



Bonaparte Watershed Stewardship Society

Water Management Planning

Part of an ongoing Watershed Sustainability Planning process

BWSS Progress and Next Steps

- Watershed sustainability plan
- Streambank Restoration activities
- Water management planning
- Progress Summary to Northern Bonaparte Watershed

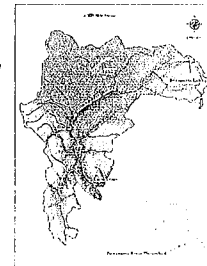
70 Mile Meeting; June 2010

Purpose:

- to review what the BWSS has been up to lately
- link to existing local community initiatives

Bonaparte Watershed

- It's a big diverse watershed
- >500,000 ha, many streams, lakes, wetlands
- Variety of human uses



Diverse Watershed Character



Watershed Planning

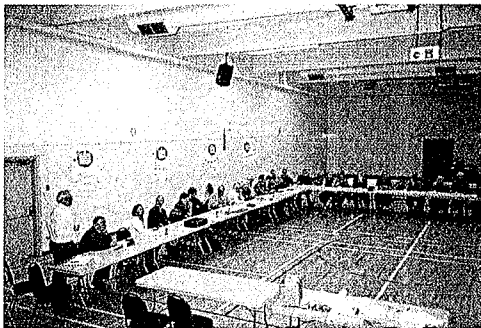
- Opportunity to develop community based watershed plan provided by FSWP 07-08
- Plan includes entire watershed
- Local community interests drive the priorities
- FSWP has sponsored the watershed planning process as well as streambank restoration work

Watershed Planning 2007-2008



2007-2008 Watershed Planning Process: Key Ingredients

- Guiding principles
- Important watershed features, characteristics, values, uses
- 11 Key areas of action to protect these values
- Ongoing effort to implement goals of the plan and involve more groups



Operating Principles that lead to success

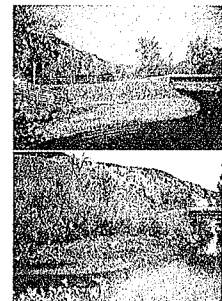
- Ecosystem (watershed) approach
- Inclusive community based process
- Incremental pursuit of collective vision
- Long term perspective
- Link to existing initiatives such as the Green Lake OCP (local, more area specific), Cariboo Chilcotin Land Use Plan (broad overview plan)

12 Watershed Action Areas

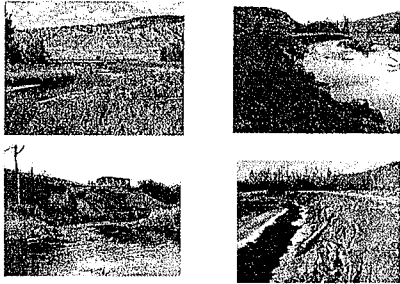
- Watershed planning
- Watershed health
- Participation
- Communication and Involvement
- Using available maps, data and information
- Riparian areas
- Fish and fish habitat
- Water quality
- Water supply
- Sustainable agriculture
- Forestry and forest health
- Managing development

Goal 6 Riparian Areas

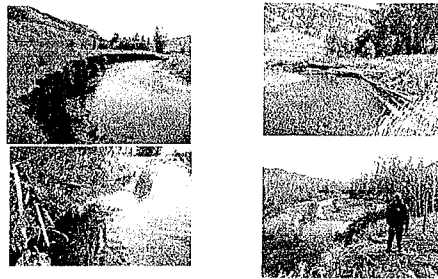
- Restore and maintain healthy riparian areas
- Includes streambank restoration
- Running Inventory of sites done, sites to be done
- Assessments of past projects



Riparian areas and streambank stabilization



Nearly one hundred high priority streambank erosion and riparian planting sites addressed



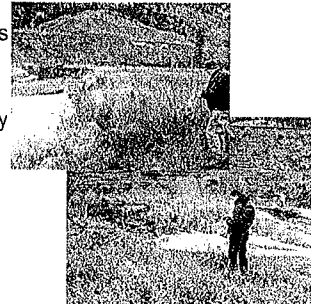
We are getting somewhere at a watershed scale after 9 years...

- Riparian restoration efforts are starting to add up...



