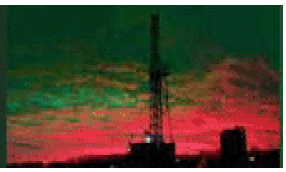


Prosperity Through Unity Research Project
OGC – Science & Community Environmental Knowledge Fund
Annual Report to March 31, 2004

PART I - Abandoned Well-Site End Land-Use Objective Treatments: Operational Trial and Monitoring

Summary of progress towards overall project objectives and deliverables:

1. Identify a representative sample of abandoned well sites in Northeastern British Columbia suitable for the study of reclamation techniques.
   Deliverable: Inventory of sample well sites showing end-land use objective potential.
   1st year progress: data collected for inventory, results included in this report

2. Evaluate site conditions including soil compaction, soil type, soil nutrients and/or contaminants, moisture regime, Biogeoclimatic zone, slope, etc. to determine suitable end-land use objectives and prescribe test treatments that will lead to enhanced knowledge of well site rehabilitation.
   Deliverable: Ten reclamation test site summaries and twenty reclamation prescriptions signed by a Registered Professional Forester.
   1st year progress: The 4 test site summaries will be completed and handed in after we assess the treatments that were completed in the fall, the remaining 6 will be completed once the treatments are completed. Sites assessments have already been submitted. The final reclamation prescriptions and signed-off by a Registered Professional Forester will be submitted once we have results from monitoring the trial plots, to ensure the optimum treatments are prescribed for each site.

3. Develop and refine a reclamation prescription template and interim pre-site assessment template to improve efficiency and effectiveness of future reclamation efforts.
   Deliverable: Reclamation prescription template.
   1st year progress: Refined reclamation prescription template, based on steering committees' comments is included as attachment to report.

4. Complete the required reclamation treatments on test sites. The test sites will follow the design of an operational trial to maximize information obtained. The availability of other funding will dictate rehabilitation work on remaining sites with RP's.
   Deliverable: Reclamation and treatment details.
   1st year progress: Four sites were treated. Progress was slightly slower because of timing and weather conditions. Treatments on the remaining 6 sites will be completed in 2004.

5. Monitor treatment success and soil conditions through follow-up site visits.
   Deliverable: Monitoring of treatments and annual reports detailing the findings
   1st year progress: Monitoring of treatment plots will commence in 2005.

Inventory & Treatment Site Selection

Introduction:

There are more than 20,000 wellsites in British Columbia's well index. Approximately 4000 of these sites (ca. 20 percent) have received a Certificate of Restoration (COR). Older well sites are more likely to have a COR (Figure 1), but the majority of wells drilled prior to 1970 are still awaiting COR status, mostly because many of these wells are still active. For this project, we focussed on well sites within the Dawson Creek (93P) and Fort St John (94A) mapsheets (Figure.2), where 1873 well sites had received COR, out of a total of 9279 well sites (20.2 %). To identify candidate COR wellsites for site assessments and reclamation treatments, a screening process was used that evaluated biogeoclimatic zone, land status, years since oil and gas drilling, and expected forest productivity.

Figure 1. Distribution of COR'd wellsites by rig release age class for all wells in BC

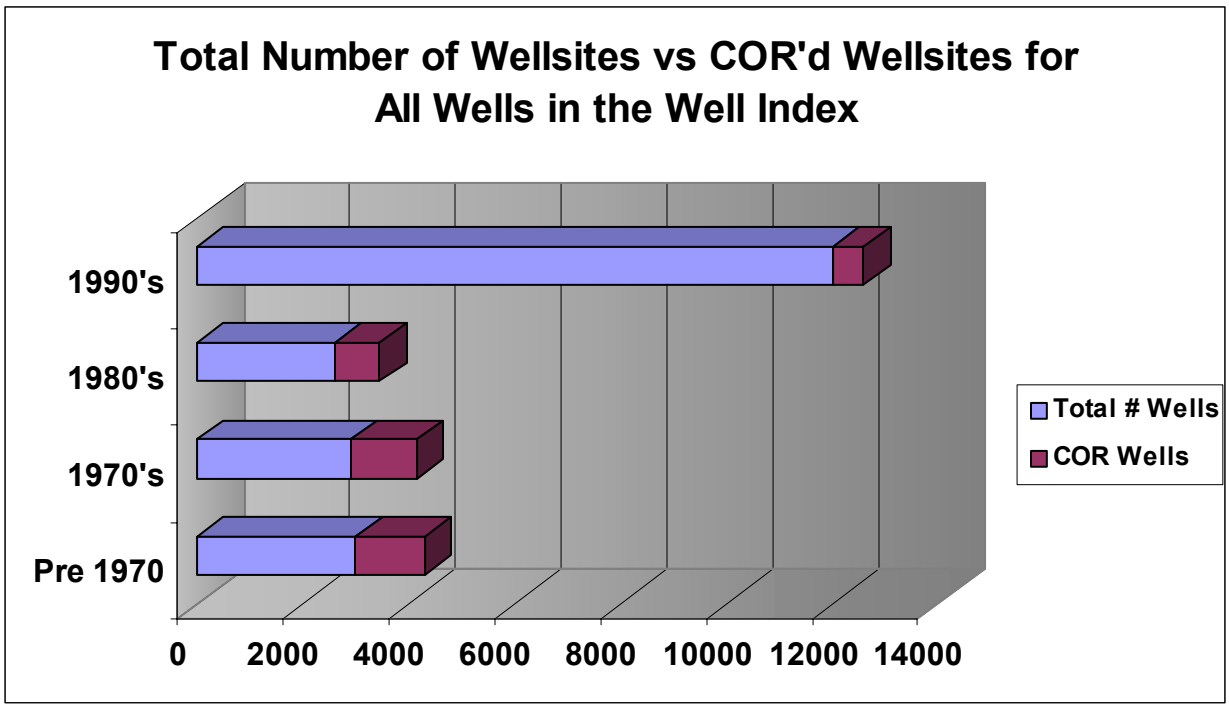
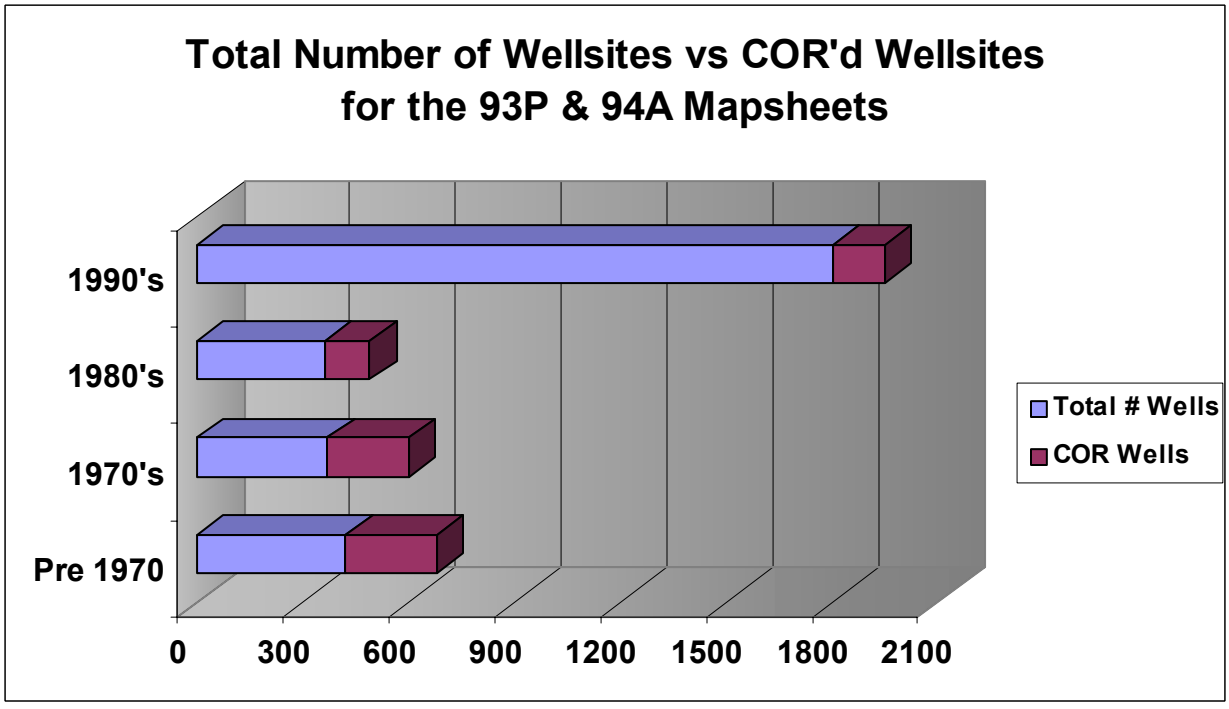


Figure 2. Distribution of reclaimed wells by rig release age class for the 93P/94A Mapsheets



Inventory Methods:

Within the 93P and 94A mapsheets there were approximately 1873 COR'd wellsites identified in the well index (May, 2003 version). We evaluated summary statistics using an Excel spreadsheet and displayed the results in charts and graphs. Our screening for field study sites involved selection of well sites that were:

1. located in the BWBS biogeoclimatic zone (BC Ministry of Forests biogeoclimatic maps)
2. in townships / NTS blocks ("map units") with > 80 % crown land (based on colour coding provided on maps produced in 2001 by McElhanney, Ft St John) , and
3. in map units with > 65% forest cap classes 1, 2, 3, and 4 (Canada Land Inventory maps)

This selection process reduced the number of candidate well sites to 412 COR'd wells, and they were located in 98 map units. We then prepared a randomized list of the map units, and selected map units for further study. Within each of the selected map units, all sites were considered for further evaluation. To ensure some geographical diversity in our study, we chose sites from 94A and 93P in proportion to their representation in the overall list ie approximately 75 percent of sites were from 94A and 25 % from 93P. We used the BC government "online cadastre" web–based geographic information system to obtain an orthophoto of each well site, which was used to make preliminary evaluations of a) access, b) extent of ingrowth, and c) characteristics of the surrounding vegetation. As the site assessments were being carried out, we further modifed the selection process to ensure a range of site ages were evaluated, and in some cases, sites with difficult access were rejected.

