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Trails versus Polygons

CONTRASTING VISIONS OF THE LAND

The previous chapters describe in detail relationships to land, place naming, and contemporary contexts for a range of northwestern Canadian First Nations. In this chapter, I consider how indigenous conceptions of the Land intersect with approaches to study and classification of landscape in Western scientific traditions. The fundamental unit in most approaches to landscape ecological classification, especially in this era of GIS assisted mapping, is the polygon, a fixed areal extent, defined by some set of criteria, with hard determinate boundaries. A polygon may be defined using nearly any set of spatially distributed criteria, and is a visual rendering of an analytic procedure, or a “mapping.” A map composed of polygons typically covers the entire area of interest with a tiling of these discrete and non-overlapping units. This is so natural to those of us familiar with Western mapping traditions as to seem an unproblematic rendering of the real world. As ecologists know, however, the devil is in the details, and tidy map units may be far less clear and useful on the ground. An experience that first gave me an inkling of the issues inherent in generalizing to polygons was an attempt to make sense of the intricate mosaic of floodplain vegetation on the bottomlands of the lower Nass River

in northern British Columbia for a forest management project in the early 1980s. There was plenty of patterned vegetation diversity; the difficulty was that the scale was on the order of a few metres in places, far too fine for usable maps. One could determine several discrete sets of site types with associated vegetation, but their spatial occurrence was so intimately intermingled as to be impossible to render as discrete polygons, as it was driven by differences in microtopography, which influenced waterlogging, soil aeration, and soil texture, and flood frequency, and therefore the assemblage of plants in each locale. The best one could do from a polygon perspective was to render the whole area as some sort of mosaic unit—which meant that no inferences could be drawn about any particular spot.

Highlighting the issues involved here was the conflict over reforestation of some of these areas. Though my associates and I struggled through dense tangled thickets of red osier dogwood and stands of young cottonwoods, large volumes of timber had purportedly been removed from the site, and the foresters were attempting to establish spruce seedlings on an 8-by-8 metre grid on one of their supposedly more productive sites, and failing. It turned out that scattered very large spruce trees had existed over the generally low-lying site, germinating on small elevated sites with better soil drainage, such as ancient logs or rootwads or small levees. This was documented by examining large-scale pre-logging air photos, where one could measure the crown of each pre-existing large tree, surrounded by a sea of lower shrubby species and wetlands. Remote sensing experts call this variable grain, as in the graininess of a photograph.

Similar issues of scale and generalizability may be found for many different variables that are commonly rendered in map form. Though polygons appear tangible, natural and concrete, they are, of course, abstractions. The metaphor borrowed for such a tradition of mapping, I would argue, is taken from European systems of land tenure, where a series of fixed bounded and owned plots form a tiling that covers the landscape. Linear features, such as rivers and roads do traverse the landscape, and some features lack areal extent, or are of a much smaller scale, and so are rendered as points and lines. GIS reproduced these conventions through raster and vector data.¹

The mosaic approach to landscape ecology put forward by Troll (1971), Forman (1982), Forman and Godron (1986), Naveh and Lieberman (1994) and others derives in part from the hard boundaries imposed upon landscape by anthropogenic patterning, especially with relation to property regimes adopted in agricultural and urban cultural landscapes. The boundaries may

