2900
- 2900 - 3100
- 3100 - 3284

Aspect



Aspect
- east
- flat
- north
- northeast
- northwest
- south
- southeast
- southwest
- west

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Topograp

Shaded Rel

Elevation

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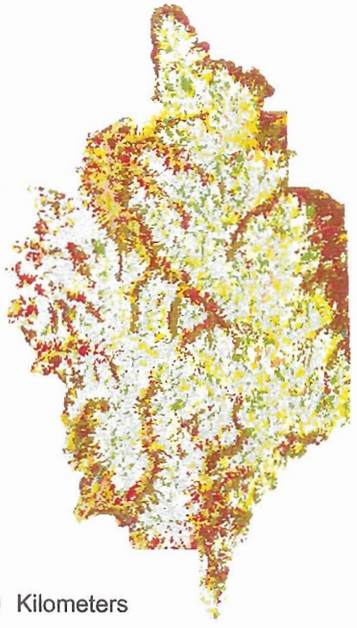
Vegetation Profile of the Sawtooth Wilderness, Idaho

Cover Type



- Douglas fir
- Douglas fir/lodgepole pine
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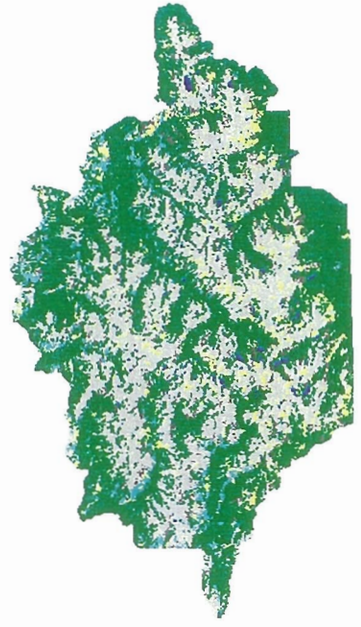
- aspen
- barren
- broadleaf riparian
- conifer riparian
- grass riparian
- grassriparian
- lodgepole pine
- mesic shrub
- mixed broadleaf/conifer
- mixed subalpine
- mixed subalpine forest
- mixed whitebark pine
- mixed xeric forest
- montana/subalpine grassland
- mountain mahogany
- ponderosa pine
- rock
- sagebrush
- subalpine fir
- upland grassland
- whitebark pine

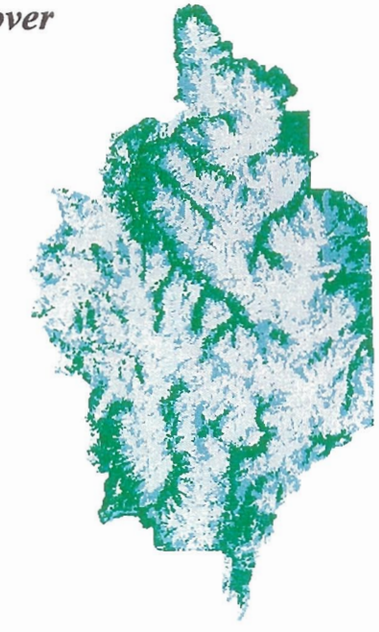
5 0 5 10 Kilometers

Life Form



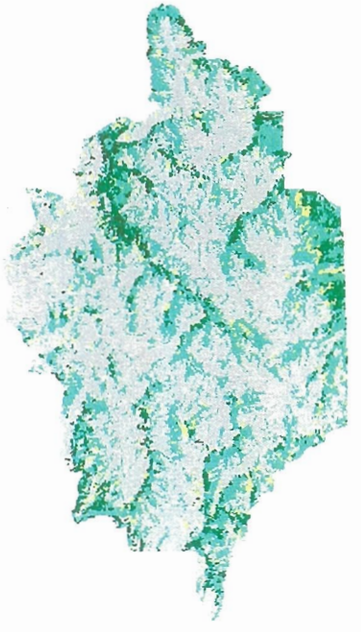
- barren
- grass
- rock
- shrub
- tree
- water

Canopy Cover



- dense
- open
- moderate
- not forested

Tree Size



- large (>21 in dbh)
- medium (9-21 in dbh)
- not conifer
- sapling (<5 in dbh)
- small (5-8 in dbh)