Through this process, 25 site assessments were carried out in the summer of 2003, and six sites with an expected high capability for forest production were selected for treatment.

Inventory Results:

Figure 3 shows that the number of sites receiving COR varies over time, which likely reflects in part variation in oil and gas drilling activity. Although some periods (e.g. 1990's) had relatively few sites being reclaimed, an average of 40 to 60 sites per year received COR over much of the past 30 years. Considering that drilling activity has likely intensified over the past 5-10 years, these numbers could be considered a minimum number of sites expected for reclamation on an annual basis in the near future. Many of the COR'd sites represented dry holes, that were available for restoration shortly after drilling was completed. For sites where oil and gas were produced, the timeframe and schedule for their reclamation depends on a number of factors which we did not evaluate, but likely includes production, new technology to maintain production, discovery of new (deeper) reserves, among a number of other factors.

Figure 3. Reclaimed well sites in 93P and 94A

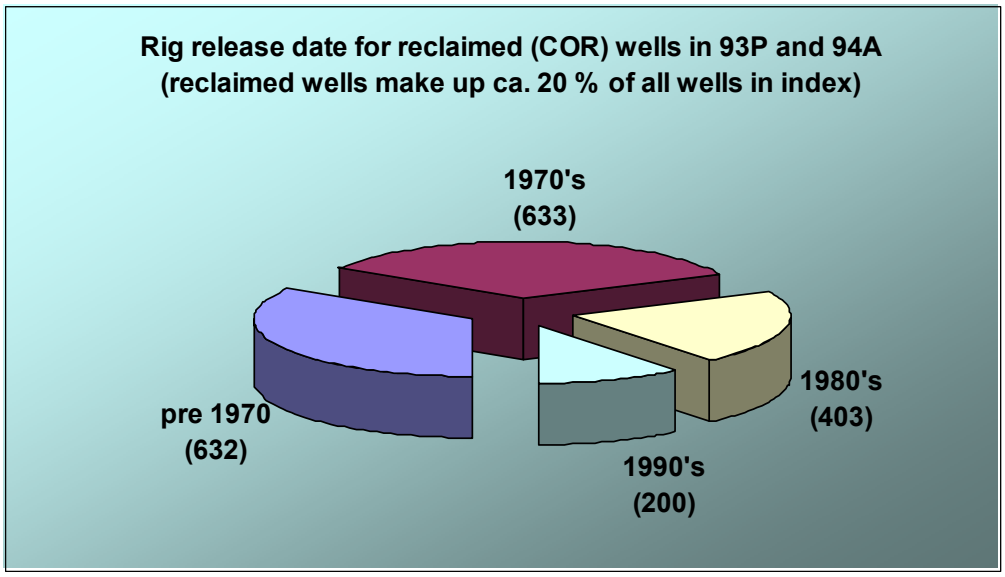
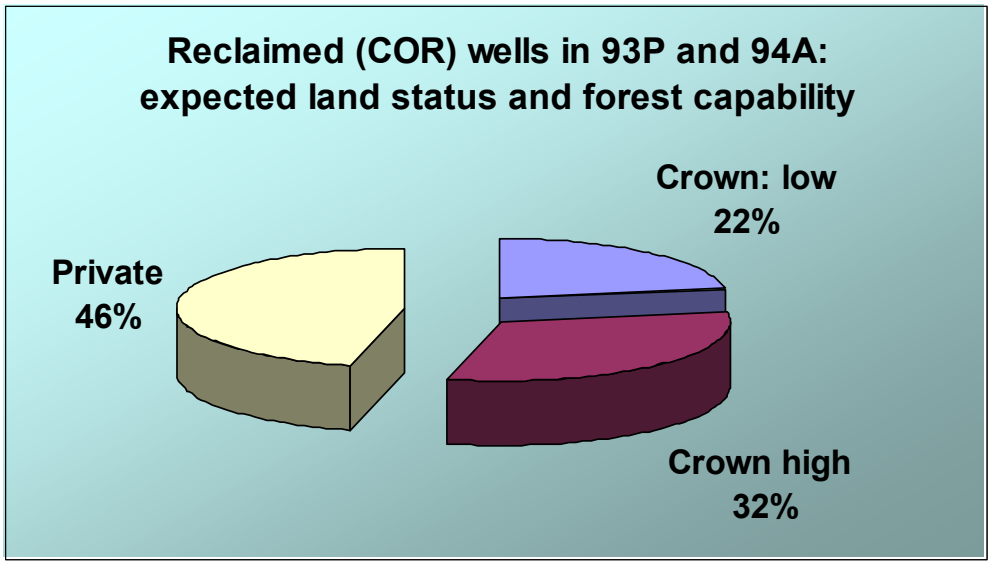


Figure 4. Expected land status and forest productivity of reclaimed wellsites



Site Assessments

Introduction:

We developed a pre-site assessment template with input from OGC, MoF, First Nations and Forestry & Reclamation specialists. Our intent is that this template will be considered for incorporation into the existing application process and will be the mechanism to incorporate a professional prescription to attain the desired end land-use objectives into the development of the site. From these site assessments, reclamation prescriptions will be developed, prescribing the necessary techniques required to restore the sites to the most suitable end land use objective.

In developing and testing this site assessment template, we completed site assessments on twenty wellsites, which already have Certificates of Restoration, but may not have been restored to an optimal end land use objective. These sites were selected through our inventory process. Reclamation prescriptions will be developed for these sites, with the intent that funding may become available to complete further restoration efforts.

Site Assessment Methods/Results:

The site assessment prescription was developed using forestry and reclamation experience and previous site data collection materials from both the forestry and oil and gas industry. All information deemed an important factor for restoring the site was included in the prescription. Since there is no pre-construction information on these sites, both onsite and offsite (control) information was incorporated into the template. Data incorporated in the template includes: elevation, aspect, slope, biogeoclimatic zone, vegetation (Figures 5&6), vegetation cover, vegetation height, soil horizons (Figure 7), soil texture, coarse fragment %, coarse fragment size, soil penetrability, soil water content, unfavourable substrates, humus form, rooting depth, soil moisture regime, soil nutrient regime, and surface cover materials. The site is first stratified based on site conditions then plots are located in each stratum both on the site and off the site. All of the information is then collected for each plot. Site description information is also collected and many comments are made about stratum differences, the sites potential uses and key factors affecting reclamation. A sketch of the site including; stratums, plot locations, etc. is also completed for as part of the site assessment. (see appendix 2 for site assessment template)

Testing the template in the field proved to be very useful as the information and layout of the form has had many modifications to ease the collection in the field and to capture all pertinent information. Under recommendation from the steering committee additional changes have been made and are included in the example attached. We expect the template to adapt even more over the course of the project as we learn more about the influencing factors affecting the sites restoration.

The site assessments also proved useful in comparing sites from the various age classes identified in our inventory. Many of the older sites (pre 1970) were naturally coming back very well with tree and native plant ingress (Figure 8). Conversely, sites from the 1980's had small amounts of tree ingress, especially

around the edges of the site, as well as some native plant ingress (Figure 9). Many of the 1990's sites had few trees on them but had distinctly more topsoil, coarse woody debris and consequently good native plant ingress, even at their early stage (Figure 10).

Figure 5. Photo of vegetation in an offsite plot.

Figure 6. Photo of vegetation on a site. A lower lying stratum is in the bottom right of the photo, while an elevated stratum is in the top left corner of the photo.

Figure 7. Onsite soil pit, where soil information is collected.

Figure 8. Tree and native vegetation ingress on a site from the pre-1970 category of our inventory.

Figure 9. Tree ingress on a site from the 1980's category of our inventory.

Figure 10. Native vegetation ingress on a site from the 1990's category of our inventory.

Site Treatments

Introduction:

Our treatments were designed to test whether or not soil conditions on COR well sites were suitable for the production of commercial tree species. The results of our previous study had emphasized the importance of the soil moisture regime in determining regeneration success of planted pine, so we stratified our site selection based on the expected moisture regime. Stratification was accomplished initially by examining Canada Land Inventory maps of the area and estimating the average moisture regime for map units of approximately 100 square km. The actual moisture regime for candidate treatment sites was then verified by field checks, and detailed site assessments. In the first year of our study we focused our efforts on treating sites with mesic moisture regime. Sites with wetter conditions will be identified and treated in 2004.

We based our selection of soil treatments on the factors that were expected to limit productivity, based on the results of our previous research. Our treatments were designed to test operationally realistic treatments to address limitations arising from (a) reduced site organic matter levels on disturbed sites and (b) competition from seeded cover crops. In addition, we included treatments designed to test the assumption that soil physical conditions do not provide serious impediments to the growth of tree roots, and therefore will not impact forest productivity.

Reforestation treatments were designed to evaluate the performance of a variety of tree species that could be used in reforestation. Reforestation treatments will be carried out in spring 2004
The soil treatments are outlined in Table 1.

Table 1. Site treatments for operational trial of wellsite reforestation.

