Accuracy of the LANDFIRE Alaska Existing Vegetation Map over the Chugach National Forest

R.L. DeVelice
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A “Landcover Mapping Comparisons Project” is currently underway on the Chugach National Forest in which existing land cover/vegetation maps are being evaluated for accuracy and utility for land management planning applications. The project is evaluating four Forest-wide classifications, two Copper River Delta classifications, and three Kenai Peninsula classifications.

This report summarizes analytic results for the evaluation of that portion of the LANDFIRE Alaska Existing Vegetation (ak_110evt) map covering the Chugach National Forest (Figure 1).

Methods

Classification accuracy was estimated by comparing the mapped classes against actual vegetation composition as documented in the following “reference” datasets:

- 308 center points (point 1 of 4 at each location) sampled in the 1999 Forest Inventory and Analysis (FIA) periodic inventory that are within the Chugach National Forest. Caveat - FIA data are collected on a systematic grid (4.8 km, 3 mile) and were not intended to represent map units. Many of these grid points do not fall within the core of vegetation map polygons.
- 2177 plots sampled between 1988 and 1999 within the Chugach National Forest that were used in the development of a plant community type classification (DeVelice et al. 1999) and other ecology program applications. Caveat - Geographic position errors are likely in at least some of these data since the positions were obtained not by GPS but by transferring the sampling points from aerial photos to orthophotos.
- 500 sites sampled from helicopter or on the ground in 2010 as part of the Copper River Delta vegetation mapping project.

The mapped classes and reference classes were cross-walked into the more generalized “Level II” of the Alaska vegetation classification (Viereck et al. 1992; tables 1 and 2). “Level II” is being used in the “Landcover Mapping Comparisons Project” since it is possibly the coarsest level of classification that would still be of utility in land management planning applications[1].

[1] Those landcover classifications having overall accuracy exceeding 80 percent will be regarding as potentially the most useful for land management planning applications on the Forest.

Results and Discussion

The overall accuracy of the LANDFIRE existing vegetation type mapping within the boundary of the Chugach National Forest is low based on the reference data sets:

- 39 percent based on FIA data (Table 3)
- 44 percent based on ecology plot data (Table 4)
- 19 percent based on Copper River Delta mapping project data (Table 5)

If 80 percent represents a reasonable level of accuracy for the map to be useful in land management planning applications, than **the LANDFIRE existing vegetation types map appears of limited utility to managers on the Chugach National Forest**.

An example of error in the LANDFIRE mapping can be seen in Figure 2. The area of the Copper River Delta shown in Figure 2a is clearly dominated by herbaceous vegetation and shrubland. However, the preponderance of the vegetation in that area is erroneously mapped as forested by LANDFIRE (Figure 2b).

As another example of error in the LANDFIRE mapping, “Alaska Pacific Maritime Western Hemlock Forest” is shown as an existing vegetation type in a number of areas west of the ice field on the Kenai Peninsula. The corresponding SAF_SRM type is “Western Redcedar-Western Hemlock” and the corresponding SYSTMGRPNA is “Western Hemlock-Yellow-cedar Forest”. In actuality, western hemlock, western redcedar, and yellow-cedar are all absent from that geographic area.

Although not quantitatively evaluated, the general pattern of the vegetation on the landscape appears to be captured by LANDFIRE (see Figure 2). Perhaps the mapped classes could be reattributed to improve accuracy.

Literature Cited

DeVelice, R.L., C.J. Hubbard, K. Boggs, S. Boudreau, M. Potkin, T. Boucher, and C. Wertheim. 1999. Plant community types of the Chugach National Forest: southcentral Alaska. USDA Forest Service, Chugach National Forest, Alaska Region Technical Publication R10-TP-76. Anchorage, Alaska. 375 p.

Viereck, L.A., C.T. Dyrness, A.R. Batten, and K.J. Wenzlick. 1992. The Alaska vegetation classification. USDA Forest Service, Pacific Northwest Research Station, General Technical Report PNW-GTR-286. Portland, Oregon. 278 p.