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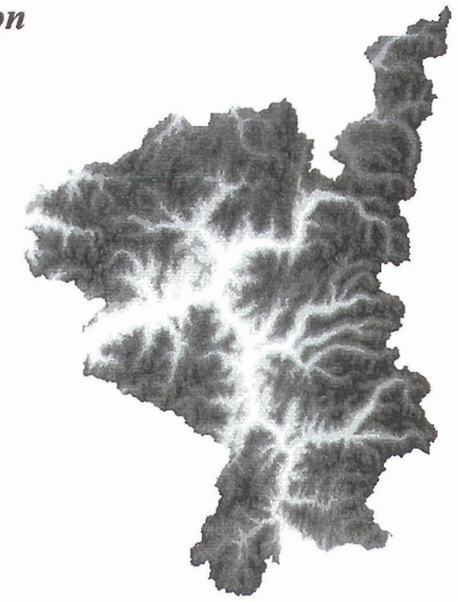
Topographic Profile of the S

Shaded Relief

10 0

Elevation



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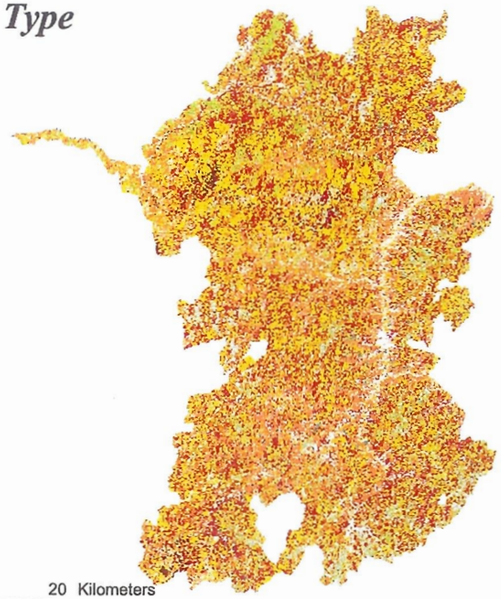
Vegetation Profile of the Frank Church River of No Return Wilderness, Idaho

Cover Type



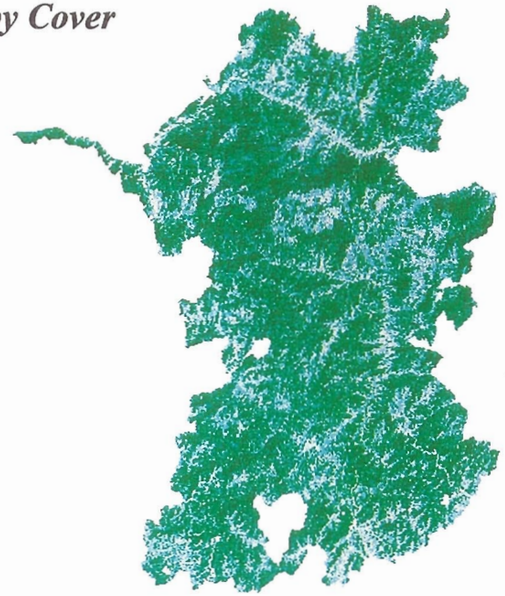
- Douglas fir
- Douglas fir/grand fir
- Douglas fir/lodgepole pine
- Douglas fir/ponderosa pine
- altered grassland
- aspen
- barren
- broadleaf riparian
- broadleaf/conifer riparian
- cloud
- cloud / shadow
- conifer forest
- conifer riparian
- grand fir
- grass riparian
- high intensity fire
- lodgepole pine
- mesic shrub
- mixed broadleaf/conifer
- mixed mesic forest
- mixed subalpine
- mixed whitebark pine
- mixed xeric forest
- moderate fire
- montana/subalpine grassland
- mountain mahogany
- ponderosa pine
- rock
- sagebrush
- shrub riparian
- upland grassland
- water
- whitebark pine

20 0 20 Kilometers

Life Form

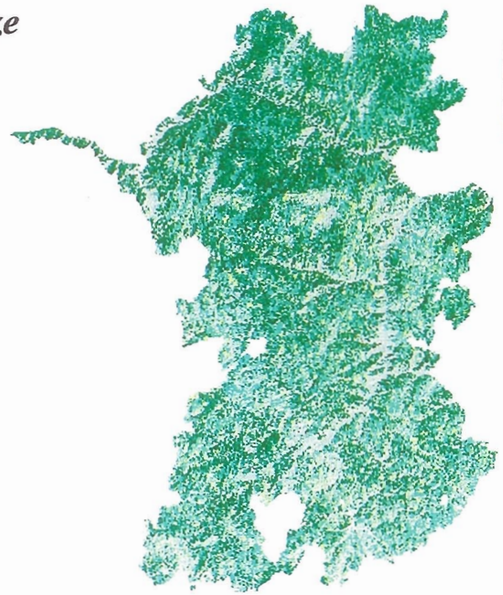
- barren
- grass
- rock
- shrub
- tree
- water