Treatment Code	Decompaction	Vegetation control	Organic amendment	Amendment Application method
U	none	none	none	n/a
B	none	brush mats	none	n/a
C	none	none	10 cm layer of wood chips	mulch
D	to 50 cm	none	none	n/a
DC	to 50 cm	none	10 cm layer of wood chips	mulch
DCI	to 50 cm	none	15 cm layer of wood chips	incorporate to 25 cm

The rationale for selecting the treatments was based on their expected ability to (a) alleviate growth-limiting conditions, (b) provide operationally realistic treatments, and (c) provide low-cost options for reclamation and reforestation. Since the sites had received COR, and had already been treated to reduce compaction for establishment of the cover crop, our lowest cost option is to simply plant trees on well sites that receive no further treatment (U=untreated). To alleviate the potential competition from cover crops which were well established on all of the wellsites, we will use brush mats attached to the ground when the sites are planted (B). To provide organic matter inputs, and to simulate the presence of forest floor as a rooting medium, and its ability to modify soil temperature and moisture conditions, we applied a 10 cm layer of wood chips (C=chips). This is not too different from the depth of forest floor in adjacent untreated areas. To evaluate whether or not soil physical conditions are suitable for productive forest growth after standard reclamation techniques have been applied, we tilled the soil to a depth of 50 cm. As a further test of soil conditions, we added wood chips to the tilled soil, either as a mulch (DC) or incorporated (DCI). The wood chip treatments we applied were costly because the material had to be transported to the site in a large van. However, in operational situations, there are often large accumulations of waste logs and logging debris remaining after clearing and site development. The wood chips we used should effectively simulate conditions that could be obtained operationally by having a mobile chipper process waste logs and debris, and spread the material across the site during the reclamation stage.

Site Treatment Methods:

The treatments were applied in October and November of 2003. Decompaction was carried out using a Komatsu 30 ton excavator with a site preparation rake and/or a bucket (Figure 11). Wood chips were obtained from the CanFor sawmill in Taylor BC, and were derived from coniferous logs. The wood chips had been stored at the site for some time, and were slightly discoloured, but are expected to be similar in character to freshly ground wood. Wood chips were stockpiled adjacent to the plots by unloading the amount required from the "shuffle deck" van (Figure 12). Wood chips were spread across the site by the excavator after decompaction, while minimizing the need for the machine to travel over decompacted areas (Figure 13). In some cases, the machine was able to reach across the site and did not have to travel over treated areas. In other cases, minor amounts of machine traffic were needed, and the effects were eliminated by further tillage as the machine worked sequentially across the plot. As the excavator carried out the tillage, we were able to confirm our initial assessment of soil moisture conditions for the plots. On one site, we were forced to relocate one plot after an initial attempt to treat it failed because of wet (subhygric) soil conditions. In this case, stockpiled chips were left some distance from the final plot location, and will be transported and spread over the plot in spring 2005. Road approaches were modified to allow the chip trucks to access the plots, and needed to be restored at the end of the treatments, increasing the costs above our initial estimates. The bare soil on the approaches will be covered with grass and legume seed in the spring of 2004. Some studies indicate that addition of wood chips to soil reduces the availability of nitrogen, and can reduce the growth of planted crops. In one previous study using pine trees planted on resotred landings in south BC, pine trees were not affected by wood chips added without added N. We intend to monitor the need for supplemental N additions through soil testing and evaluating tree health, and will add N if necessary.

Plot maps and site assessments for the 4 treated well sites are included in Appendix 1 of this report.

Figure 11. Decompaction of site using an excavator.

Figure 12. Shuffle deck van delivering wood chips.

Figure 13. Spreading woodchips over the decompacted soil.

Figure 14. Woodchips spread over unripped plot to act as a mulch.

Figure 15. Woodchips incorporated into the decompacted soil.

Future Plans

We will evaluate the budget available for treating 2 additional mesic sites in the spring of 2004. Our intent is to treat two additional sites south of Dawson Creek, but this will likely require some cost effective options such as finding a machine in the area to avoid transport costs. We are also unsure if we will have the resources to haul wood chips to the plots south of Dawson Creek, but will attempt to install at least the plots without chips. All sites on mesic moisture regimes will be planted in spring 2004 with an alternating mixture of pine and spruce, at an approximate spacing of 1.8 m by 1.8 m. On the 20 x 20 m plots, this allows for 12 rows of 12 trees (144 total, 72 of each species – with 2 buffer rows, allowing for 32 "inner plot" measurement trees of each species). On two of the plots at each well site (U, and DCI), we have allowed additional space for the testing of hardwood species (aspen and birch or others), if we are able to obtain planting stock. These will be planted in rows with a close spacing, and would provide establishment information only.

PART II - Cumulative Impact Assessment of Oil and Gas Activity on the AAC – Proposals to Avoid, Mitigate and Reclaim AAC Impact

Summary of progress towards overall project objectives and deliverables:

1. Provide a clear road map that could be implemented to achieve non-impact status on the AAC, and provide a cost estimate, time requirements, and changes required to achieve this goal, while enhancing the effectiveness and efficiency of the present process

   *Deliverable: Final 'road map' report with all suggested methodology and cost structure to deliver a full **cumulative impact study** on the AAC by oil and gas activity, past, present, and future. Final report will provide recommendations to eliminate future negative AAC impacts. This report will define cost, time, and structure of the processes that are required to achieve minimal impact on the AAC by the oil and gas industry*

   1st year progress: We have completed the report (roadmap) and a draft is attached. The report is currently being reviewed by CAPP and we should be getting feedback within the next month. Once the report has been submitted, we will be leading initiatives throughout the term of our project to help get some of the mitigating steps started.

Introduction:

This roadmap was created to form the framework to evaluate the past impacts of the oil and gas footprint and evaluate mitigating treatments for both past and future impacts. We looked at past activity and reclamation efforts, present results of those treatments and actions, and have developed a road map for providing present and future processes that should occur in order to minimize and/or eliminate this impact (Figure 1).

Methods & Results:

The proposed road map consists of two components. The first component is determining the current status of the oil and gas footprint using the best available information from both the oil and gas sector and the forest sector. The second component of the road map identifies opportunities to mitigate impact on the annual allowable cut. Below is our suggestions for completing components 1 and 2, in order of importance based on the best returns for the investment amount and the most impact on addressing the issue.

Component 1 – Current Status Assessment

- Spatial Coverage and Analysis
  - Acquire forestry data
  - Acquire oil and gas activity data
  - Reconcile data discrepancies
  - Merge data from both sectors
  - Determine the current status of the oil and gas footprint

- Assess current state of past disturbances (may be naturally regenerated)

Component 2 – Mitigation Opportunities

- Identify Backlog NSR areas (Trade off areas)
  - Assess
  - Reforest or reclaim using best end land use;
  - Process for submission to Ministry of Forests and Oil and Gas Commission;
  - Develop growth and yield information (pathway).

- Well site Reforestation (Figure.2)
  - Site assessments and reforestation plans
  - Soil restoration (ripping, fertilizing) & planting

- Contribution to other inventories (PEM / Site Index)

- Seismic Reforestation
    - Site assessments and reforestation plans

- Cooperative Planning (Integrated Land Management)
    - Data management system development, management, and upkeep.
    - Integrated land/resource management procedures

Clearly, Oil and Gas and Forest Industry activity have cumulative impacts on the land base and on each other. It is also evident that both sectors' activities are increasingly becoming entwined. Current estimates are based on areas derived from interpreted seismic line lengths. Possibly, the actual oil and gas industry impact are less than current estimates. By implementing portions of the outlined roadmap, estimates based on sound data would lead to better information and subsequently lead to informed and managed planning processes. The proposed solution would be to gradually integrate planning and operational functions where logistics provide an obvious fit. We will be leading initiatives throughout the term of our project to get some of the mitigating strategies off the ground. We will also be getting feedback from all parties involved on which strategies are the most beneficial to everyone involved and also on ideas for getting some of these strategies started.

Figure 1. Example of how concentrated oil & gas activity can be in areas within the Timber Harvesting Land base.

Figure 2. Results of campsite (upper) and wellsite (lower) reforestation within the Timber Harvesting Land base. Canadian Hunter (Burlington Resources Ltd.)

Figure 3. Older seismic line widths on the timber harvesting land base (left) and more recent and current seismic line widths on the timber harvesting land base.

Future Plans

We will be getting feedback from all parties before submitting the final report, which will include strategies that are beneficial to all parties involved. Once the final report has been submitted we will we trying to work with the OGC on initiating suitable strategies that will help mitigate potential impacts of oil and gas activities on the OGC.

PART III - Pre-Site Assessment, Reclamation Prescription, and Common Decking Site Process: Operational Trial to Improve Efficiency and Effectiveness of Reclamation

Summary of progress towards overall project objectives and deliverables:

1. Further develop the pre-site assessment template.
   Deliverable: A comprehensive analysis of all current information, information from ongoing projects, and information that is deemed important by all parties will be used to develop a pre-site assessment will be developed.(The template will be adapted based on finding from Part I of this project.)
   1st year progress: Template has been started, but not completed. Burlington Resources has offered for us to visit a site being constructed (winter & summer) and to help capture all important elements required for the pre-site. This deliverable will be completed before next summer.