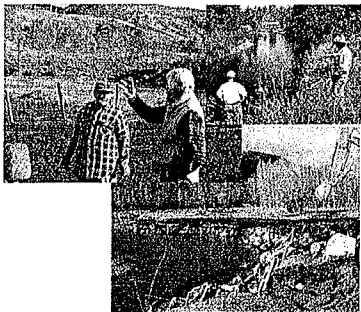
Monitoring our successes

- How many sites have been completed
- How well are they recovering
- How many more sites need to be done



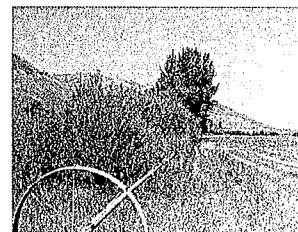
we have also found that

- Monitoring results helps encourage others to participate
- Lead by example
- Assist interested participants

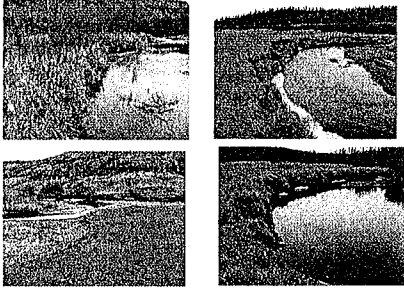


Riparian management practices

- And helps to demonstrate that riparian restoration supports sustainable agriculture
- Cost benefit, public goods protected, promotes value of agricultural infrastructure.



Planning some projects along upper Bonaparte River this year (FSWP funds)

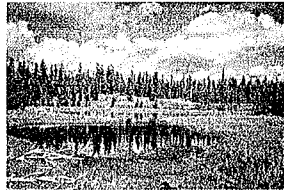


12 Watershed Action Areas

- Watershed planning
- Watershed health
- Participation
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- Using available maps, data and information
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- Sustainable agriculture
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9: Water Supply Planning Goals

- Seek a win-win storage plan for agriculture, fish recreation and other needs
- Protect agricultural water supply
- Plan for drinking and irrigation supply



9: Water Supply Planning Goals

- Water quality and sufficient flows are necessary for sustainability

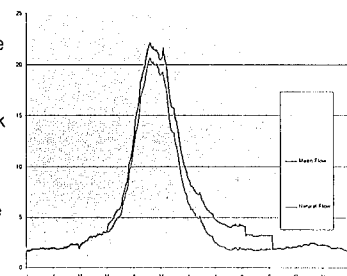


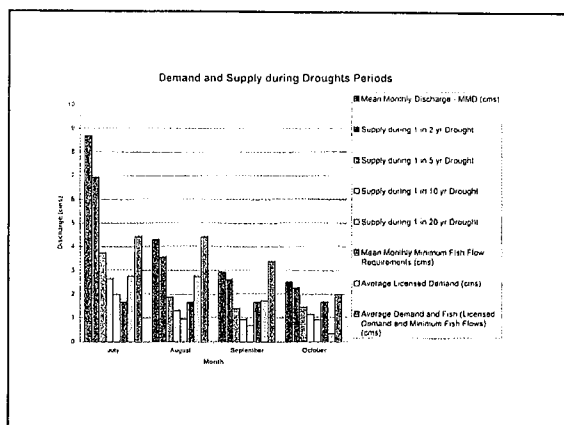
2009-2010 Some water mgt goals

- Balancing Low Flow Issues with Irrigation and Stream needs
- Water Demand: Planning ahead for short and long term solutions
- Design, function and operation of the Bonaparte Dam: capacity and limitations
- A summary of information collected follows

"Natural" Flows vs. Actual Flows

- Can examine flows in absence of licensing
- Naturalized flow
- Allows us to look at the impact of water withdrawals and ways to manage it better

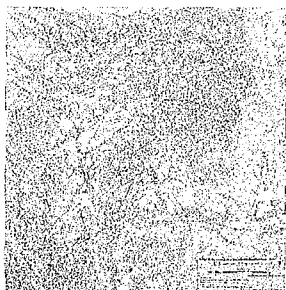




Concept of Water Budgeting May Help

- A tool for managing water resources better
- Understanding how much is available, where it is stored, how and when it flows out of the watershed all help planning for better water use

Watershed Susceptibility to Climate Change



Need to Consider Local Affects of Climate Change



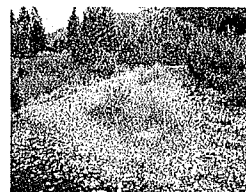
Climate Change affects water management practices