Canopy Cover



- dense
- open
- moderate
- not forested

Tree Size



- large (>21 in dbh)
- medium (9-21 in dbh)
- not conifer
- sapling (<5 in dbh)
- small (5-8 in dbh)

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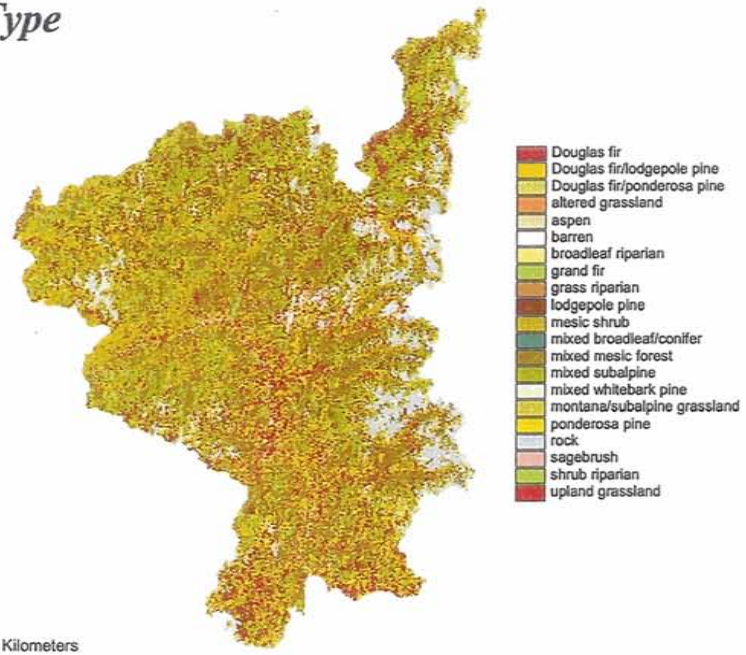
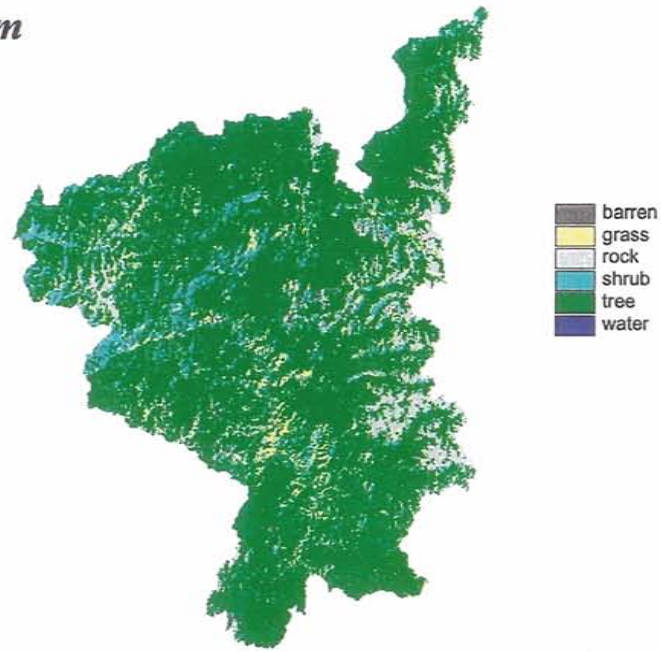
Vegetation Profile of the Selway-Bitterroot Wilderness, Idaho