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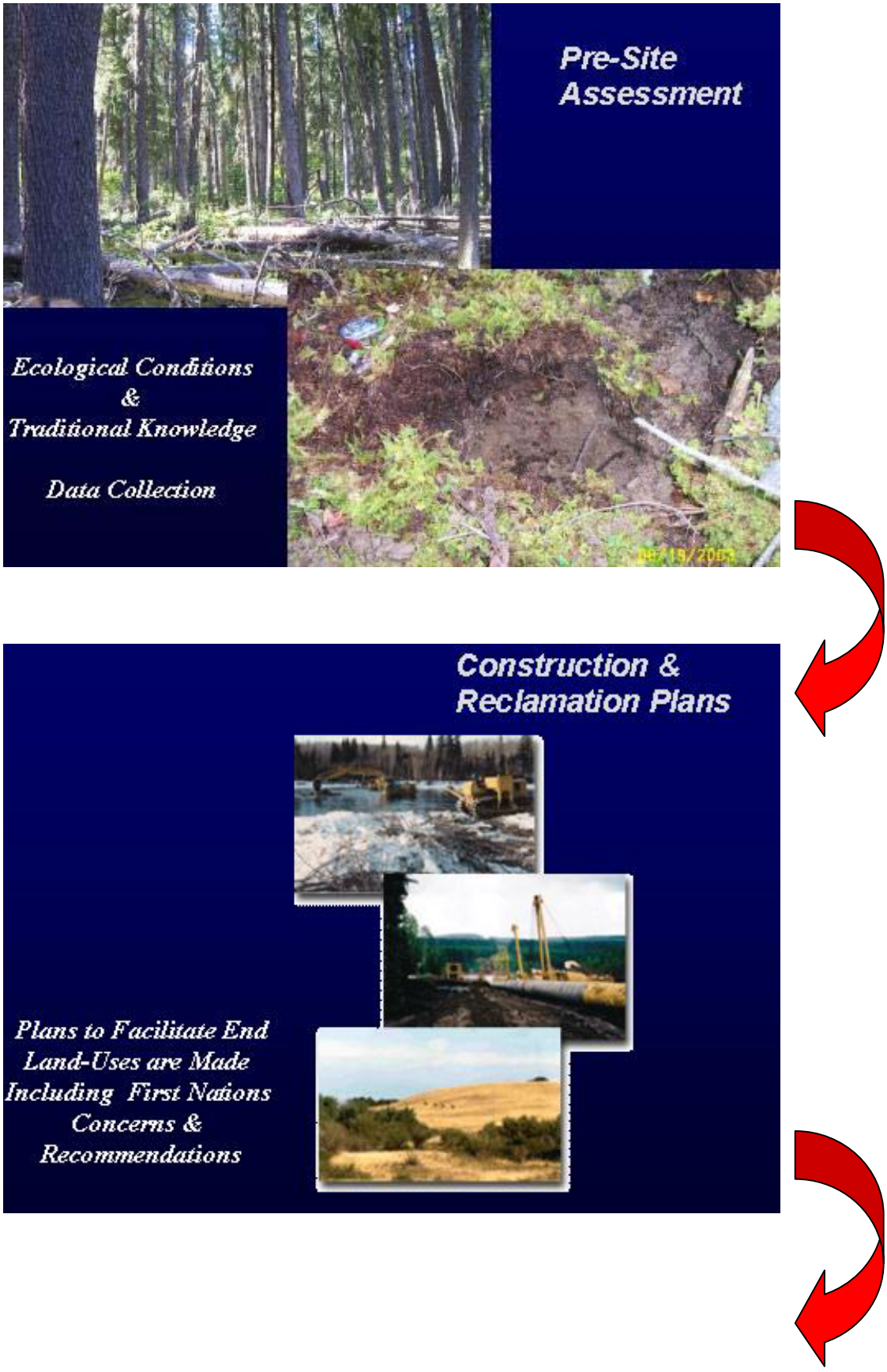
2. Refine the reclamation prescription template.
   Deliverable: A reclamation prescription will be developed with input from all parties involved that will examine all pre-site factors as well as any other factors required to determine the most appropriate reclamation treatment.
   1st year progress: The reclamation prescription from part 1 is being adapted for this pre-site assessment. The input from Burlington and from their site visit will help finish this deliverable before next summer.

Introduction/Results:

This part will identify and research the benefits of integrating pre-site assessments and reclamation prescriptions into the oil and gas application process (Figure.1) and address the possibility of common decking sites (For potential use with Part II of this project). These assessments will aid in attaining superior reclamation results, integrating First Nation Traditional Knowledge, and will help to eliminate future impacts of oil and gas activities on the Allowable Annual Cut (AAC) in the forest districts of the Peace Region.

Although we have not yet secured sites for this process, we have talked to several companies who have shown interest. We are sending out a letter of support from the OGC to help obtains sites for this process. Burlington Resources has offered to give us some insight on construction techniques (winter & summer) and how these techniques would be incorporated into our process. We anticipate we will be starting some pre-site assessments this summer.

Figure 1. The proposed process for Part III Sites.



Site Construction

Site Constructed Following Plans and First Nations Concerns & Recommendations

Post - Site Assessment & Reclamation Prescription

Ecological Conditions Re-examined , Compared to Original Site Conditions & Treatments Prescribed


Development
(Drilling, etc.)
Site Developed (Drilling)
(Producer = End Process)
(Duster = Abandonment)


Reclamation
Soil Restoration
Reclamation Carried Out
Following the Prescription
Planting
(trees/shrubs)
Seeding & Fertilizing
(plants/berries)

Workplan and budget changes for year 2

In summer 2004, we intend to complete the following for each of the three parts:

Part I
- Further refine and test the Prescription Template
- Plant and seed the 4 treatment sites from this year
- Site Assessments and soil treatment of the remaining 6 sites (2 mesic sites & 4 wet sites)

Part II
- Implementing AAC Impact Report (Roadmap) Suggestions and getting applicable participants involved.

Part III
- Start fieldwork on sites obtained for this portion
- Pre-Site Assessments & Construction Plans
- Reclamation Prescriptions

C. Bulmer will continue to act as project leader for Part I and will coordinate all aspects of the operational trial implementation and monitoring. Fieldwork will be carried out by C. Bulmer and Monashee Resources (K. Green). Monashee Resources (K. Green & S. Bell) will work with the OGC in leading initiatives to start implementing portions of the AAC Impact Roadmap for Part II. Monashee Resources (K. Green & S. Bell) will continue to act as project leader for Part III and will continue coordinating all aspects of this process, including obtaining sites and support.

The following milestones in year 2 will indicate progress towards the objectives:

- Completing the research trial plot implementation.
- Getting feedback from CAAP, as well as forestry and oil/gas industry representatives on implementing the roadmap.
- Obtaining sites from oil and gas companies to implement the pre-site assessment and common decking site trial.
- Getting First Nations involved in the data collection phase and integrating their knowledge into current reclamation processes.

There are some minor changes to the proposed budget for year 2, including the use of some of C.Bulmers funds to hire a graduate a student from UNBC to assist him in Part I, with the intent of writing an MSc thesis on the project. In kind salary costs for C. Bulmer will be cover by the Ministry of Forests, as in year 1. Overspending on the site treatments due to weather and access issues leaves a smaller site treatment budget for year 2, however due to the site conditions the lower cost per site in year 2 is expected to balance out the budget. Also $2,000 for First Nations consultation in year 1 was not utilized, and as discussed will be carried over to the “Healing the Land – An Elders Perspective” add-on for year 2.

YEAR 1 BUDGET SUMMARY

Budget Summary		Budget Requested	Budget Used	Remaining
1. Personnel costs (salaries & benefits)	a) Students			
	b) Non-student			
2. Teaching relief				
3. Doig River First Nations / Contractors (Contractors – Soil Rehab on 6 sites.)		**$14,000**	**$14,770** (4 sites)	**-$770**
4. Consultants (Monashee Resources)		**$75,000**	**$74,397**	**$603**
5. Equipment (purchase, upgrade, rental)		**$3,000**	**$2,833**	**$167**
6. Materials and supplies (Soil Sampling / Analysis by MoF Research Branch)		**$25,000**	**$25,000**	**$0**
7. First Nation Consultation (Traditonal Knowledge section of Pre-Site Form)		**$2000**	**$0**	**$2000**
8. Administrative (overhead) costs				
Total		**$119,000**	**$117,000**	**$2000**

OGC Payment Schedule		**Payment (Date)**	**Unused**
Upon Signing Contract			
Ministry of Forests (Chuck Bulmer)	**$25,000**	**$25,000 (6/24/03)**	
Monashee Resources	**$32,000**	**$32,000 (6/24/03)**	
August 2003 (reclamation template deliverable)	**$25,000**	**$25,000 (9/12/03)**	
October 2003 (soil rehabilitation deliverable)	**$25,000**	**$23,000 (11/25/03)**	**$2000**
Upon Final Report Completion	**$12,000**		
Total	**$119,000**	**$105,000**	**$2000**
Hold Back / Outstanding		**$12,000**	

Appendix: Plot layouts and brief site descriptions for treatment sites

Figure A1. Four mesic well sites were treated in 2003 (Bernadet & Aitken), and two more mesic sites were staked out in preparation for treatment in 2004 (Noel & Boot Lake).