be far more gradational in landscapes not dominated by human property regimes and transformative activities. When I fly north from Edmonton in western Canada where I live, I quickly pass over the urban sprawl and suburban periphery of greater Edmonton, and then fly for a while over a vast flat patchwork quilt of surveyed mile-square sections, neatly divided by township and range roads, developed as largely quadrangular agricultural fields and punctuated with irregular scrawls of wetland (“sloughs”), ponds, small groves of trees, and small, discrete clusters of buildings. Passing the wide sinuous path of the Athabasca River, the boreal forest coalesces, and the quadrangular tesserae of an agricultural landscape mosaic are left behind. The landscape consists of a dark sweep of coniferous forest, accented by lakes, stream courses and wetlands, and patches perhaps of deciduous trees on gravel ridges or where fires or logging slashes have reset succession. Still further north, multicoloured areas of wetland increase, and forest patches grow more open except, perhaps, along river courses or on steeper slopes. Permafrost, glacial deposits, and bedrock bosses begin to shape the patterning of the land which comes in myriad tones of bronze, gold, ochre, lime green and dark forest green, with large amounts of wetland and water (in the summer season), sometimes dark, and sometimes aqua or reddish. Patterns are sinuous, rounded. The grain of pattern may be fine, at least as it appears from 7000 feet in a small plane. Here I feel more as if I am admiring the complex patterning of a batik scarf, or perhaps the swirling colours of salt dyed silk. Were I to return to these landscapes in winter, the patterning of the landscape would appear completely different, with lakes and wetlands clear roads for travel, and most of the vegetation beneath snow. Features of the winter landscape would not be overly dominated by vegetation communities or limnology, but by wind, snowfall, aspect and exposure. Large woody vegetation—clumps of spruce and tamarack, woodlands of birch, willows or shrub tundra—would influence wind, snow deposition and texture, and feed for animals. The shifts of weather patterns from one year to the next lend a stochastic aspect to exactly where animals may feed, where berry bushes or birch trees may freeze, or whether ice crusts will impede cratering by caribou searching for lichens beneath the snow.

Of trails and places

Tim Ingold (2000) and Beatrice Collignon (2006) have written about issues of mapping, of journeying, and perception of environment and landscape, integrating theoretical and philosophical concerns with anthropological,

cognitive and geographic perspectives. I find it interesting (and reassuring) that these authors, working in different contexts and quite independently of my own work, elaborate quite similar conceptions of human relationships with landscapes and environments to those I have laid out (Johnson 1998; Johnson and Hunn 2009; this work). Collignon (2006:96) describes Inuinnait (formerly known as Copper Eskimo) landscape perception in terms of “lines” (routes of travel), “points” or “places” (camps and other significant locales), and zones or areas, that is irregular areas of well-known and well-frequented country surrounding “points.” She sees Inuinnait perception of land as being organized “axially” along these routes of travel or axes, and describes way-finding in terms of the memorization of these routes, together with sequences of named and unnamed landmarks, and including the associated histories and stories and remembered experiences which have accrued over the years. These “lines” or routes are remembered through chants, which name the sequence of places to be encountered when travelling the route, strongly reminiscent of the Paiute songs recorded by Isabelle Kelly in the American southwest (Fowler 2009) and the Sahaptin stories of Jim Yokuts reported by Hunn (1996). Collignon finds Nuttall’s concept of “memory-scapes” fitting (Nuttall cited in Collignon 2006). Collignon, a geographer, discusses how Inuinnait mapreading replicates the indigenous organization of landscape, describing how people involved in her toponym work oriented on the map by locating a couple of significant places, and then working out the “line” connecting them with reference to the contours of the coast, filling in other places or “points” in between. Elevation data and contours, Collignon tells us, were not used in orienting on the printed National Topographic Series maps. This is quite similar to my experience watching a map interview with my Kaska Elder teacher Mida Donnessey in 1998. She asked the researcher to identify a set of lakes on the topographic map so that she could orient and reproduce a sequence of sites with which she was familiar in that area.²

In the 1970s, David Pentland (1975) investigated indigenous maps and mapping of Cree in the Hudson Bay lowlands of northern Ontario in the region of Norway House. His article reproduces several maps drawn by people from this region. Interestingly, what they reveal is a careful depiction of routes; the maps give the details of drainage systems which served as routes of travel, and contain careful depiction of significant landmarks (tributary streams, lakes, etc.) including rapids and portages for which there was a carefully elaborated classification that also included information about

fish resources, and “back way” routes, that were parallel streams which could be taken as an alternative way around sections of dangerous rapids. However, large and prominent features, such as nearby rivers unrelated to the route being depicted, were omitted. Pentland’s discussion again highlights the significance of routes of travel (“trails”) and travel hazards in organizing ways of thinking about the land, and contrasts Cree depictions with the area-based maps produced by the Canadian government.