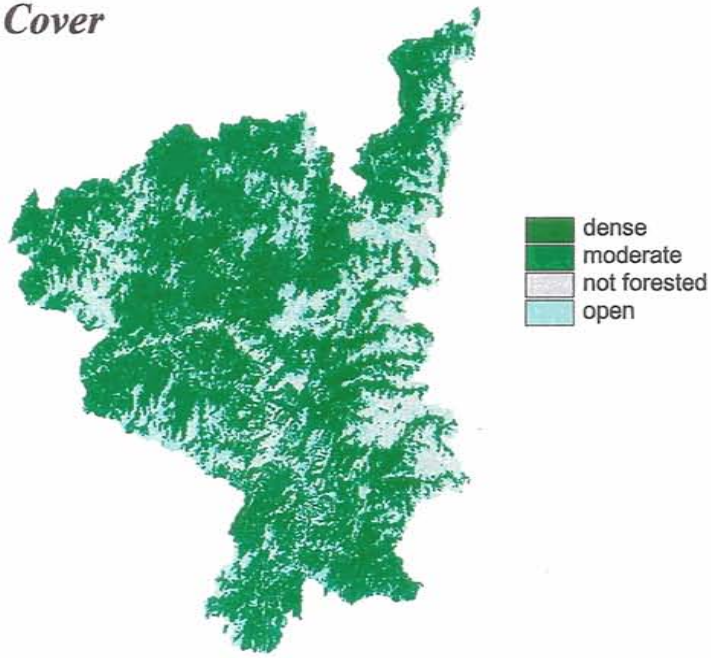
Cover Type



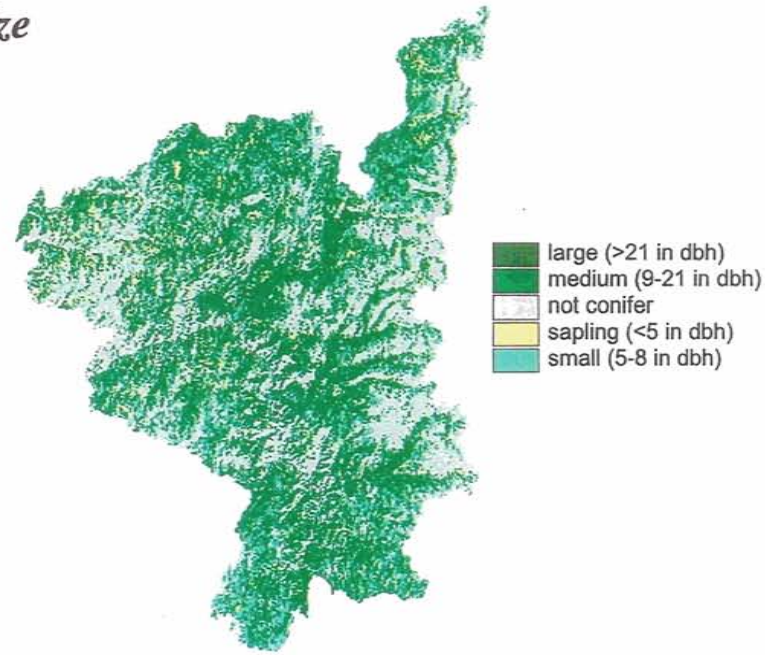
Life Form



Canopy Cover



Tree Size



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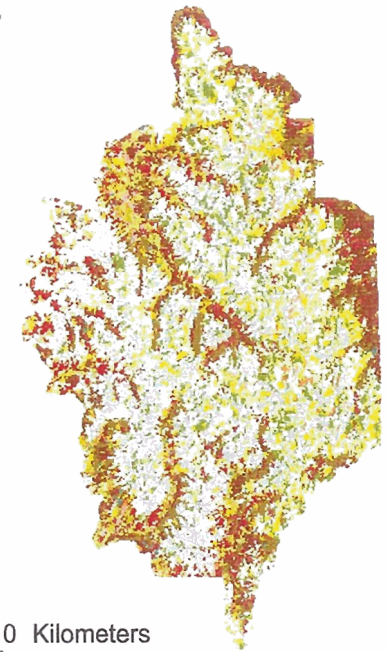
Vegetation Profile of the Sawtooth Wilderness, Idaho

