

Registration and Coffee





A long-range reservoir operating plan study.

Mississippi River Headwaters Reservoir Operating Plan Evaluation (ROPE)

A Partnership between:
the U.S. Army Corps of Engineers
and the U.S Forest Service.



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Purposes of this Meeting

- Garner support for the modeling approach by ensuring that all issues (important potential effects) will be addressed by the models.
- Gather input on acceptable balances of trade-offs between issues for multiple objective operating plans.



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Objectives of this Meeting

- Brief the Partnering Group on ROPE Study history and goals.
- Present the basics of the study models to the group.
- Present the potential range of alternative operating plans.
- Gather Partnering Group input for consideration in operating plan selection.



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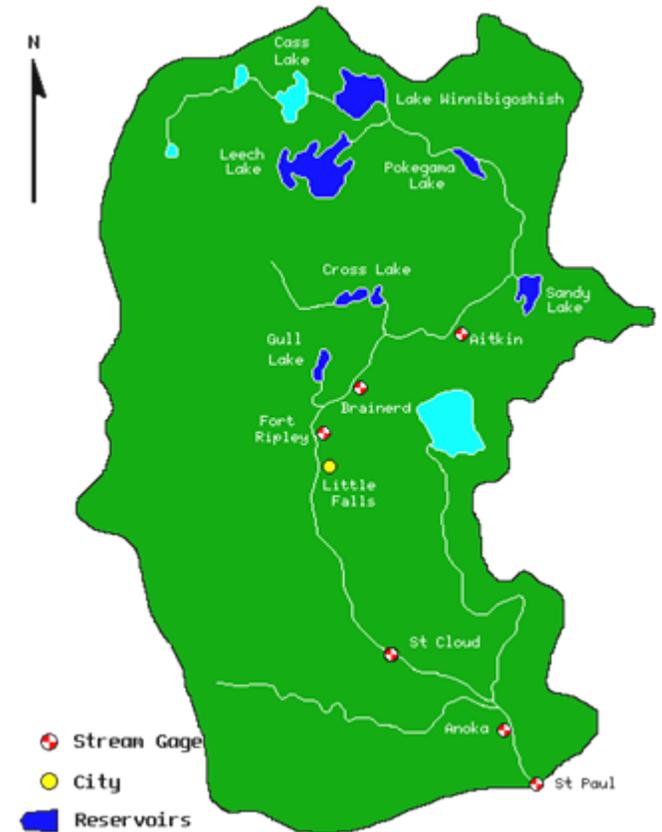
What is the ROPE Study?



ROPE is an acronym for
Reservoir
Operating
Plan
Evaluation.

This study is evaluating the
operating plans for the
Mississippi River Headwater
Dams.

The study includes the Upper
Mississippi River from Lock and
Dam 2 to Lake Bemidji.





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Who is Involved?

- 6 Corps of Engineers reservoirs
- 1 US Forest Service reservoir (Cass Lake)
- 4 Non-Federal reservoirs
 - 3 Hydropower Dams
 - Lake Bemidji, Otter Tail Power
 - Blandin and Prairie River Dams, MN Power
 - 1 Habitat Management Dam (Mud Lake, MDNR)
- Tribes, Mississippi Headwaters Board, Citizens, Businesses
- Downstream Hydropower Dams, Cities etc.
- Lake Associations/Groups, Task Force Groups