Ingold’s exposition of mapping, mapmaking, wayfinding and navigation is pertinent here. He writes that for the local person, “places do not have locations but *histories*. Bound together by itineraries of their inhabitants, places exist not in space but as *nodes in a matrix of movement*” (Ingold 2000:219, emphasis added). A matrix of movement, I would argue, is the sum of travellers’ paths, and Ingold elsewhere describes place as inscribed through journeying. Ingold refers to this “matrix of movement” as a “region,” which Collignon or I would refer to as “territory,” the homeland or area of use and familiarity, and Australian anthropologists and Aborigines would refer to as “country.” Ingold continues:

. . . ordinary wayfinding, then, more closely resembles storytelling than map-using. To use a map is to navigate by means of it: that is, to plot a course from one *location* to another in *space*. Wayfinding, by contrast, is a matter of moving from one *place* to another in a *region*. (Ingold 2000:219, emphasis original)

The quintessential devolution from wayfinding, which is based upon nuance and experience, to navigation, that is setting a course between locations, is encapsulated in the recent explosive use of sensitive global positioning system units in everything from aircraft to automobiles to hikers’ hands. At this time, the GPS user need not even consult a representation of the landscape of concern in the form of a map, but simply needs to chart a certain set of abstract bearings to reach the location of the carefully geo-referenced destination. “Geo-referenced” refers to highly accurate three-dimensional plotting from navigational satellites, an updating of the abstract astronomically derived grid of the ancient Greeks. This works adequately under most circumstances, as long as the unit continues to function, and assuming that the shortest distance between two points contains no serious obstacles to travel.³

“Relational databases” and layers

A corollary of organizing one’s sense of the landscape by reference to what I have called “trails” or the “traveller’s path,” linking nodes comprising a network of specific places, named or not, in that the characteristics (the entailments or affordances) of those places are like a relational database, where toponyms may function as mnemonic pegs on which to “hang” other information about the land. Such information may include safe travel routes, travel risks, places of residence and past residence, gravesites and power places, gathering sites, fishing places and hunting lookouts, and seasonal cycles.

Collignon, describing Inuinnait knowledge of the Land writes:

A series of places—of points—form a kind of framework on which a mental image of the land can be anchored . . . These points are the places on the land used on a regular basis: the camps (one’s own and those of other people), the fishing lakes, streams, plant-gathering areas. They also include all the visible landmarks of the territory such as *inukhuit*, meat caches, fox traps built from a mound of boulders and conspicuous or unusual landforms. But there are also invisible markers: stories and anecdotes that make the places come alive through narrative. The land holds the memory of the Inuit and landscapes are indeed “memoriscapes” . . . (Collignon 2006:92)

Various authors (e.g. Collignon 2006; Hunn 1996; Ignace 2000; Cruikshank 1990b; Kari and Fall 1987; Andrews 1990; Andrews and Zoe 1997; Andrews et al. 1998; Basso 1996; Thornton 2008) have pointed out that place is linked to story. Toponyms key rich associations, including the moral dimension, resources, risks, and recent or ancient history. I have conceptualized the rich net of knowledge tied to place, especially named places, as a set of overlays or layers, all attached through experience and specific knowledge, to place or sets of places that are arrayed along pathways or trails.

Polygons

The polygon has a long and interesting history and is heavily implicated in the creation of space from place (Edgerton 1987; Olwig 1996). Once Europe rediscovered some of the classic works of the Ancient Greek world in the late Medieval period and early Renaissance, the grid system employed by Ptolemy which was defined by the stars—our familiar and unremarked

system of latitude and longitude—could be employed in maps of the entire globe, making it possible to precisely designate any space in the absence of any familiarity with a region. Ptolemy's *mappamundi* was organized by “. . . imagining the globe not as amorphous topography but as a *homogeneous surface* ruled by a *uniform geometric grid*.” (Edgerton 1987:13, emphasis added)

Quickly this abstracted space became implicated in the spread of empire, and competing European colonial nations sought economic advantage and hegemony over yet-unknown places. As Edgerton wrote:

Indeed, a casual look at almost any seventeenth- or eighteenth-century map of America reveals the absolute faith Europeans of all religious persuasions had in the authority of the cartographic grid. Monarchs laid claim to lands solely on the basis of abstract latitudes and longitudes. Troops were sent to fight and die for boundaries that had no visible landmarks, only abstract mathematical existence. (Edgerton 1987:46)