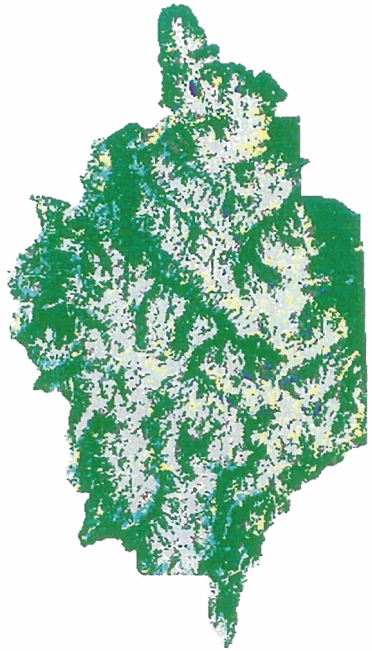
Cover Type



- Douglas fir
- Douglas fir/lodgepole pine
- Douglas fir/ponderosa pine
- aspen
- barren
- broadleaf riparian
- conifer riparian
- grass riparian
- grassriparian
- lodgepole pine
- mesic shrub
- mixed broadleaf/conifer
- mixed subalpine
- mixed subalpine forest
- mixed whitebark pine
- mixed xeric forest
- montana/subalpine grassland
- mountain mahogany
- ponderosa pine
- rock
- sagebrush
- subalpine fir
- upland grassland
- whitebark pine

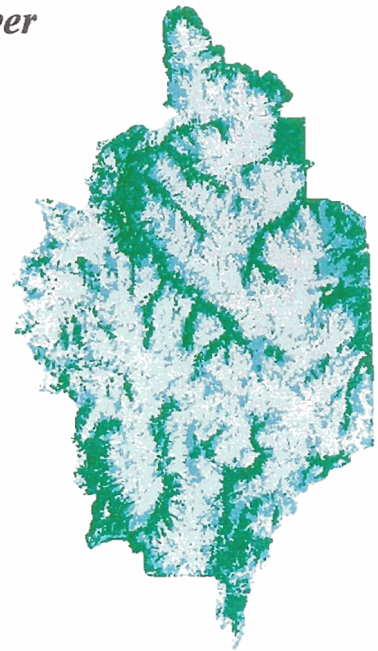
5 0 5 10 Kilometers

Life Form



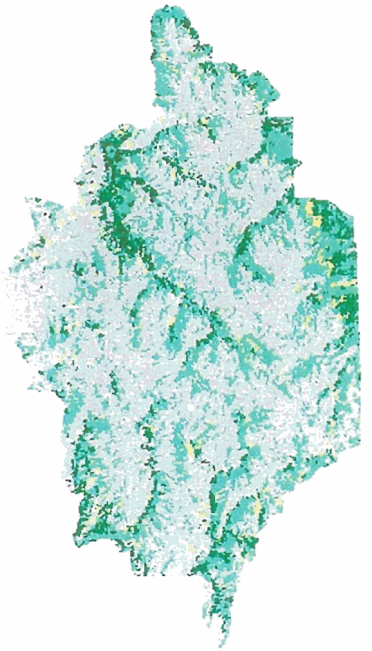
- barren
- grass
- rock
- shrub
- tree
- water

Canopy Cover



- dense
- open
- moderate
- not forested

Tree Size



- large (>21 in dbh)
- medium (9-21 in dbh)
- not conifer
- sapling (<5 in dbh)
- small (5-8 in dbh)

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Topographic Profile of the Frank Church River of No Return Wilderness, Idaho

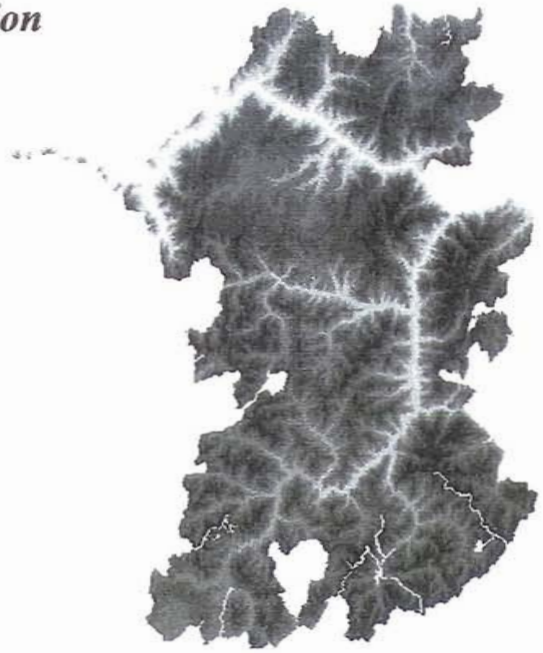
Shaded Relief

20 0 20 Kilometers

Slope

Slope (degrees)
- 0 - 9
- 10 - 15
- 16 - 20
- 21 - 25
- 26 - 29
- 30 - 33
- 34 - 37
- 38 - 42
- 43 - 64