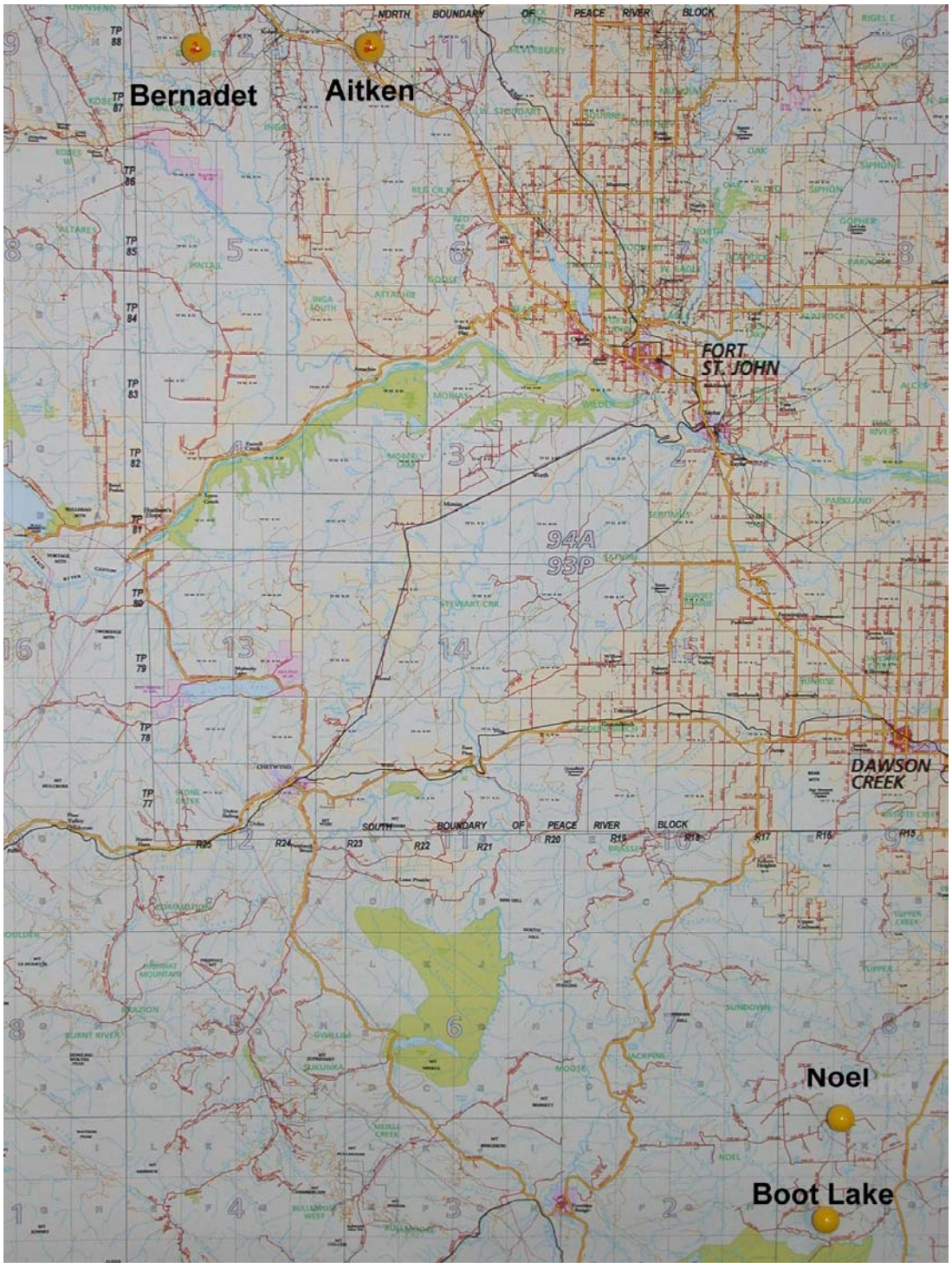
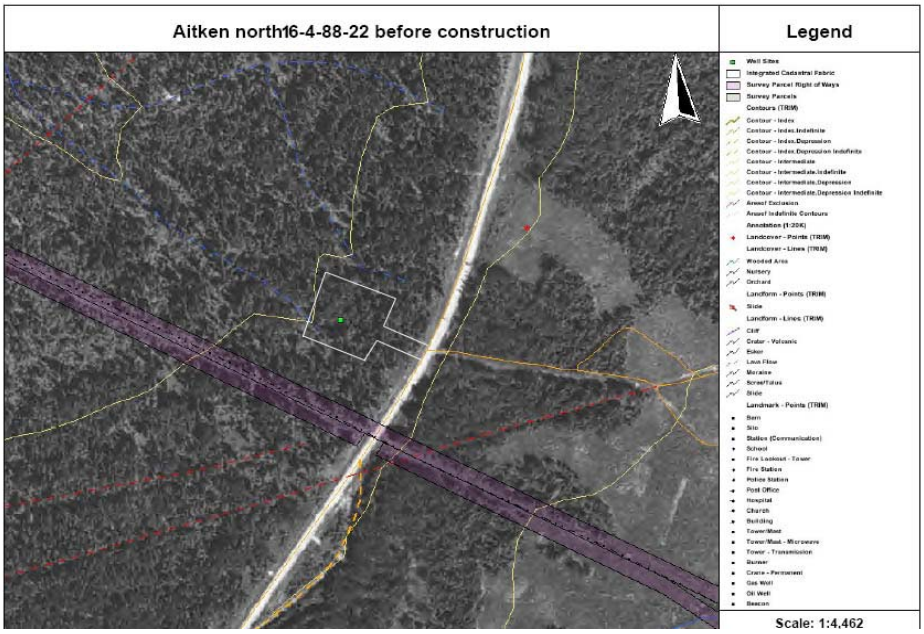


Figure A2. Orthophoto and treatment plot layout for 16-4-88-22 (Aitken).



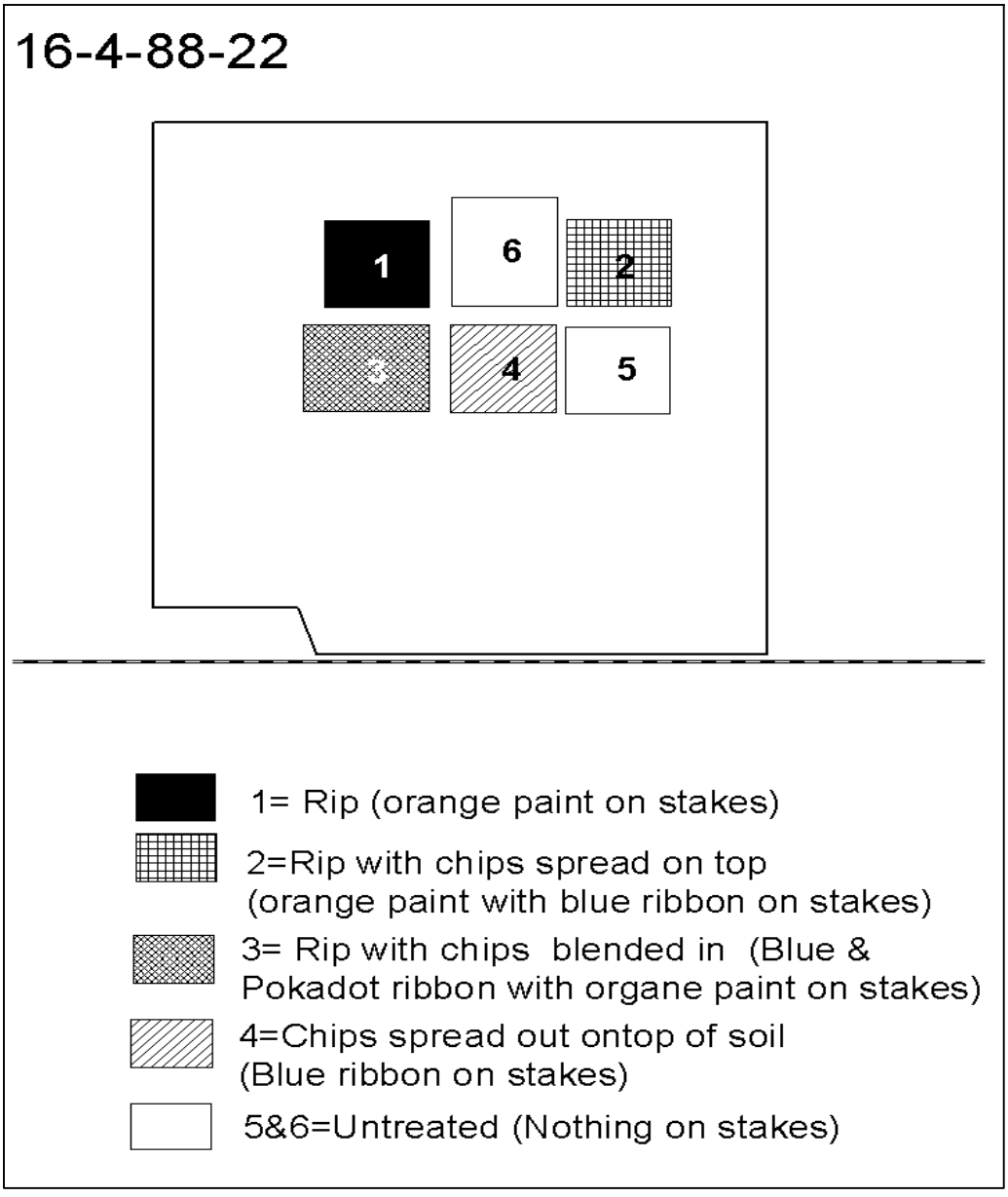
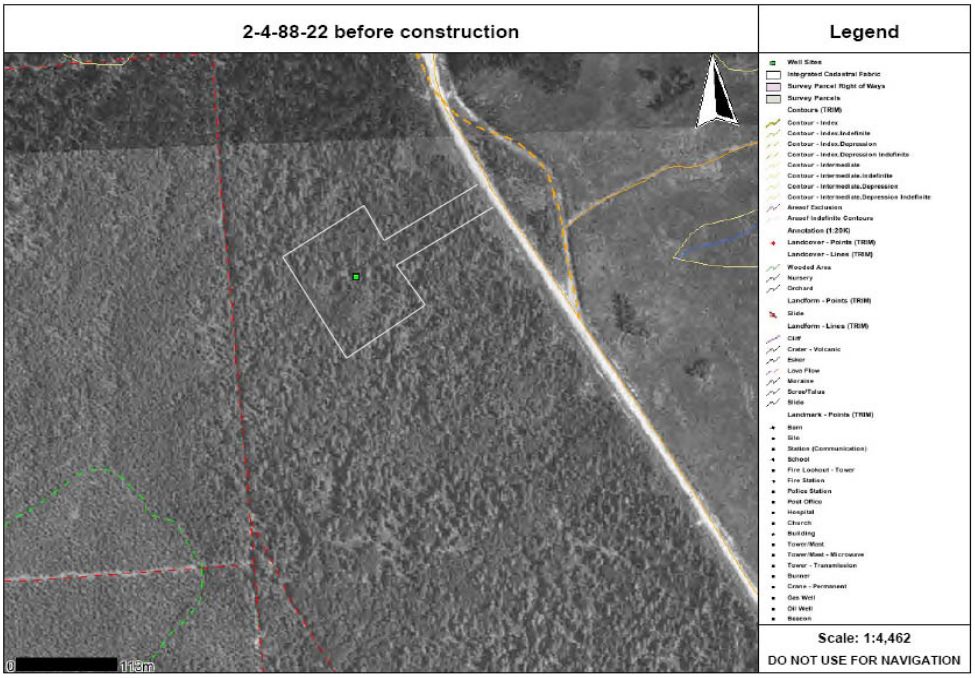