Along with the creation of a universal, abstract spatial grid defined by astronomical, not earthly, features, the Alexandrians and then the Romans perfected surveying, enabling the delineation of abstracted polygonal spaces on the earth's surface. A Roman work called the *Corpus Agrimensorum*, authored by Hyginus Gromaticus in 500 AD, laid out how to measure land according to a “molecular grid.” According to Edgerton, his job was to survey land in conquered territories into hundred-square units for distribution among Roman colonists. This has strong resonances with the history of colonization in more recent times, when empty gridded space has been dispensed to colonists and concessionaires of colonial and modern state governments (Tsing 2005). Indeed, the Witsuwit'en were dispossessed of their cleared fields, cabins and barns in the Bulkley Valley in northwest British Columbia by just such a creation of empty gridded space from their lived homeland when the colonial government dispensed Crown grants to veterans of the Boer War (Mills 1994:9).

Surveying is also implicated in the conversion of customary tenure and rights systems in Europe. Olwig writes:

Surveying created a *geometrical, divisible* and *hence saleable* space by making parcels of property out of lands that had previously been

defined according to rights of custom and demarcated by landmarks and topographical features . . . (Olwig 1996:638, emphasis added)

This enabled enclosure and the expansion of private holdings at the expense of the commons, creating the array of non-overlapping rectangular bounded plots that became the model for land units in North America and world wide, and which I believe is the basis for the tradition of the bounded polygon as a basic unit of mapping.

Polygons are delimited, bounded generic areas of space, inscribed on the landscape through a specialized mapping methodology. Polygons mark generic classes of landscape, including age and composition of timber cover inferred from air photos, ecological types such as deciduous aspen woodland, mixed forest, wet meadow, and so forth, and inherently involve abstraction and simplification. The bounding of such polygons is of necessity hard; gradational or fuzzy boundaries are not possible to render, and transitional types, or fine-scale mosaics must either be included in other units, or must be broken out as polygons of their own, perhaps rendering smooth gradations in pixel-like mosaic tiles, like jerky animation or low-resolution computer graphics. Polygons are antithetical to flow.

In mapping land for land-use planning, or resource or ecological inventory, a series of different polygons will be delineated to represent the spatial distribution of different categories, such as a set of ratings for moose habitat potential, a layer describing predominant vegetative cover, or a layer that presents soils or surficial geological deposits. Polygons of each layer are often colour coded to facilitate discrimination of types and visual apprehension of spatial patterning of each category of spatial data, a practice that tends to reinforce the sense that the landscape is made up of discrete, bounded patches, that are internally homogeneous and in sharp contrast to adjacent areas, and that the patterns created by these coloured areas are true representations of aspects of the landscape so depicted. The contents of landscape polygons are anchored in gridded space, static and atemporal, unless done as sets of different maps to reflect shifting seasonal arrays or historical change.

Traversing this patchwork of polygons are linear features, such as roads, rail lines, and waterways, unless they are presented on a separate base map of human features or topography. Human settlements are also likely to be indicated as points, or dots of various sizes, unless the landscape being rendered has large areas of urban or residential land. Edge effects from linear features, and the areal extent and nature of settled areas are erased in their collapses

to single dimensional lines and dimensionless points, as is their relationship to surrounding areas. Particularity is eclipsed, except by the lettered labels indicating highway numbers, village names, and the names of rivers.

A key question, then, is how to create a conversation between the path-based, rich and localized realm of landscape as experienced by people living in and moving in a region, homeland, or local environment, and the abstracted, spatialized representations of the land which underlie much of the contemporary world's treatment of and relationship to land.