Elevation



Elevation (meters)
- 600 - 900
- 900 - 1100
- 1100 - 1400
- 1400 - 1600
- 1600 - 1900
- 1900 - 2100
- 2100 - 2400
- 2400 - 2600
- 2600 - 2900
- 2900 - 3109

Aspect

Aspect
- east
- flat
- north
- south
- west

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Vegetation Profile of the Frank Church River of No Return Wilderness, Idaho

Cover Type

- Douglas fir
- Douglas fir/grand fir
- Douglas fir/lodgepole pine
- Douglas fir/ponderosa pine
- altered grassland
- aspen
- barren
- broadleaf riparian
- broadleaf/conifer riparian
- cloud
- cloud / shadow
- conifer forest
- conifer riparian
- grand fir
- grass riparian
- high intensity fire
- lodgepole pine
- mesic shrub
- mixed broadleaf/conifer
- mixed mesic forest
- mixed subalpine
- mixed whitebark pine
- mixed xeric forest
- moderate fire
- montana/subalpine grassland
- mountain mahogany
- ponderosa pine
- rock
- sagebrush
- shrub riparian
- upland grassland
- water
- whitebark pine

20 0 20 Kilometers

Life Form

- barren
- grass
- rock
- shrub
- tree
- water

Canopy Cover

- dense
- open
- moderate
- not forested

Tree Size

- large (>21 in dbh)
- medium (9-21 in dbh)
- not conifer
- sapling (<5 in dbh)
- small (5-8 in dbh)

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Topographic Profile of the Selway-Bitterroot Wilderness, Idaho

Shaded Relief

10 0 10 Kilometers

Slope

Slope (degrees)
- 0 - 8
- 9 - 14
- 15 - 19
- 20 - 23
- 24 - 26
- 27 - 30
- 31 - 34
- 35 - 39
- 40 - 56

Elevation

Elevation (meters)
- 600 - 800
- 800 - 1000
- 1000 - 1300
- 1300 - 1500
- 1500 - 1700
- 1700 - 1900
- 1900 - 2100
- 2100 - 2400
- 2400 - 2600
- 2600 - 2800

Aspect

Aspect
- east
- flat
- north
- south
- west

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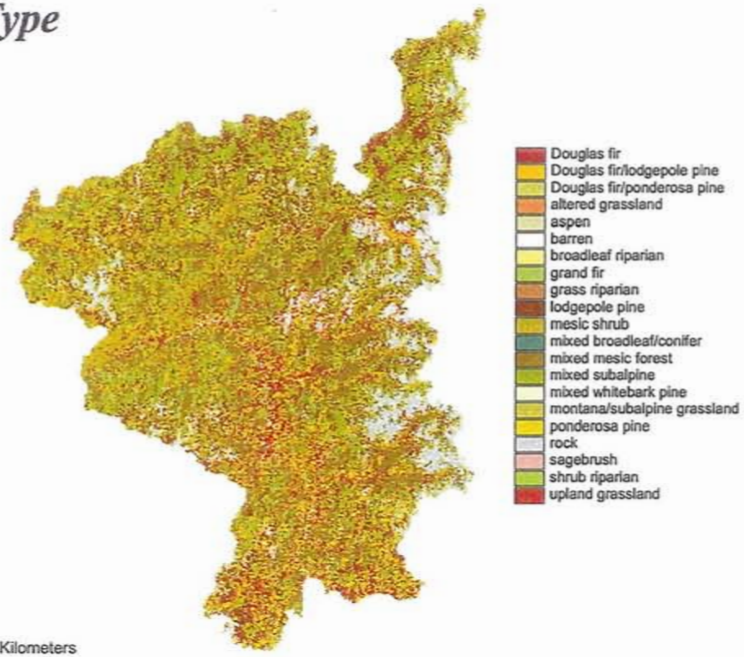
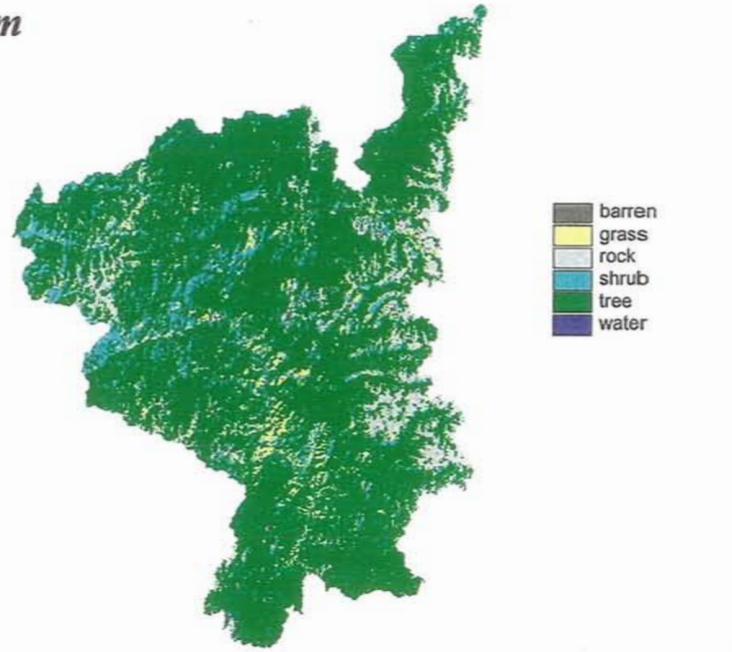
Vegetation Profile of the Selway-Bitterroot Wilderness, Idaho