Table 1. Alaska vegetation classification (Viereck et al. 1992) to level II[2]

Level I	Level II	Code
I. Forest	A. Needleleaf (conifer) forest	I.A
	B. Broadleaf forest	I.B
	C. Mixed forest	I.C
II. Scrub	A. Dwarf tree scrub	II.A
	B. Tall scrub	II.B
	C. Low scrub	II.C
	D. Dwarf scrub	II.D
III. Herbaceous	A. Graminoid herbaceous	III.A
	B. Forb herbaceous	III.B
	C. Bryoid herbaceous	III.C
	D. Aquatic herbaceous	III.D
IV. non-vegetated	*(not included in Alaska Vegetation Classification)*	IV

[2] See http://www.fs.fed.us/pnw/publications/pnw_gtr286/

Table 2. LANDFIRE existing vegetation types mapped within the boundary of the Chugach National Forest ("EVT_NAME") cross-walked to level II of the Alaska vegetation classification (see Table 1 for definition of codes).

EVT_NAME	Level II Code
Alaska Sub-boreal Mountain Hemlock-White Spruce Forest	I.A
Alaska Sub-boreal White-Lutz Spruce Forest and Woodland	I.A
Alaskan Pacific Maritime Mountain Hemlock Forest	I.A
Alaskan Pacific Maritime Sitka Spruce Beach Ridge	I.A
Alaskan Pacific Maritime Sitka Spruce Forest	I.A
Alaskan Pacific Maritime Subalpine Mountain Hemlock Woodland	I.A
Alaskan Pacific Maritime Western Hemlock Forest	I.A
Boreal Coniferous Woody Wetland	I.A
Boreal Coniferous-Deciduous Woody Wetland	I.A
Pacific Maritime Coniferous Woody Wetland	I.A
Pacific Maritime Peatlands	I.A
Western North American Boreal Mesic Black Spruce Forest	I.A
Western North American Boreal Treeline White Spruce Woodland	I.A
Western North American Boreal White Spruce Forest	I.A
Boreal Floodplains	I.B
Boreal Riparian Stringer Forest and Shrubland	I.B
Pacific Maritime Floodplains	I.B
Western North American Boreal Dry Aspen-Steppe Bluff	I.B
Western North American Boreal Mesic Birch-Aspen Forest	I.B
Western North American Boreal Subalpine Balsam Poplar-Aspen Woodland	I.B
Alaska Sub-boreal White Spruce-Hardwood Forest	I.C
Western North American Boreal White Spruce-Hardwood Forest	I.C
Alaskan Pacific Maritime Periglacial Woodland and Shrubland	II.A
Western North American Boreal Spruce-Lichen Woodland	II.A
Alaska Sub-boreal Avalanche Slope Shrubland	II.B
Alaska Sub-boreal Mesic Subalpine Alder Shrubland	II.B
Alaskan Pacific Maritime Avalanche Slope Shrubland	II.B
Boreal Shrub Swamp	II.B
Pacific Maritime Shrub Swamp	II.B
Western North American Boreal Mesic Scrub Birch-Willow Shrubland	II.B
Alaskan Pacific Maritime Subalpine Alder-Salmonberry Shrubland	II.C
Alaskan Pacific Maritime Subalpine Copperbush Shrubland	II.C
Boreal Shrub-Tussock Tundra	II.C
Alaskan Pacific Maritime Alpine Dwarf-Shrubland	II.D
Alaskan Pacific Maritime Alpine Sparse Shrub and Fell-field	II.D
Boreal Dwarf Shrub Wetland	II.D
Boreal Peatlands	II.D
Pacific Maritime Dwarf Shrub Wetland	II.D