- Water issues are already a common focal point
- recent shifts in "normal" patterns will affect water mgt practices

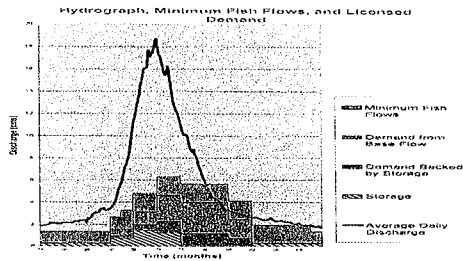


Drought management planning as part of watershed planning

- Voluntary requests to reduce watering at critical low flow periods has offered short term relief
- A better plan is needed for long term management



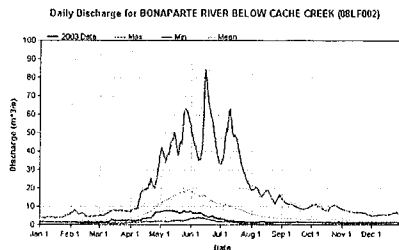
Bonaparte River as an Example of Planning for Human Use Balanced with In-stream Flow Requirements



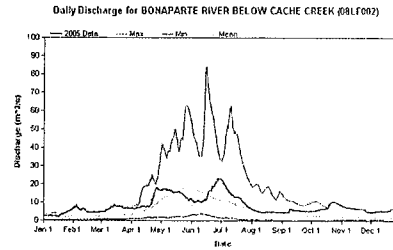
VARIABILITY BETWEEN YEARS

- Weather patterns are breaking pattern (Regime shift)
- Variability is increasing (unusual events are occurring more commonly)
- Frequency of drought events is increasing
- More frequent low flow shortages can be expected

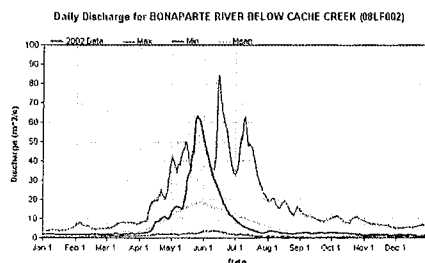
2003 Bonaparte River Low Flow Year



2005 Bonaparte River Average Flow Year



2002 Bonaparte River High Flow Year



Improved management approaches are needed that meet both

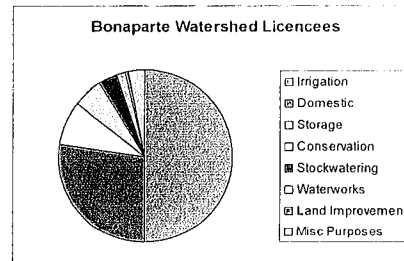
- Human use needs
- Stream needs



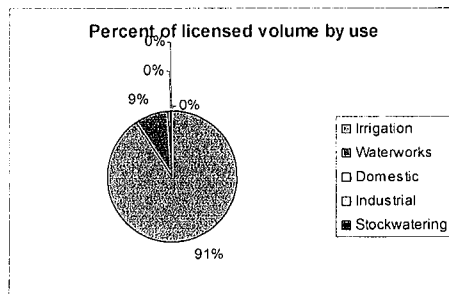
Agricultural Water Demand is High

- Total licensed demand from Bonaparte River is 33,660 acre-feet
- Irrigation accounts for 30,528 acre-feet (90.6%)
- Waterworks accounts for 2904 acre-feet (8.6%)
- Domestic accounts for 126 acre-feet (0.4%)
- Industrial accounts for 61.9 acre-feet (0.2%)
- Stock watering accounts for 40 acre-feet (0.1%)

Irrigation is the highest volume human use



Licensed Use by Volume



OPTIONS

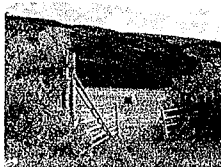
Reactive approach

- Legislation
- Enforcement
- Metering
- Shutdown orders
- Requirement for locally funded water mgr/ bailiffs

Proactive approach

- Vol reductions
- Vol shutdowns
- Coop planning with Regional Mgr
- Compromise
- Include Long term solutions like storage

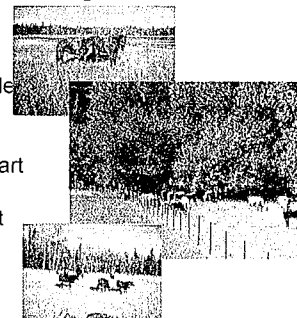
Wise Water Use Protects the Agricultural Industry