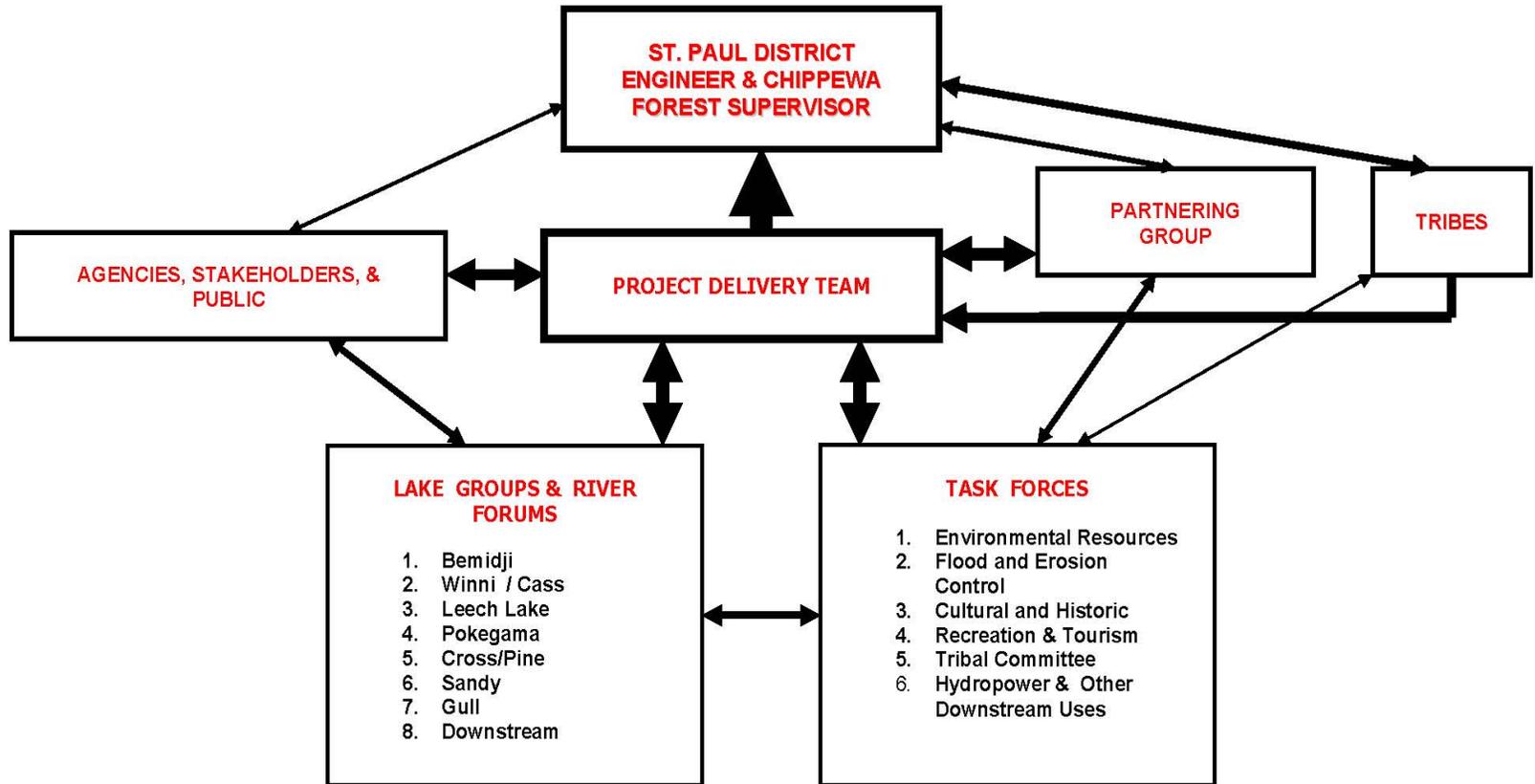


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ROPE

Cooperation/Collaborations



LEGEND

Flow and Strength of Formulation Communications



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Past Partnering Group Role

- Four years ago Partnering Group members helped define the scope and prioritize efforts within their organizations.
 - Lead to the development of successful partnerships between COE, FS, State Agencies, Tribes, Lake Groups, and other NGO's.
 - Participation on ROPE Task Forces by these groups has been especially instrumental to the progress of the ROPE Study.



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Future Partnering Group Role

- Continue to ensure Agency, Tribal, and NGO support of the ROPE Study
- Assist with plan formulation, possibly during workshop in early May.
- Assist with trade-off assessment and plan selection.
- Review of Report and EIS during various stages.



