Appendix B

NPS Off-Road Vehicle Trail Condition Assessment Methods

The Condition Assessment Inventory effort is a region-wide ORV trail baseline data acquisition effort based out of the Alaska Regional Office. Conducted between 2004 and 2007, the effort has been lead by Kevin Meyer, Project Leader, soil scientist and trails specialist, and Blain Anderson, Technical Specialist, GIS and trails specialist. Both Meyer and Anderson are staff on the Natural Resource Science Team at AKRO in Anchorage. Meyer is a permanent member of the team and Anderson is a term employee hired specifically for the inventory effort. Funding for Anderson's position has been provided by a series of three NRPP projects. In 2006 and 2007 he has been funded under a NRPP Project entitled: Implementing Best Management Practices (BMPs) –Mapping and Managing Off-Road Vehicle Trails in Alaska. Together, the two make up the ORV Technical Assistance Team, or TAT, for the region.

The Condition Assessment work consists of three separate phases: project planning, field inventory, and data processing and product generation. Project planning is typically conducted in the spring (Feb.-April) and is used to identify candidate trails for inventory, develop park contacts, obtain permits (as required) and outline and coordinate field logistics. Field inventories are conducted in the summer months (May-Sept.) and consist of conducting on-the-ground examinations of physical trail conditions for candidate trails. Data processing and product generation during the off-season (Oct.-April) and consist of post field GPS correction, data editing, data analysis, and map and table product generation. Meyer, as project manager, is responsible for the project planning phase and all project administration and budgeting. Both team members conduct the field inventory effort, with Anderson being primarily responsible for the data processing and product generation phase.

Project planning has been conducted on a regional level. Based upon a regional ORV task force study conducted in 1999 and 2000, ORV trails, areas of use, or ORV activities were identified in 14 different park units across the State. The overall goal of the project effort is to assess each unit for motorized use, and provide an accurate centerline location and physical character description for each active motorized trail.

Because of the high cost of conducting mapping efforts field data collection has been designed to be as efficient and effective as possible. This was lead by efforts in 2004 to test and refine mapping techniques across a wide variety of terrains and use types within a single, easily accessed park. Wrangell-St. Elias proved a test platform. Following work there in 2004, mapping expanded to BELA, DENA, GAAR, GLBA, and LACL in 2005. Mapping continued in DENA, GAAR, LACL and WRST, and expanded into ANIA, CAKR and YUCH in 2006. And in 2007 mapping will be completed in BELA, DENA, GAAR, and WRST and expanded into ALAG, KATM, KLGO, KOVA, and NOAT. Total miles mapped in 2004 were 190; in 2005, 142; and in 2006, 113. This reduction in mileage covered was due to the increasingly more remote and difficult to access locations of the trails and the fact that many were mapped on foot. Approximately 130 miles are planned for 2007 to complete the region-wide assessment.

FIELD INVENTORY METHODS

The field inventory effort strives to conduct a 100% sample of every active ORV trail within the region -in that every foot of a trail is traversed during an on-the-site field examination.

Guided by rough trail location maps obtained from the parks and/or available GIS datasets, the trails are traversed, via all-terrain vehicle or on foot, depending upon site conditions, the availability of ATVs and park preference. The crew is equipped with duplicative "mapping-grade" Global Position System (GPS) receivers that allow for attribute attachment during the field inventory effort. Trimble GeoExplorerIII instruments have been used almost exclusively for the effort. They have proven to be highly reliable, light weight, efficient, and have excellent battery life and data storage capabilities. The button selection configuration of these instruments also provides some advantages over the touch screen configuration of some newer models in that they provide a more positive tactile touch–helpful when wearing gloves in cold conditions and when keying while in motion, and provide good screen imaging under various light conditions.

Team members collect data on two GPS instruments simultaneously to ensure that 100% coverage is obtained during the traverse. Each team member collects data independently, but they freely communicate between each other on the description of segment characteristics. This is particularly true when starting to map in a new area or when encountering unusual site conditions. The physical character description or "Condition Assessment" is collected by individual trail segment based upon 8-12 distinct physical parameters including trail segment: type, character, width, grade, side slope, surface character, drainage, mud-muck, rutting/subsidence, vegetation condition, and stoniness. In addition, data is collected on water management features, water erosion problems, stream crossings, physical reference points, interest points, survey points, signs and hazards.