- Showing that working cooperatively produces a win-win for agriculture (producer) and stream health (fish)

Improved water use fits with BWSS watershed goals

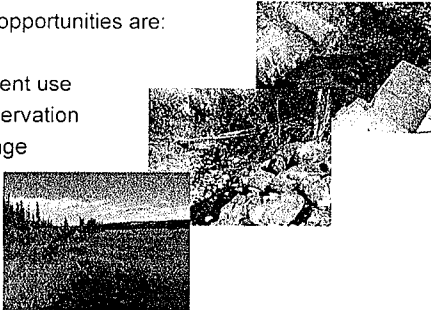
- Irrigation efficiency supports sustainable agriculture for the future of the watershed and is part of the long term strategy for drought management planning



Beneficial Management Practices Improve Water Use

Some opportunities are:

- efficient use
- conservation
- storage

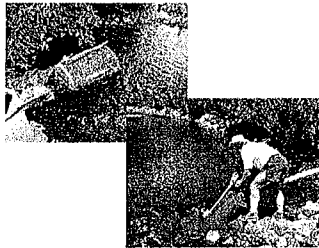


2010-2011: BWSS can propose a plan for

- Intake screening
- Off channel watering
- Irrigation efficiency
- Voluntary reductions
- Drought response planning
- Water storage planning

Intake screening

- Proper screening
- allows water use without killing young fish especially during low flow



Off channel Livestock watering

- Off channel watering sites are part of the long term solution



Irrigation efficiency

- working with landowners at local irrigation efficiency demonstration sites helps save cost and water



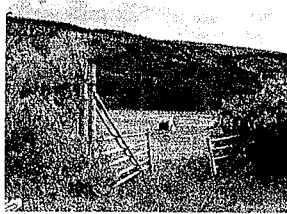
Irrigation efficiency

- Tensiometers, and weather data have been used with scheduling and equipment upgrades to achieve water savings



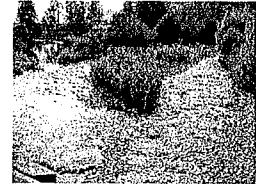
Irrigation efficiency

- In the long term water use efficiency including economic benefits to the irrigator can result from watershed - scale irrigation efficiency practices



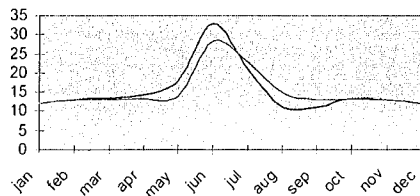
Water Storage could also be part of the longer term solution

- Storage of water can augment summer low flow and provide water for agricultural development as well as stream health



Hydrograph diagram: peak to low flow swap using a series of many small and some large storage/detention structures

Concept of Using Water Storage to Mitigated Low Flow



Bonaparte Lake licensing

- In 1992, Water Management granted MoE F&W Branch a conditional conservation storage license to store 14,300 AF on Bonaparte Lake (pre-dates AG license)
- Water Users Group was also granted a conditional storage license in 1992 to store 3,000 AF

– Both of these licenses must abide by a rule curve and release schedule

Bonaparte Lake Outlet before Dam



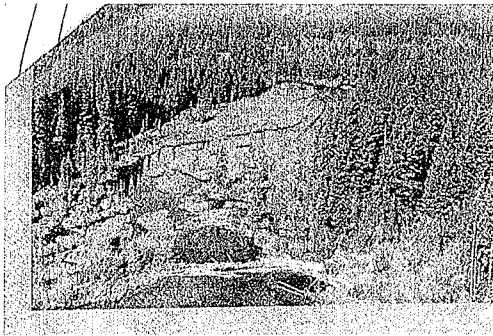
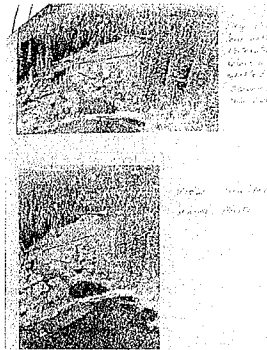
Limit of Licensing

- In 1993, the Bonaparte River was placed under a Water Reserve, Section 44 of the Water Act, for "conservation purposes to protect the fishery resource, and in order to make provision for water supply for irrigation projects 1993
- No new licenses since