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ROPE Progress

Headwaters Recon Study Completion	June 2001
First Partnering Group Meeting	April 2002
Release of Notice of Intent for EIS	December 2003
Public Scoping Meetings	June 2004
Completion of Draft Model Development	December 2005
Second Partnering Group Meeting	Today



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Future ROPE Milestones

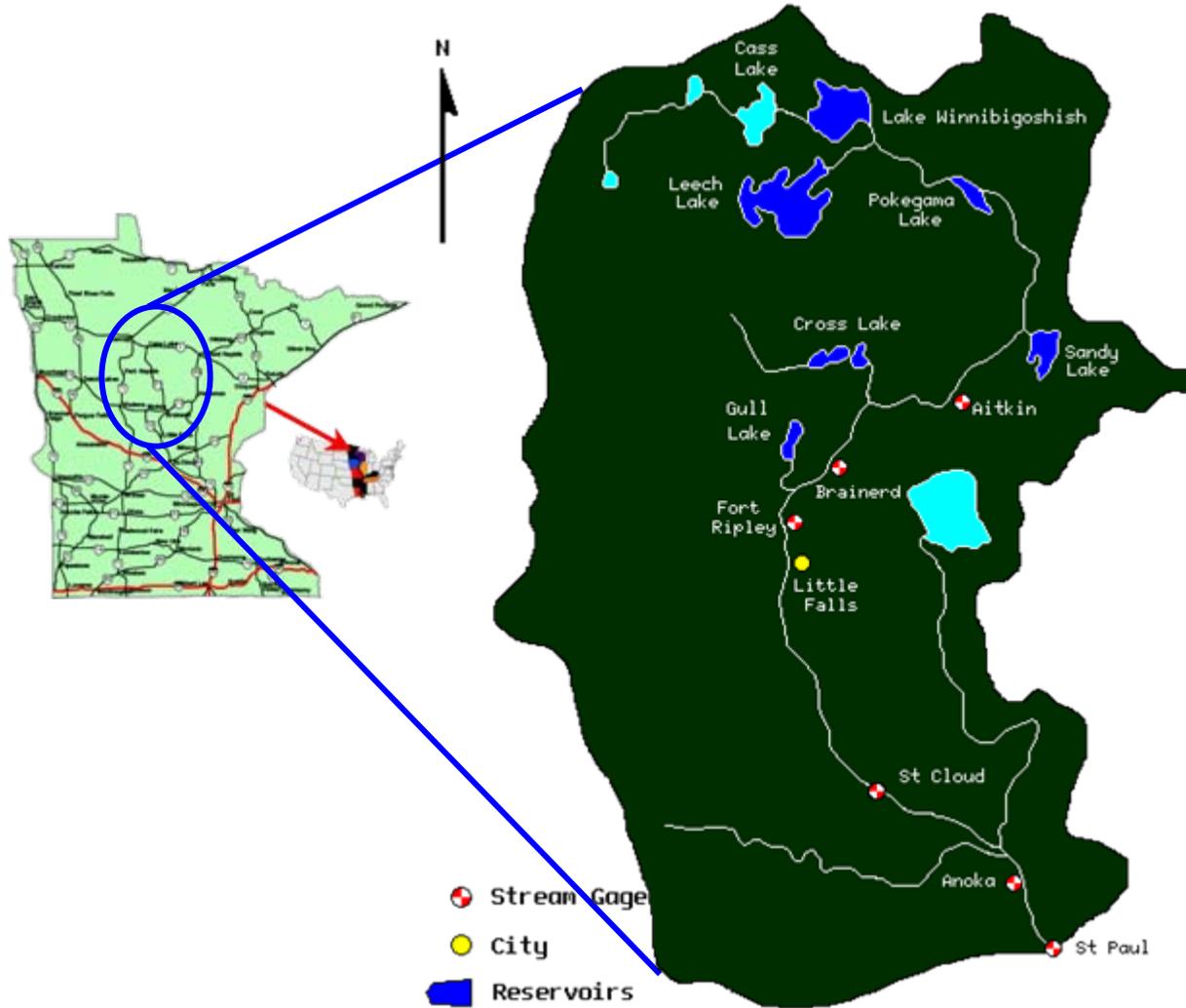
Plan Formulation Workshop (Partnering group participation welcome)	Early May
Identify Initially Preferred Plan	Early July
Distribute “In-House” Draft Report and EIS (Partnering Group Review)	Early August
Release Draft Report and EIS for Public Review (Partnering Group Review)	Early October
Release Final Report and EIS for Public Review (Partnering Group Review)	January of 2007
Sign Record of Decision and Begin Operating Under new Plan	Spring of 2007