Figure A3. Orthophoto and treatment plot layout for 2-4-88-22 (Aitken).



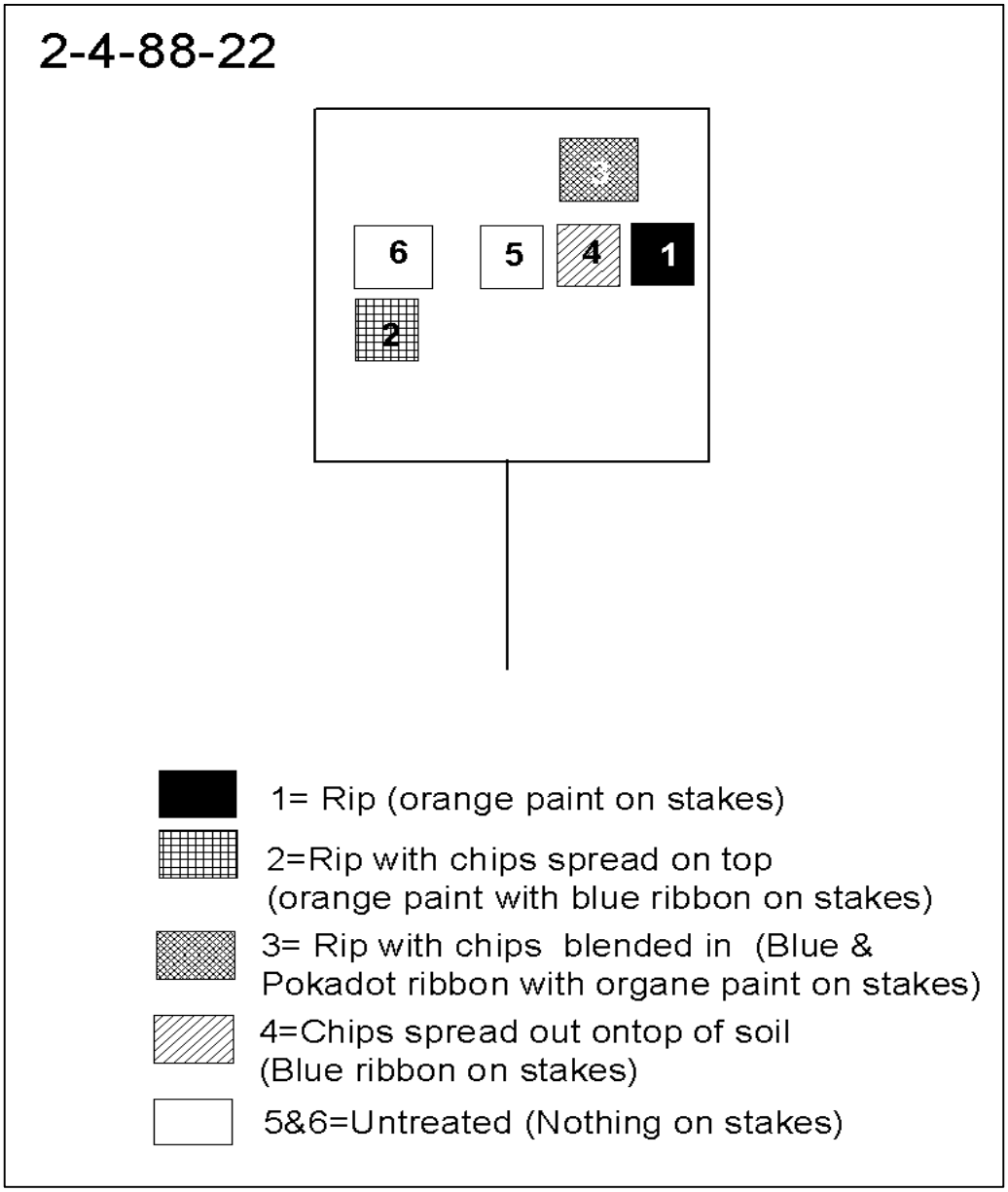
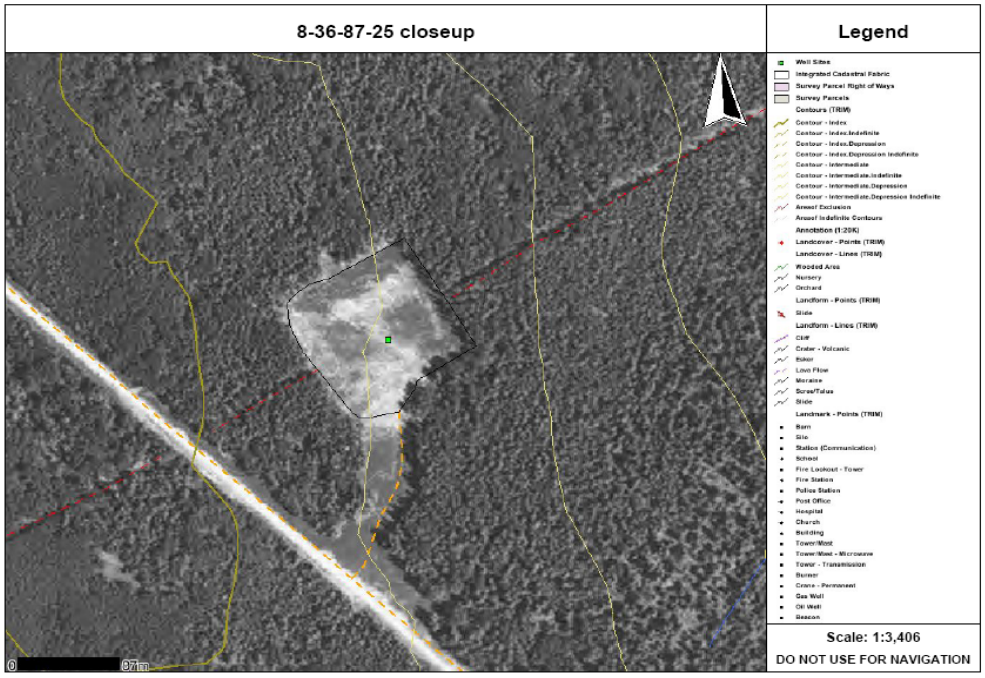


Figure A4. Orthophoto and treatment plot layout for 8-36-87-25 (Bernadete).