Orientation

Systems of orientation figure in the traveller's perspective and in abstract spatial representations of land alike. Mapping, wayfinding, and narratives about land all require some sort of system of orientation. The concept of four cardinal directions (north always at the top) is so engrained in Western notions of how the world is, that we speak, for example, of driving "up" to Inuvik in the Mackenzie Delta region (latitude 69°N) from Edmonton, located in the prairie region of Alberta (latitude 53°N). In what real sense is Inuvik above Edmonton? Only in that north has become "up" because it is always located at the top of the map page.⁴ I found that when I worked in the Mackenzie Delta region, I conceived of northward travel along the Dempster Highway as "up," and spoke of driving "up" to Inuvik. I found it nearly impossible to not say this, despite knowing that for my Gwich'in interlocutors, you travel down to Inuvik from Fort McPherson (it is located about 180 km to the north and east of Fort McPherson). This is because, in Athapaskan orienting systems, upstream and downstream are primary axes in describing and experiencing the Land. Fort McPherson is upstream of Inuvik, which lies downstream to the north, about halfway down the huge Mackenzie Delta.

For many peoples, especially those of forested and mountainous environments, the axes of orientation are formed by properties such as direction on a drainage, and upslope-downslope position, rather than by a set of cardinal directions. This is true for the Gitksan (Johnson 2000), and for the Witsuwit'en. For Gitksan speakers, their dialects, rendered as "Eastern" and "Western" in English, are instead *gigeenix* 'upstream' and *gyeets* 'downstream.'

James Kari has described systems of orientation and topographic knowledge for Athapaskan speaking peoples in northwestern North America (Kari 1989, 1996; Kari and Fall 1987), showing how place names are markers within regions, facilitating travel and exchange across regions. Specific stems

for 'river,' 'lake' and 'mountain' are shared within these regions, though variation in the shape of the words derived from the common stems will occur between languages.⁵ Drainage basins, with their associated mountains, are fundamental in Athapaskan perception of land, and terms for upstream-downstream, and upslope-downslope are found in all of them, while abstract terms for cardinal directions are absent. These perceptions are related to travel and orientation while moving on the land; direction of river flow is significant to ease of travel, and helps one to parse the grain of the land. Which way are things moving? Slope and current require neither technology nor visibility to be perceived, and accord well with the motion and action centered sense of Athapaskan languages. When one cannot see the northern horizon or the pole star, and nothing in the landscape comes in straight lines, "north" is an abstraction that does not relate to embodied experience.

An extension of this orientation system, I believe, is the complex set of locational prepositions that Athapaskan languages draw on when describing landscape. Moore (2000, 2002) and Hargus (n.d., 2007) carefully present the terms used to indicate directions in Kaska and in Witsuwit'en. 'Up,' 'far ahead,' 'down,' 'further down,' 'to the side,' 'across' (often rendered in English translation as "across-side") can describe directions in relation to both slopes and rivers, and be extended metaphorically to indicate closeness of social relationship, as Moore explains (2000, 2002).

In the far north, as at sea, the winds can be significant in orientation. Where prevailing winds tend to blow from consistent directions, and especially if other clues to direction may be obscured, knowing the winds and parsing their signs can help the traveller to know what direction he or she is travelling. Collignon (2006) and Aporta (2000), and Aporta and Higgs (2005) describe the significance and names of the winds for Inuinnait and Inuit in the Canadian Arctic. When I was working with Gwich'in in the Mackenzie Delta region, the names of the winds and something of their patterning was one of the things I was taught as important for orientation, and also for predicting winter temperature and visibility, thus significant in terms of snow quality and overflow on river ice, along with the expressed concern that the wind patterns were becoming less predictable in this period of rapid climate change. Aporta (2000, 2009) describes the wind system of the Inglulik Inuit as a system of cardinal directions, with axes of WNW, NNE, ESE, and SSW. He writes:

... the Inuit of Igloodik designate four primary winds: Uangnaq (WNW), Kanangnaq (NNE), Nigiq (ESE) and Akinnaq (SSW) [MacDonald, (1998):181]. MacDonald points out that these winds constitute two pairs of counterbalancing winds, “one on the Uangnaq-Nigiq axis, the other on the Kanangnaq-Akinnaq axis” [ibid.]. He also points out the symbolic value of these opposites, especially in the pairing of Uangnaq and Nigiq, which “are said to retaliate against each other” [ibid.]. As I will show now, this opposition (and the understanding of its occurrence) goes beyond the symbolic to play a leading role in predicting the mood of the moving ice. (Aporta 2009)

Here too, the wind both allows orientation, and as an agent in the landscape, also causes conditions which have implications for safety and hunting opportunity.