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Overview of Headwaters Lakes



Headwaters
Reservoirs included in
the ROPE study:

- 1.Cass Lake
- 2.Lake Winnibigoshish
- 3.Leech Lake
- 4.Lake Pokegama
- 5.Sandy Lake
- 6.Cross Lake
- 7.Gull Lake



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Existing Corps Project Authority

- Navigation
- Tribal Trust
- Flood Control/Reduction
- Recreation
- Water Quality & Water Supply
- Fish and Wildlife



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Key Aspects of Corps Operations

To support the authorized Federal purposes, the water control plans for the Corps reservoirs have the following operational provisions:

1. Summer water levels (and other target levels)
2. Minimum river flows during low-flow periods
3. Fall/winter drawdown of lake levels
4. Flooding considerations (in lake & downstream)
5. Tribal trust considerations



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Recreation is Intense at Headwaters Reservoirs



Cross Lake beach
Crosslake, Minn.



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Development Pressures Are Great



Cross Lake



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Guidelines Affecting Operations



Corps regulations are based heavily on past MDNR guidance and are subject to change in the ROPE. Guidance to be re-evaluated include:

- The rate-of-change for outflows from the dam
- Maximum releases tied to reservoir levels
- Delayed drawdown of Cross/Whitefish Lakes
- Spring target levels for walleye spawning/egg stripping in Winnibigoshish
- Minimum flow guidelines



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The ROPE Study Vision

- The purpose of the ROPE Study is to work with the public and other agencies to create a basin- wide operating plan that operates the Headwaters in a way that benefits the natural, economic and cultural resources of the region.
- Build consensus to fully coordinate potential changes in dam operations to optimize and balance multiple uses of the Headwater Reservoirs and Mississippi River



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Keys to Study Process

- Shared Vision Planning: Heavy Tribal, interagency, and public involvement sought throughout process to build consensus.
- 6 year study with COE and USFS total funding of about \$4 million.
- Preparation of EIS & Coordination via meetings, draft report, & final report
- Use of optimization and simulation models to develop, evaluate, and select from a range of alternative operating plans.



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Outputs from ROPE Study



- Focus on re-optimizing operations of Corps and Forest Service Headwaters dams at Cass, Winnibigoshish, Leech Lake, Sandy, Pine (Whitefish chain), Pokegama, and Gull lakes
- Recommend operational changes for Bemidji, Mud/Goose, etc.
- Recommend new environmental projects, erosion control projects, and local flood reduction projects may be identified
- Improved interagency and Tribal coordination network for managing Headwaters resources and better public understanding of the merits and limitations of operation



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Tribal Involvements



- Tribal Representative on Delivery Team
- Worked with Tribal Representatives to identify Tribal interests via a service contract with the Leech Lake and Mille Lacs Bands
- Meetings with Tribes (government to government), to update them on progress and gather input regarding alternative development, analyses, and selection.
- Informal and formal review and comments

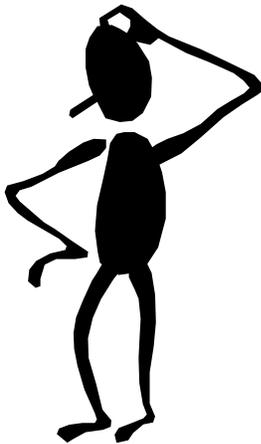
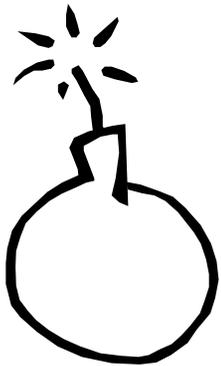


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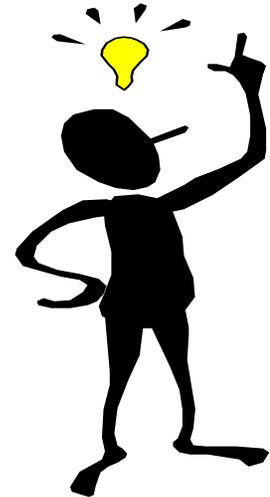


Ongoing Public Involvement and the EIS

Scoping Problems and Opportunities



*Your concerns
and ideas are
important to us!*





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EIS (use and steps)

EIS is required when a Federal Action is likely to have a significant effect.