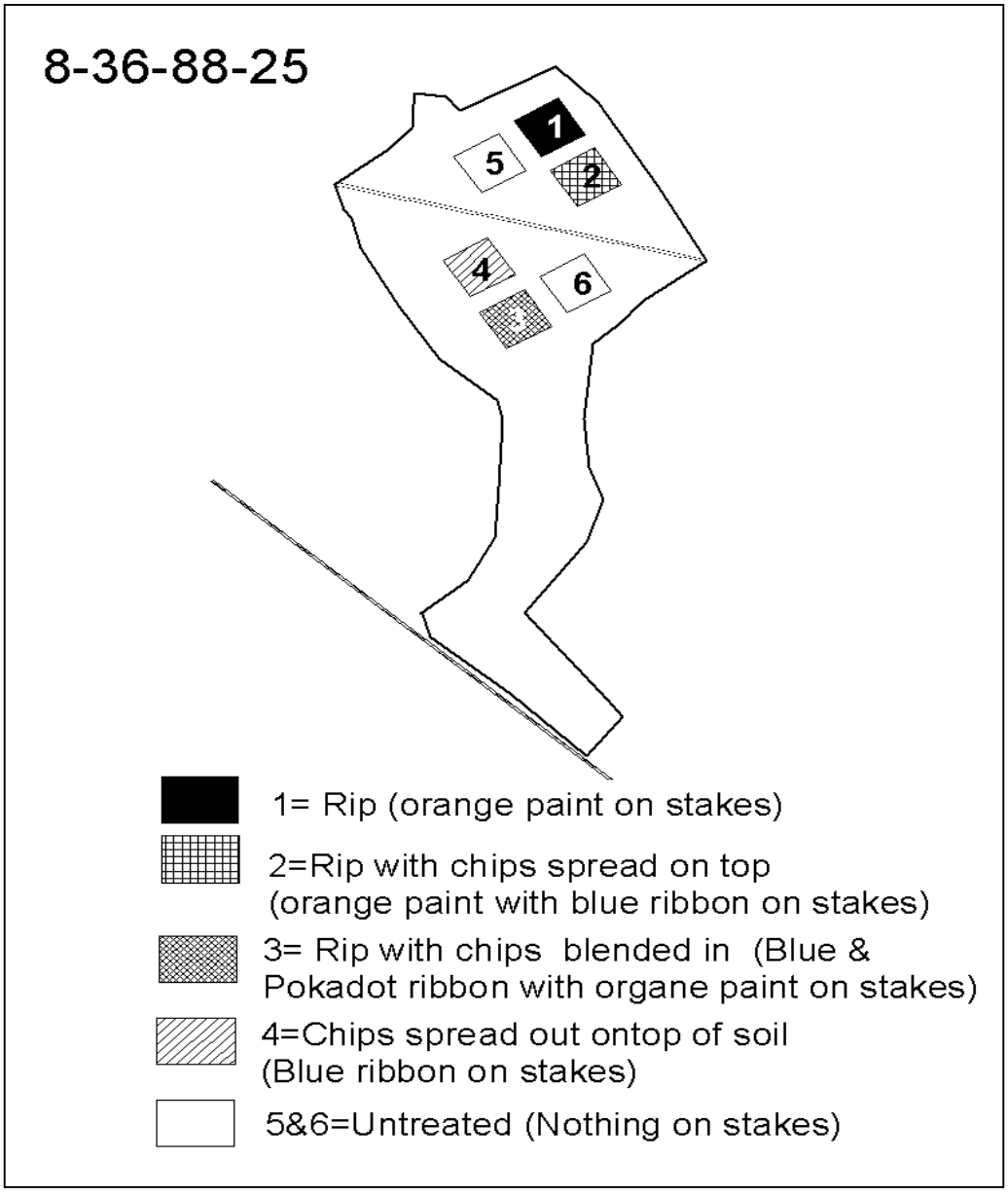
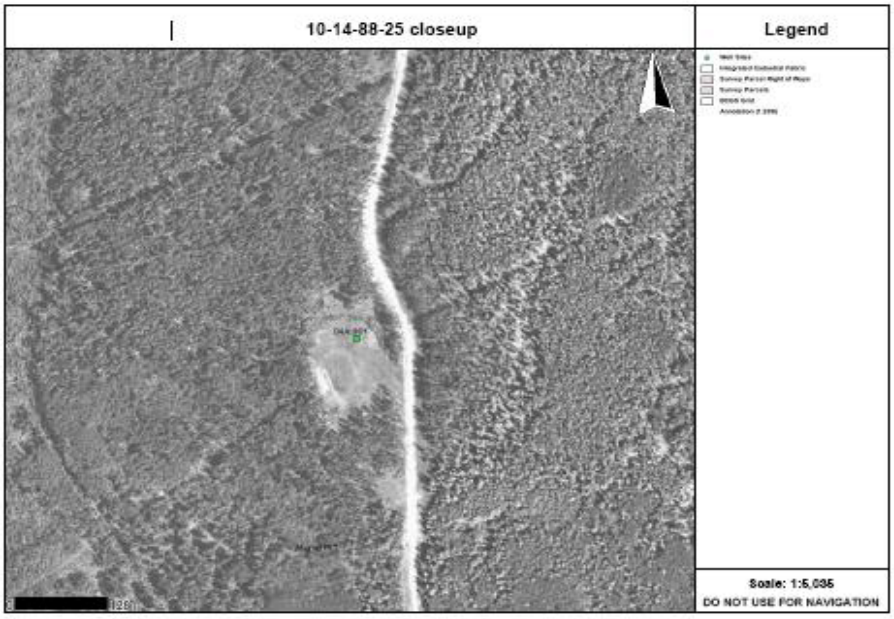


Figure A5. Orthophoto and treatment plot layout for 10-14-87-25 (Bernadete).



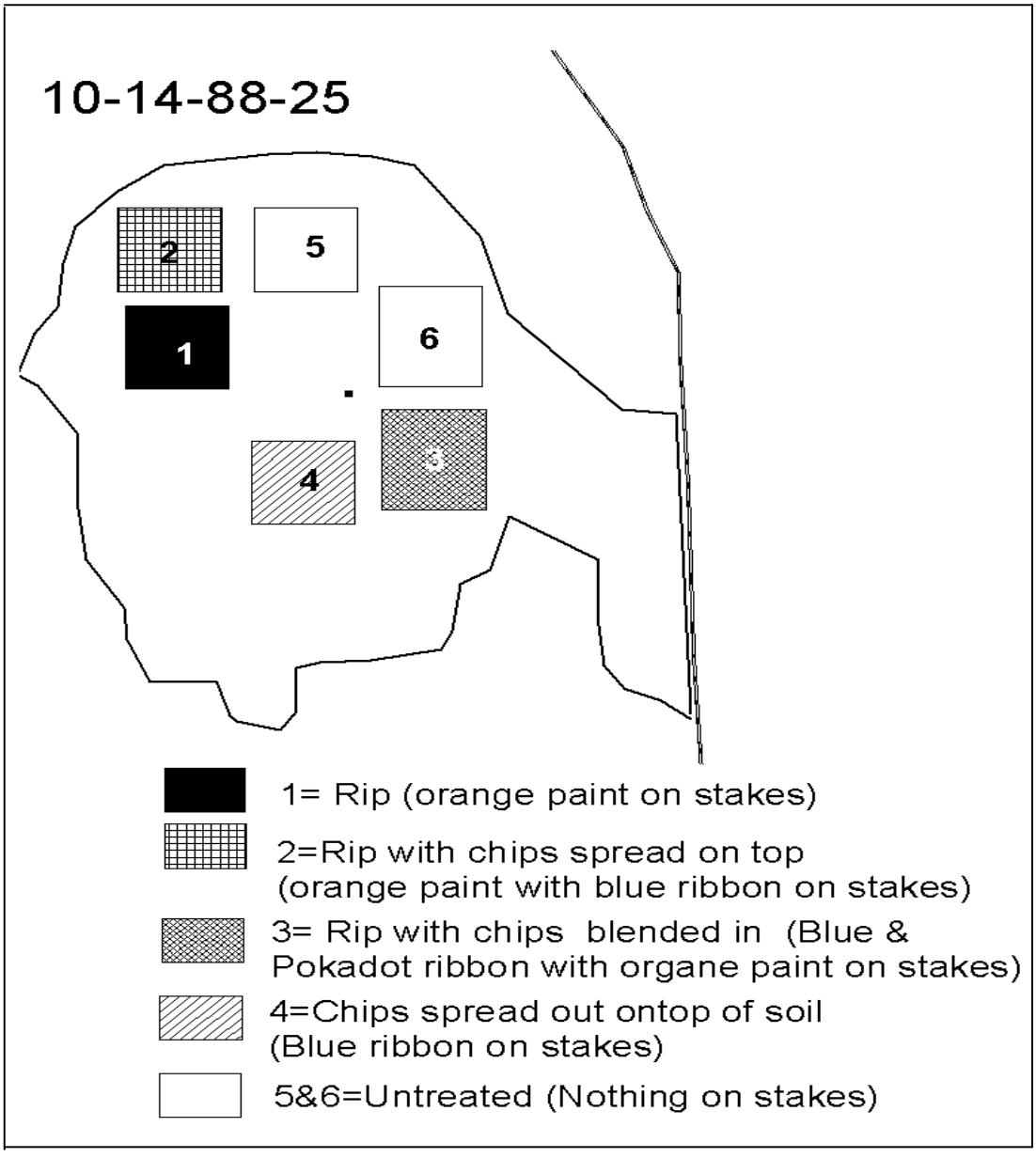


Figure A6. Orthophoto and treatment plot layout for a-1-D, 93P-8 (Noel).