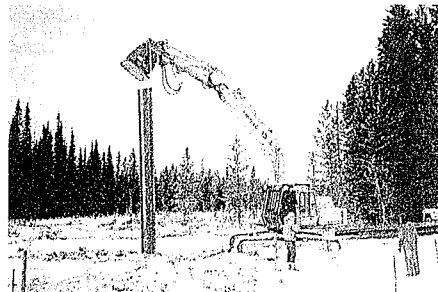
Brief Bonaparte Dam History

- Ashcroft Water, Electric and Improvement had dam on lake before 1930: power at falls
- Dam in poor repair in 1948: no power use
- Fish and Wildlife applied for license in 1980s on Bonaparte, Eagan, Machete, Young (and Loon?)
- Dam pursued for conservation flows in late 1980s: negotiated Agriculture license

(B Costerton April 2010)



Bonaparte Dam Construction, 1994



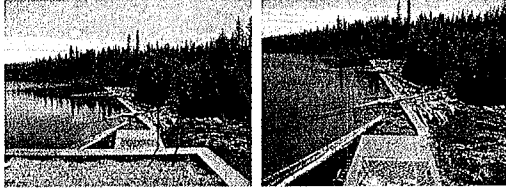
Bonaparte Dam Construction, 1994

- Purpose of augmenting streamflow during low flow periods to maintain and preserve salmon and trout habitat
- Licensed storage is 0.64 m on lake (~2 ft) above the natural invert and matches the old log-crib dam height (OK with lakeshore owners)
- MoE F&W operates the dam and coordinates the collection of Bonaparte Lake level and outflow data

Bonaparte Dam Construction, 1994



Bonaparte Dam, 2009



Rule Curves: mgt tools

- Lovedahl, P. Eng 1990 – used monthly averages
- KPA Eng 1994- used a three day average
 - Owner of Bonaparte Resort and S Maricle were operating Dam until 2001
- Costerton P. Eng 2001
 - B Costerton operates Dam from 2001-present
 - explained operations in March 2010 meeting (4 more of his slides follow)

BWSS concerns re Dam operations and function

- There has been concern over operation of the DAM in the past
- The BWSS wrote a letter in Jan 2001 to the Water Management Branch asking 9 questions
- These were answered in a letter from Water Management in Feb 2001

BWSS 8 questions

- Who monitors the Dam?
- Who Decides when to open/close it?
- If there is no control what is being done to rectify problem?
- Can a member of our society be involved?
- Where are any monitoring stations, who reads them, and how often?
- Where is the rule curve and release schedule to be attached to the WUC license?
- Is the licensed amount an annual amount and as a result of non-cumulative from year to year?
- The storage dam on Loon Lake is in dis-repair, not being monitored and self interest motivates releases, why?

Concerns over Dam operation

- Bonaparte River watershed has had unusually severe water shortages for a watershed of its size
- One potential explanation for this is that the watershed has been described as being "over committed for water licenses (MELP 2000).
- On yearly basis, about 20% stream discharge is licensed for diversion out of the system
- The conservation storage license on Bonaparte Lake should help to alleviate the low flow conditions in the Bonaparte River
- However, there is still concern that this storage will not be sufficient in extreme droughts.
- The other major concern is that the water shortages that occur in the major tributaries of the Bonaparte River that will not be lessened by the conservation storage (MELP 2000).

Answers to questions about the capacity and limitations of the Bonaparte Dam (from Bob Costerton's Presentation)

- Could add 2 ft of "negative storage" below natural invert if outlet creek dredged:
Section 44 reserve put on water for conservation – MoE has license application. Cabinet approval req'd for MoE to issue F&W license
- Additional storage marginal as supply is an issue (dam does not fill in driest years)

Answers to questions about the capacity and limitations of the Bonaparte Dam
(from Bob Costertons Presentation)

- Store snowmelt: Always filled? Not in 2004
- Larger storage would not be filled in very dry years and would be of benefit less often than existing storage. Same storage volume elsewhere would be more useful
- Minimal freshet release in dry years (to fill)
- Move water early in flood year; only flood reduction similar to any large lake

Answers to questions about the capacity and limitations of the Bonaparte Dam
(from Bob Costertons Presentation)

- Attempt to fill lake in early July and keep high to mid-July if dry forecast
- Release water in sustainable manner until end irrigation season (end Sept) when other withdrawals cease and more flow for fish
- Reduce flows to base flow through winter
- No ability to augment flow for salmon incubation through winter