Data Recording Method

As the team traverses the trail the physical characteristics for each individual trail segment is recorded in the GPS unit. The process is as follows. Standing at the trailhead, a trail segment feature is opened and the physical characteristics of the first uniform segment of trail are keyed into the GPS unit based upon that segment's type, soil character, width, grade, etc.

For example, the physical characteristics for the first segment could be keyed in from the data dictionary options as follows:

- Main,
- double wheel track,
- 6-12 feet wide,
- 0-6% grade,
- side slope of 0 -20%,
- trail surface of native fine mineral,
- poorly drained,
- muddy,
- 9-16" deep ruts,
- no stone hindrance.

The team then moves along the trail as the GPS collects location data. The team carefully looks for changes in the trail's physical conditions for any of the recorded parameters. When a change is observed, such as the trail grade increases from 5% to 7%, the team member presses a "segment" key on the GPS. That closes the first segment and records its location coordinates along with the physical character descriptors and opens a new line segment. The "end" point of the first segment automatically becomes the "start" of the second segment. The attribute value is then modified for the new segment–in this case from "0-6%" to "7-12%" grade (all other attribute values are automatically carried forward to the new segment within the instrument); and the traverse continues. In this manner, each physical character change triggers the creation of a new line segment.

Utilizing a GPS allows these changing physical conditions to be rapidly and accurately documented along the trail alignment. In the course of mapping, more than one value often changes within a segment, as might be expected when a physical environmental characteristic such as surface character or drainage class changes. These indicators of native site conditions strongly influence tread durability and as conditions change from mineral to organic surfaces or from well to poorly drained or saturated conditions, trails often begin to display other changes, for example: braiding, muck-holes, or deep rutting. Since both physical character changes and their expression in tread character change frequently; and it is not uncommon to have dozens if not a hundred or more distinct trail segments–each with a unique combination of attribute values, for any trail over a mile or two in length.

Other features found in the field are also mapped. Examples of typical features encountered include signs, stream crossings, campsites, hazards, ditches, airstrips, parking areas, braided areas, etc. These can be mapped as points, lines or polygons.

In addition to the Trimble attribute-attached GPS instrument, the crew is also operating one or two recreational grade GPS receivers. One is obtaining a "track log" that is being used in conjunction with a digital camera to obtain a "GPS Photo Link" data set –a latitude and longitude location documented photo record. The track log is also used to provided a third trail centerline backup record, and occasionally, as a navigation aid. The same or a second recreational grade GPS is also activated to collect odometer mileage data for administrative use and to estimate "milepost" points along the alignment.

To conduct the inventories, the crew members are equipped with 2-way radios; analog compasses; clinometers for measuring grades and side slopes; 16 foot and 100 foot tapes and laser range finders for horizontal measurements; flagging for marking trails; and digital cameras. To support the work, the crew has two Honda 4 wheel drive 400 ATVs, and utilize park ATVs at remote sites. The ATVs are rigged with "RAM" brand GPS mounts and PVC pipe external antenna mounts. Power winches, tow ropes and chain saws are all commonly used support tools. The crews are largely self-contained and can operate independent of park support. They are fully equipped with transportation, camping, data management and auxiliary power.

DATA PROCESSING AND PRODUCT GENERATION

Raw GPS data are post processed for better locational accuracy using Trimble Pathfinder Office software as soon as an internet connection is available. Data are further processed to eliminate position errors, accidental data collection, and other errors and exported to ArcGIS shape files. This allows further editing capabilities such as vertex snapping, smoothing, and display on orthorectified satellite imagery. Maps of trail locations and detailed descriptions of individual trail segments in map and table form are then produced for each park unit. In addition, a numerical "condition classification" rating is made for each trail segment based upon its physical characteristics. Segments are assigned to one of five condition classes: Good, Fair, Degraded, Very Degraded and Extremely Degraded. As time allows, these ArcGIS files are uploaded to the AKRO GIS Team's geodatabase, which makes them available to the Parks with associated metadata and other pertinent information.

On some trails, a Trail Prescription may be conducted to identify possible mitigation actions to improve trail degradation issues. Trails are typically selected by Park staff for this additional, and slower, mapping work by the team while in the field. These "Prescriptions" form the basis of estimating material quantities, work effort, logistics, and treatment options, and are based on knowledge of "sustainable" trail building techniques, structure design, trail planning, and layout considerations for re-routing options.