

APPENDIX A – KEY LEARNINGS AND RESEARCH OPPORTUNITIES

Table 8 Key learnings and research opportunities [6]

Learning Type	Notes
Research Opportunity / Learning	Unpublished research says that flipping mounds might work less well than picking material up and placing it down bottom first. Potential to try not flipping the mounds. This might help keep the top organic layer from decomposing as fast. Bigger mounds might also be better (tall and area).
Learning	Need mosses to come back for long-term recovery. If sedges dominate, you may have arrested development. Decades recovery expected.
Research Opportunity	Use CWM to support growth
Research Opportunity	Research biochar to help stability – may get washed out.
Learning	Why rich fens don't work: <ol style="list-style-type: none"> 1. Too wet 2. Peat itself is mostly sedge peat and humus – not as fibrous – so does not have the physical properties of a sphagnum mound (not holding shape well). 3. Exposure to oxygen = accelerated decomposition rates 4. Freeze-thaw cycle 5. Low nutrients 6. Suffer from too dry or too wet = trees don't do well
Research Opportunity / Learning	<ol style="list-style-type: none"> 1. Is there a reasonable expectation to see a treed system in the rich fen ecosite? They are mostly shrub and sedge. <ol style="list-style-type: none"> a. Key to set a reasonable expectation before mounding. If the surrounding area is fairly open, it may be unreasonable to expect a recovery of a tree layer. Perhaps focus on a sedge and shrub layer. 2. If there is a decent amount of tree cover, and there is a mound present, we want to see the ground and the trees recover, but we need to do the mounds better or differently
Learning	In the Drayton Valley project, mounds were taken from material around the line and placed directly on the lines. It's called the hummock-transfer technique. Shrubs and other materials are transferred with the mounds. Seedlings can be planted on the mounds. So far, the seedlings are doing fairly well. It was only completed in March 2019. The concept is similar to a forest floor transplant in upland areas. No long-term results are available in fens.

Learning Type	Notes
Learning	Trees may not be the main driver of these sites; makes sense the trees do not recover well.
Learning	Fen water can dry up over time and then those mounds will be more dry patches. Recovery can be slow, but doable in a long-term time horizon. Willow and birch then larch trees.
Learning	Winter road reclamation near Peace River: Flattened wet lines remain open but slowly dried up over time. The buildup of sedge biomass provided space for moss growth. Together they formed drier microsites for shrubs and tree seedlings to establish.
Learning	Two OSE well sites reclaimed by mounding and planting. Similar results to what you described. In bogs and poor fens, inverted mounds retain shape but remain bare. Planted seedlings benefit from dryer microsites and grow well on the mounds. The pools either remain open or revegetate through natural ingress, depending on the peatland setting, size, and depth of the pools
Learning	Imperial: Two OSE well sites, no mounding. Natural regeneration when woody species are left on site. When woody species are chipped or taken out, the site remains wet and flooded with poor woody regeneration
Learning	Peatlands take 100s of years to restore themselves. Of the opinion that the creation of the problem is the problem, and we are only making band-aids. Access is a priority problem.
Learning	Caribou is a pet peeve problem because the caribou were likely in uplands eating and living too before we started anthropogenically forcing them into the wet areas.
Research Opportunity / Learning	Need to control the water table. Creating conditions in different areas – you need to have areas above the water table. None of the trees in Alberta can grow under flooded conditions. Some can tolerate flooding but not permanently. Alder and some willows are also tolerant of flooding but can't be inundated forever. Sedges can withstand flooding.
Research Opportunity	Affect the water table possibly through soil manipulation. Elevation might not be key.
Research Opportunity / Learning	The goal could be to achieve leaf area maximization. Can achieve this with shrubs and sedges to get the same leaf area as a mature tree. The fen will recover in tens of years