Western North American Boreal Alpine Dryas Dwarf-Shrubland	II.D
Western North American Boreal Alpine Dwarf-Shrub Summit	II.D
Western North American Boreal Alpine Dwarf-Shrub-Lichen Shrubland	II.D
Western North American Boreal Alpine Ericaceous Dwarf-Shrubland	II.D
Boreal Herbaceous Wetlands	III.A
Boreal Tussock Tundra	III.A
Pacific Maritime Coastal Meadows and Slough-Levee	III.A
Pacific Maritime Herbaceous Wetlands	III.A
Western North American Boreal Dry Grassland	III.A
Western North American Sub-boreal Mesic Bluejoint Meadow	III.A
Alaska Sub-boreal and Maritime Alpine Mesic Herbaceous Meadow	III.B
Alaskan Pacific Maritime Mesic Herbaceous Meadow	III.B
Western North American Boreal Alpine Mesic Herbaceous Meadow	III.B
Boreal Aquatic Beds	III.D
Agriculture-Cultivated Crops and Irrigated Agriculture	IV
Agriculture-Pasture and Hay	IV
Barren	IV
Boreal Sparsely Vegetated	IV
Developed-High Intensity	IV
Developed-Low Intensity	IV
Developed-Medium Intensity	IV
Developed-Open Space	IV
Open Water	IV
Pacific Maritime Sparsely Vegetated	IV
Snow-Ice	IV
Temperate Pacific Tidal Marshes, Aquatic Beds, and Intertidal Flats	IV

Table 3. Accuracy matrix for the LANDFIRE existing vegetation types map based on points sampled in the 1999 Forest Inventory and Analysis periodic inventory (see Table 1 for definition of codes).

		reference level 2 classes										
		I.A	I.B	I.C	II.A	II.B	II.C	II.D	III.A	III.B	IV	row sums
map level 2 classes	I.A	76	2		1	21	13	5	9	5		132
	I.B	4		2		5	1		2			14
	I.C	2		1								3
	II.A											0
	II.B	2				17	1	5		6		31
	II.C	6			1	24	6	10	12	6		65
	II.D	3				7	3	19	2	6		40
	III.A	1								1		2
	III.B	1										1
	IV	1				2	1	12	3	1		20
	column sums	96	2	3	2	76	25	51	28	25	0	**308**
	omissions (rows)	20	2	2	2	59	19	32	28	25	0	
	commissions (columns)	56	14	2	0	14	59	21	2	1	20	
	mapping accuracy (%)	50	0	20	0	19	7	26	0	0	0	

overall accuracy (%) **39**

Table 4. Accuracy matrix for the LANDFIRE existing vegetation types map based plots sampled between 1988 and 1993 that were used in the development of the Chugach National Forest plant community type classification (see Table 1 for definition of codes).

		reference level 2 classes											
		I.A	I.B	I.C	II.A	II.B	II.C	II.D	III.A	III.B	III.D	IV	row sums
map level 2 classes	I.A	870	48	60		55	38	57	107	38		2	1275
	I.B	71	17	17		14	8	8	14	8		1	158
	I.C	28	6	14		7	2	4	5	2			68
	II.A	58	1	1		8	6	6	17	5			102
	II.B	26	2	3		17	3	24	16	3		1	95
	II.C	82	10	6		17	6	8	32	10	1	2	174
	II.D	46	5	3		25	8	31	25	12			155
	III.A	14	2	2		3	2	7	4	1			35
	III.B	2											2
	III.D												0
	IV	39	7	2		17	4	14	20	10			113
	column sums	1236	98	108	0	163	77	159	240	89	1	6	**2177**
	omissions (rows)	366	81	94	0	146	71	128	236	89	1	6	
	commissions (columns)	405	141	54	102	78	168	124	31	2	0	113	
	mapping accuracy (%)	53	7	9	0	7	2	11	1	0	0	0	

overall accuracy (%) **44**

Table 5. Accuracy matrix for the LANDFIRE existing vegetation types map based on the sites sampled from helicopter or on the ground in 2010 (see Table 1 for definition of codes).