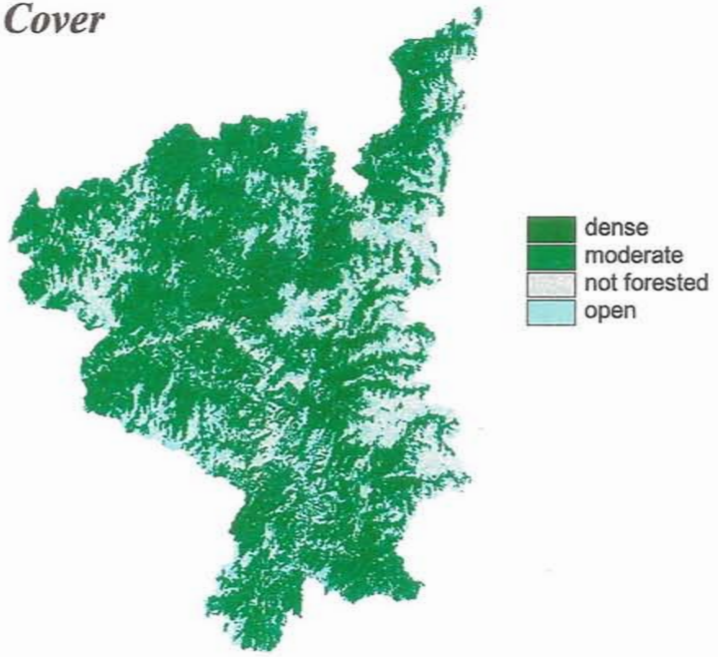
Cover Type



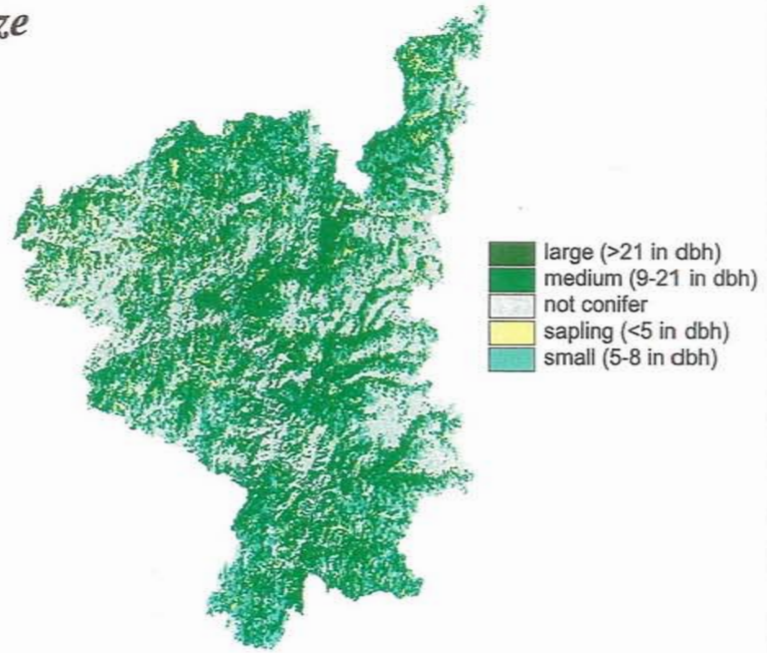
Life Form



Canopy Cover



Tree Size



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