- 1. Purpose & Need** for proposed action.
- 2. Public Scoping:** identification of relevant & significant issues that will be analyzed.
- 3. Development of Alternatives** to Proposed Action.
4. Analysis of **Environmental Effects.**
- 5. DEIS, Public Comment Period, ROD**



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ROPE Scoping

- 1999: public meetings with MHB to identify water resource issues on Mississippi Headwaters.
- 2002: “task force” & Lake groups assembled to help generate issues & recommend analysis
- 2004: 4 public scoping meetings in Headwaters & Cities to solicit public comments on ROPE.
- 2004: 4 Interagency meetings with local, State, and Federal representatives invited.
- 2004: public meeting with Mille Lacs & Leech Lake Bands of Ojibwe.
- 2003-4: newsletters, website.
- 2005: “update” meetings w/ local Government, Leech Lake Band, & NGOs in Headwaters



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ROPE Issue Identification



- Natural Resources ~
plant & animal
- Water quality
- Cultural Resources
- Recreation



- Socio-economics ~
i.e. homes, resorts,
marinas, hydropower
- Flood control
- Erosion
- Tribal Interests



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ROPE Scoping

- Scope of the project has narrowed since project proposal:
 - No dam removal
 - No new construction project
 - No land acquisition
 - No drought planning – separate effort
- Operational changes within current authorities will be pursued. This still allows for a great deal of latitude for changes.



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ROPE Computer Models

- Primary models include:
 - Prescriptive Reservoir Model: Assist in alternative development to optimize dam operations
 - STELLA model: To simulate and evaluate alternative water release plans
- Secondary models include:
 - Decision model (a model output interface): to help summarize PRM and STELLA output to aid in comparing and selecting plans
 - Resource models or “overlays”: for impact analysis