map level 2 classes \ reference level 2 classes	I.A	I.B	I.C	II.A	II.B	II.C	II.D	III.A	III.B	III.D	IV	row sums
I.A	35	16	5		71	53		32	24	2	4	242
I.B	4				8	6		3	10	1	1	33
I.C												0
II.A	1				1	2			1			5
II.B					1							1
II.C	8	5	4		47	32		39	20		2	157
II.D					1			1	1			3
III.A												0
III.B												0
III.D												0
IV	1	5			4			12	5	7	25	59
column sums	49	26	9	0	133	93	0	87	61	10	32	**500**
omissions (rows)	14	26	9	0	132	61	0	87	61	10	7	
commissions (columns)	207	33	0	5	0	125	3	0	0	0	34	
mapping accuracy (%)	14	0	0	0	1	15	0	0	0	0	38	

overall accuracy (%) **19**

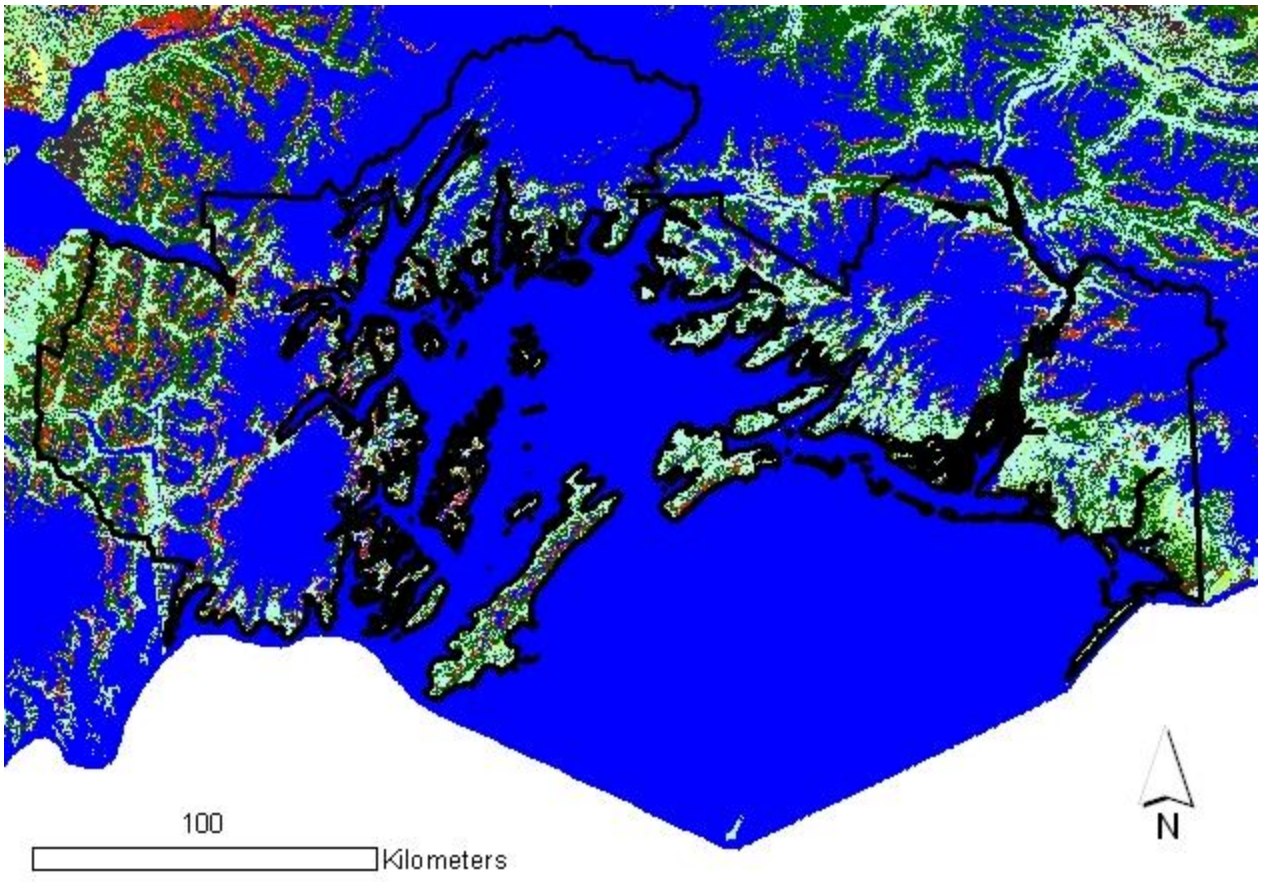

Figure 1. LANDFIRE existing vegetation type mapping in southcentral Alaska with the Chugach National Forest boundary shown as the heavy black line.

A) ***B)***

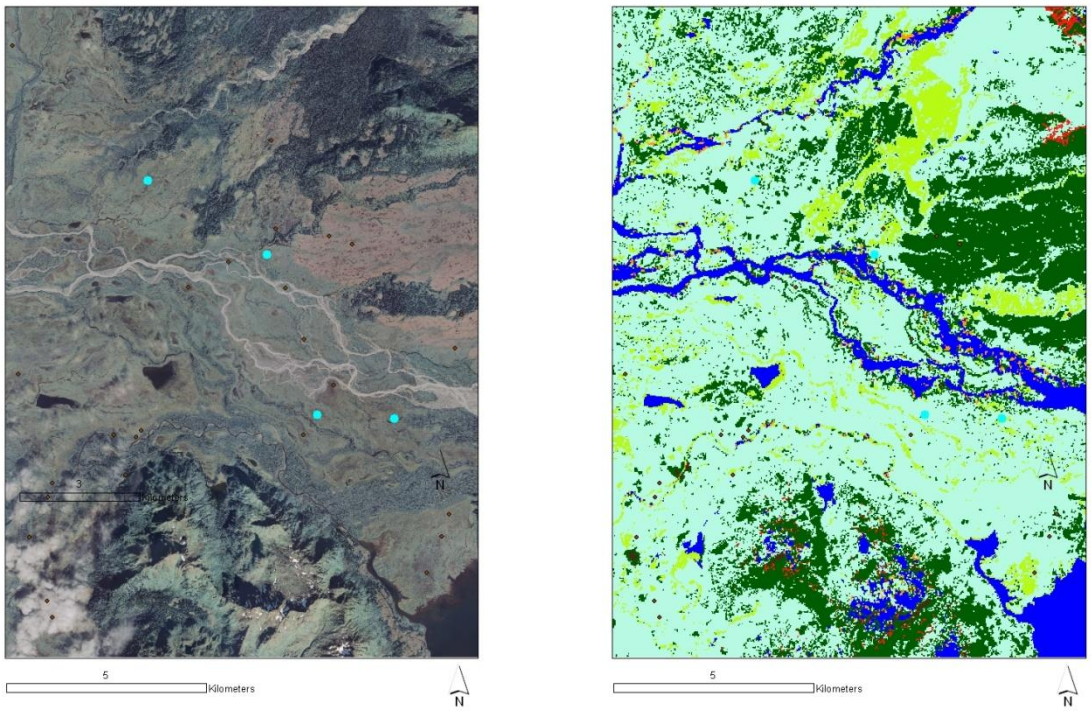

Figure 2. A portion of the Copper River Delta. *Photo A* is an orthophoto the four points highlighted in blue are from the 2010 dataset and are classified as graminoid herbaceous vegetation (III.A). *Map B* is the corresponding area in the LANDFIRE map. The four points highlighted in *Photo A* are erroneously mapped as needleleaf forest (I.A) in the light gray-green area of *Map B.*