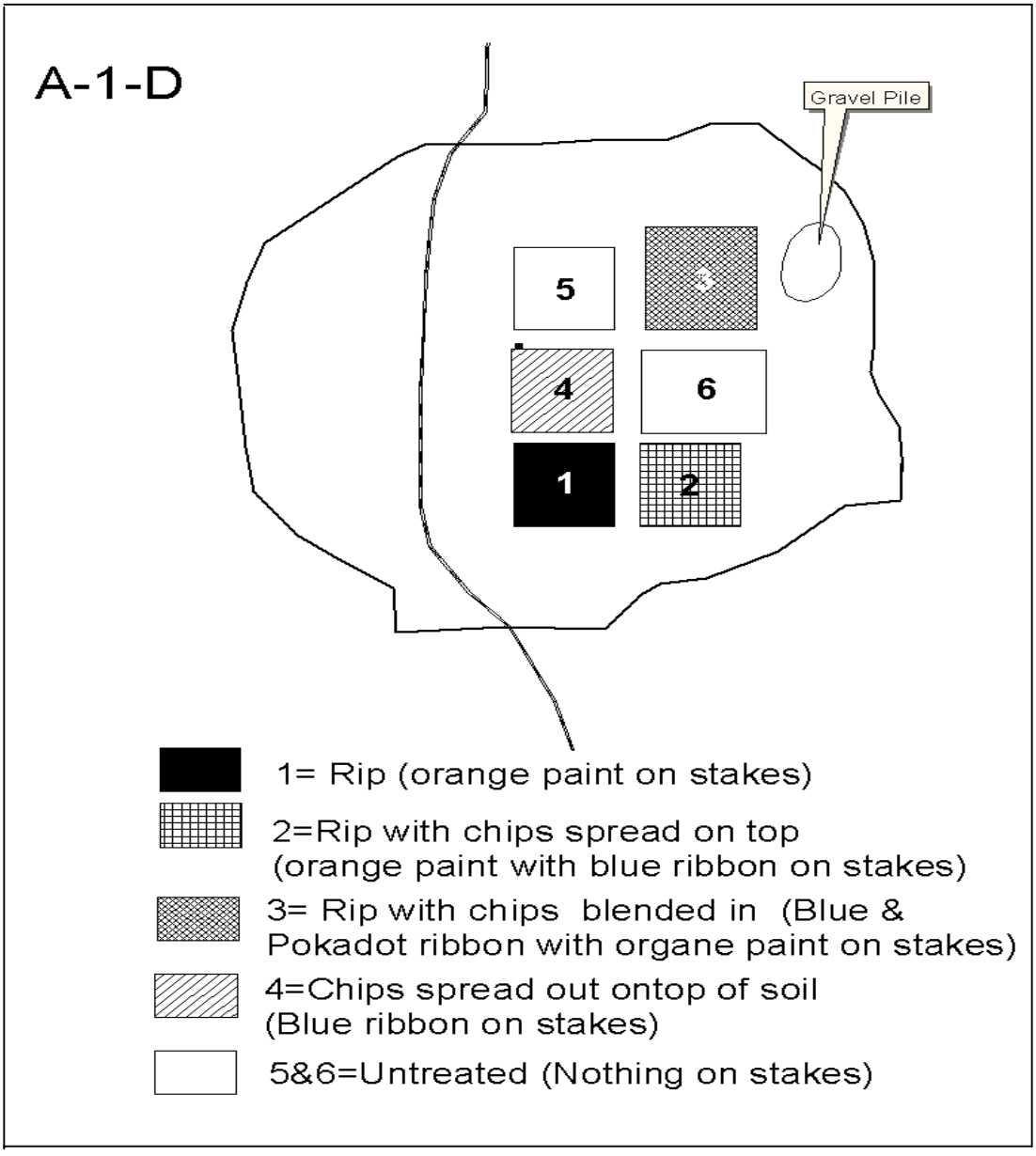
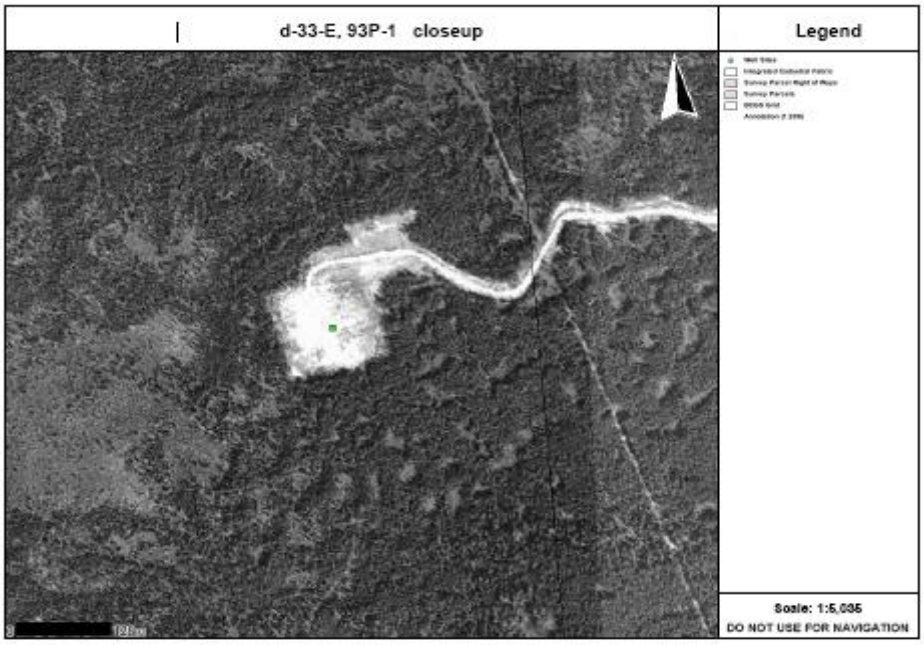


Figure A7. Orthophoto and treatment plot layout for d-33-E, 93P-1 (Boot/Blackhawk Lake).



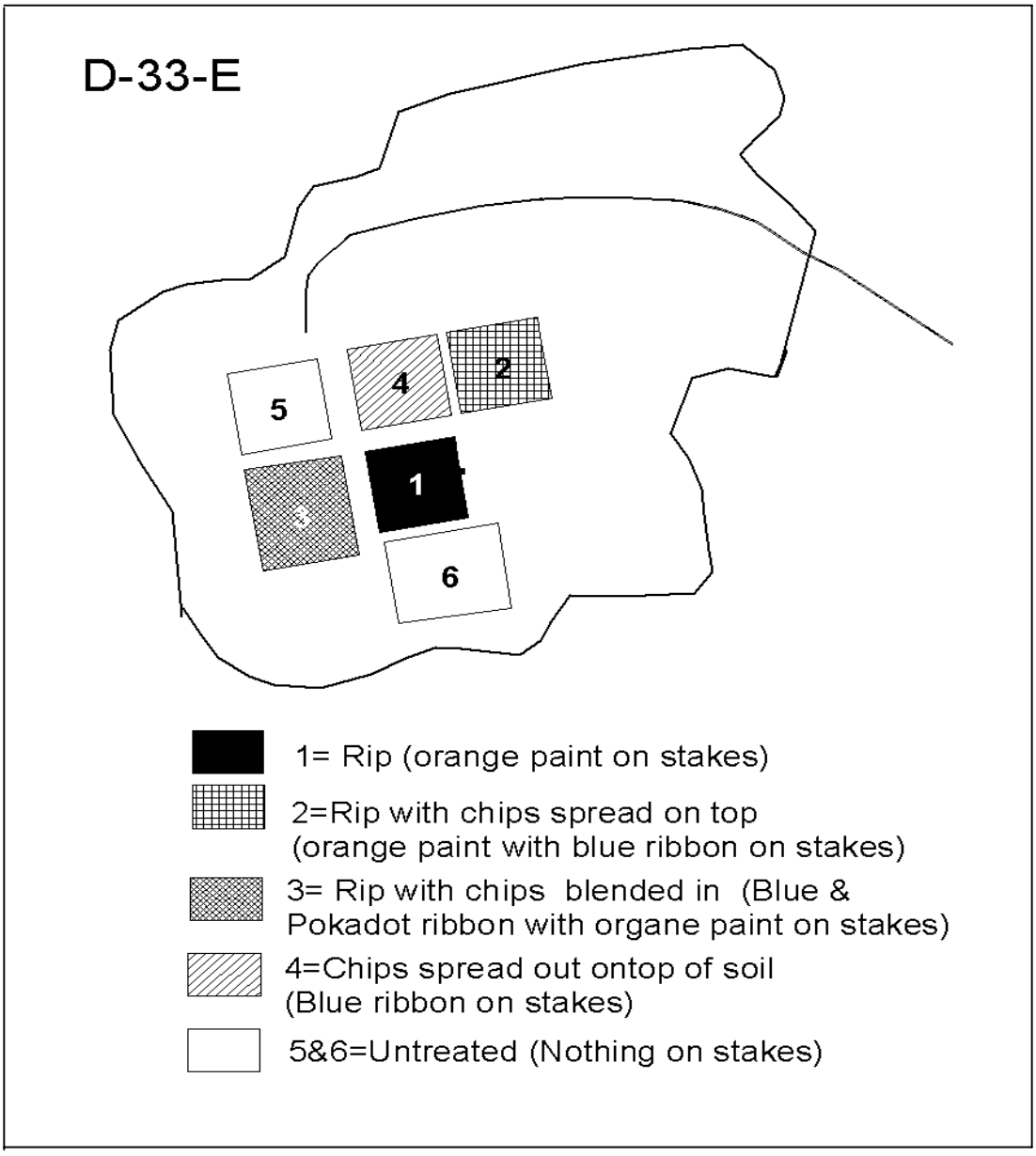


Table A1. History and characteristics of sites treated in 2003, and schedules for treatment in 2004.

Site	Location	Rig release	Prod	Stake holders	Elev. (m)	Slope % / Aspect	SMR	SNR	Grass / Herb %	Tree cover % / ht (m)	Texture 0-10 cm	Coarse frag surf %	Rooting depth cm	BEC
Aitken Creek	16-4-88-22	n/a	und	n/a	860	10 % NW	mesic	med-rich	20	n/a	sil	15	18	BWBS mw1-01
Aitken Creek	2-4-88-22	n/a	und	n/a	855	2 % N	mesic -shvg	med	70	n/a	sicl	5	15	BWBS mw1-01
Bernadet	10-14-88-25	1979	oil	grazing	875	3% NE	mesic	med	80	20	sic	20	12	BWBS mw1-03
Bernadet	8-36-87-25	1994	und	grazing	850	7 % E	mesic	poor-med	30	n/a	sicl	15	16	BWBS mw1-03
Noel	d1A 93P8	1994	und	n/a	985	4% SE	mesic	Poor-med	80	n/a	sicl-cl	5	15	BWBS mw1-01
Blackhawk Lake	d33A 93P1	1991	gas	n/a	970	2% NE	mesic	med	80	5	sicl-cl	20	12	BWBS mw1-04