Answers to questions about the capacity and limitations of the Bonaparte Dam
(from Bob Costertons Presentation)

- Water supply is much better than before 1992 dam construction
- No repeats of extreme dry years in 1987/88
- Lowest flow since then is 8 times higher
- Generally KPA rule curve flows met in wet and normal years, some shortfall when dry
- Sometimes Chinook bump in flow in Aug not possible / preferable to sustained flows

Other Water Storage Opportunities



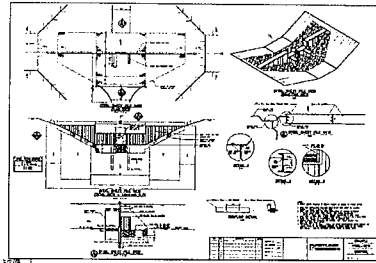
Types of storage

- Live storage, water release controlled (ex: Bonaparte Dam)
- Detention Storage: passive structure (fixed works detain drainage water temporarily)
- Detention Storage: passive structure (detained water infiltrates into groundwater supply)

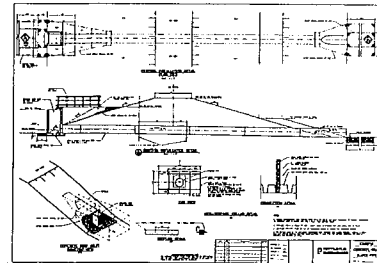
Dams

- Could propose a series of low cost low risk structures, 4 design types:
- Rock weir riffledesign
- Gates, sluice pipe, spillway design
- Concrete inlet sluice box design
- Steel weir control design

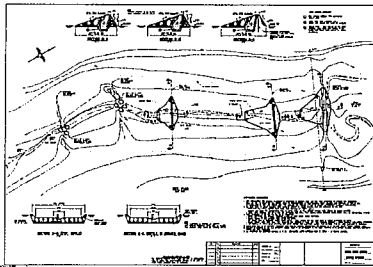
Steel Weir structures



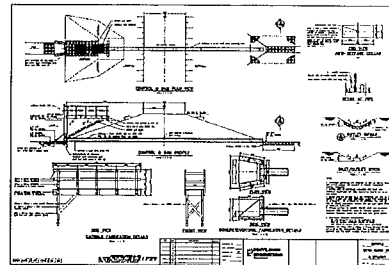
Gated Sluice Pipe and Spillway



Rock Weir Series



Concrete Inlet Sluice Pipe



Other Water Storage Opportunities

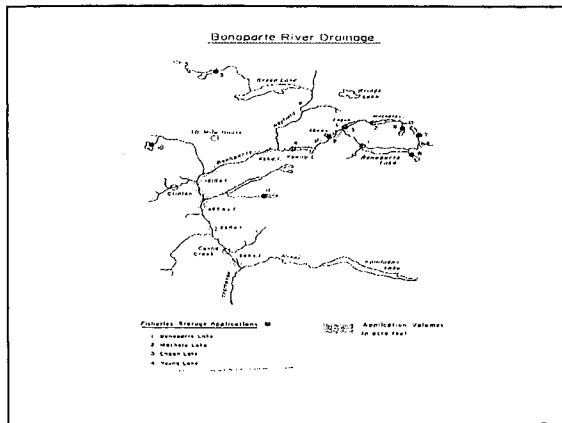
- In 1986-89 MoE Fish and Wildlife Branch applied for Conservation Storage Licenses on:

- Bonaparte 14,300 AF
- Eagan Lake 538 AF
- Machete Lake 5945
- Young Lake 5191 AF

Potential Storage at Other Lakes

Lake	Area	Storage(2')
Eagan	4.0 km ² = 980 acres	1960 acre-ft
Machete	4.7	1160 2320
Young	3.4	840 1680
Loon	7.0	1730 3460

Lots of other licenses/ applications / issues!



Summarize water storage opportunity

- Not easy to do
- Expensive infrastructure
- Complex licensing issues
- Management and maintenance liability
- Oliver example, MOE reluctance to license)
- Part of the solution to a larger set of issues
- Multiple use benefits
- Long term benefits
- Multiple opportunities for storage, detention, aquifer recharge
- MOE role, responsibility, resourcing

Part of the overall watershed plan

- Long term beneficial watershed use