In places such as the Alberta prairies, the absence of landmarks and the subdued grain of drainage and topography render reckoning by the sun a natural and effective strategy, and the four cardinal directions created by the apparent passage of the sun—east, south, west then north—have deep importance in cosmology as well as in orientation. In the sundance, dancers move in a sun-wise direction (clockwise) (e.g. Anonymous 1996). In this northern region, the directions are also associated with seasons, and cycles of beginning, ending and renewal.

Orientation with reference to cardinal directions may be derived from the need to navigate (here we are reminded that a root of navigate is *nave-*, boat) in places or regions that lack strong grain of slope and current. Adelaar (1997) comments about contrasts in orientation systems of Austronesian language speakers who dwell in interior regions, versus the orientation systems of those who dwell along the coasts. Interior peoples orient in relation to rivers and mountains, while coastal dwellers tend to have orientation systems based on some sort of cardinal direction system. Which direction is “up” or “upstream” when you are out of sight of land, at sea? Here celestial navigation can be important, as the pattern of the stars varies only by time and latitude, if they are visible, and the path of the sun is a consistent guide, when it is visible. Goodenough (1996) describes the complex navigation system of mariners in the Western Carolines, Micronesia, who have created a 32-point sidereal compass, using Polaris (at the northern horizon) and the Southern Cross (on

the southern horizon) as its poles, with a series of paired stars whose rising and setting marks the other directions. Goodenough writes:

These thirty-two points, like the points on the European wind rose, form a conceptual compass, and serve as the directional points of reference for organizing all directional information about winds, currents, ocean swells, and the relative positions of islands, shoals, reefs, and other seamarks. Every point has another that is conceptually diametrically opposite to it. These diametrical opposites are seen as passing through a point at the center of the compass, and a navigator thinks of himself or any place from which he is determining directions as at this central point, just as western navigators do when using a magnetic compass.

In practice this system required finesse and practical experience to account for the inexact spacing of the actual rising and setting of stars, and student navigators had to memorize large amounts of information about the nearest objects lying along each of the star paths for every island, a practice called “Island Looking.” Navigators also named “sea roads” between various islands and reefs, along with the reciprocal star directions on which they lie, and so on.

A variant of the upslope-downslope orientation appears on islands. For Polynesians, “toward the mountains” (Hawai’ian *mauka*) contrasts with “toward the sea” (Hawai’ian *makai*). Winds are important for dwellers on islands and for mariners, too. In Hawai’i in my youth, the sense of which side of the island was windward and which leeward was part of my understanding of place; the consistent trade winds create significant differences in distribution of precipitation and therefore of vegetation on Oahu. This is apparently an ancient concept in Austronesian languages, and becomes transmuted to upriver/downriver in interior groups such as the autochthonous peoples of interior Borneo (the Dayak) (Adelaar 1997). Sets of terms relating to this upriver/downriver orientation system have a strong similarity to the set of terms found in Athapaskan languages (Adelaar 1997:69-70).

A dichotomy appears to exist in traditional descriptive words for positions; whether these reference the speaker’s position and body (right/left, above/below, front/back) or are tied to some system of cardinal directions (Brown and Levinson 1993). The perception of body-centred position description as the “natural” way to speak about positions is naturalized in European and

American concepts, and may be inherent to Indo-European languages, while in other language families, absolute reference may be employed even when speaking of the positions of features or objects near the speaker, as in Guugu Yimithirr (Haviland 1993) or Tzeltal (Brown and Levinson 1993).

Among the impetuses to the development of absolute systems of reference for European cultures were the demands of seafaring, as was also the case for Austronesian and Polynesian mariners (Adelaar 1997). The European compass or wind rose encodes 16 (or 32) specific directions, which can be used to plot a course. Once navigational instruments advanced to include magnetic compasses, the direction of north could be told even without being able to sight on stars or see the sun. Maps could then be drawn using the abstract grid of latitude and longitude, using north, south, east and west as derived from the courses of sun and stars, and people could navigate to places or positions they had never before seen.⁶