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N o d e M a p

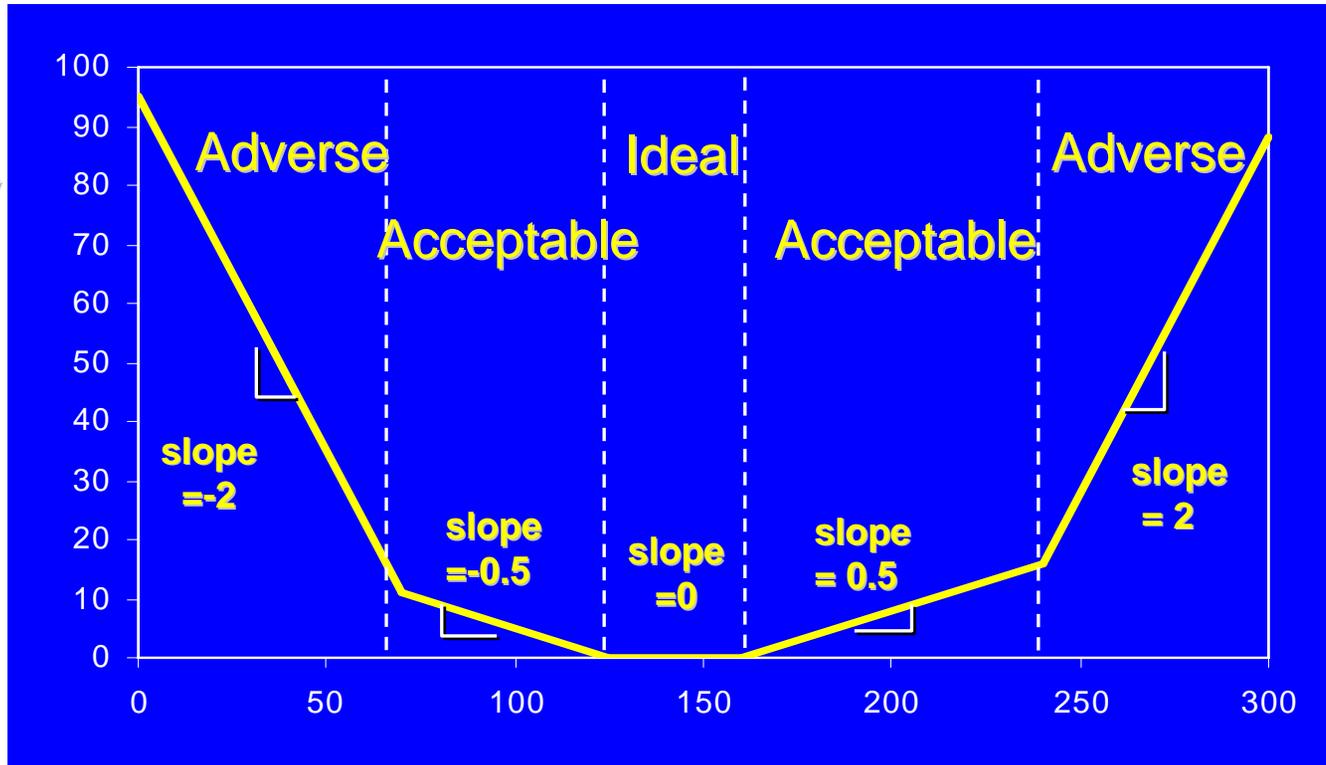


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Penalty Functions

Penalty
per
time
period



penalty
is
applied
in each
time
period

Lake Stage



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Penalty Functions- Flood Control

- Structure survey conducted in 2001-2 for all areas potentially affected by dam operation.
- Modeling consists of stage / "damage dollars" curves and stage / "# structures damaged" curves.
- Damage in dollars and number of structures damaged will be reported for each plan simulation.



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Penalty Functions- Environmental

- Environmental Task Force assisted in the development of the penalty functions.
- Individual penalty functions were built for: walleye, musky, smallmouth bass, whitefish, greater redhorse, winter aquatic community, submersed vegetation, emergent vegetation, wild rice, sedge meadow, dabbling ducks, muskrats, and shorebirds and terns.
- “Composite” penalty functions were developed for each node.



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Penalty Functions- Environmental

- Penalty functions were not built for the following environmental resources, but will be discussed in the EIS:
 - Endangered Species (Bald Eagle, Grey Wolf, Canada Lynx)
 - Exotic Species
 - Water Quality
 - Air Quality



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Penalty Functions- Tribal

- Leech Lake and Mille Lacs Bands have expressed their view that all species have equal value.
- With modification, the Environmental penalty functions represent Tribal desires
- All species were weighted equally to develop the composite curves.
- Tribal penalty functions are represented separately in the models.



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Penalty Functions- Archeological

- Thousands of archaeological sites are known to exist along reservoir shorelines and downstream river reaches
- 97 sites are listed on or eligible for the National Register of Historic Places (NRHP).
- 35 of these sites have been included in the models
- Within the models, the number of times each site is inundated is reported for each operating plan.



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Penalty Functions- Recreation

- Based on a Minnesota DNR model of recreation use that looks at existing facilities and uses at numerous locations in the study area.
- Coupled with input gathered during scoping and lake group meetings.
- Includes, fishing, boating, canoeing, and other forms of recreation.



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Penalty Functions- Erosion

- For reservoir erosion, resource managers and others with knowledge of the study area were asked to report water surface elevations at which minor, moderate, and severe erosion occur, and this was entered into the models.
- For river erosion, it was assumed that river erosion is minor for bank full flows occurring from 2 to 6 weeks, moderate for 7 to 10 weeks, and severe for 11 weeks or more.



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Penalty Functions- Hydropower/Water Supply

- All curves were developed with the respective managers of plants on potentially affected waters in the study area.
- Hydropower curves are based on Flow vs. Power Generated.
- For waste assimilation and water supply, curves represent the minimum flow required to meet these needs at specific locations.

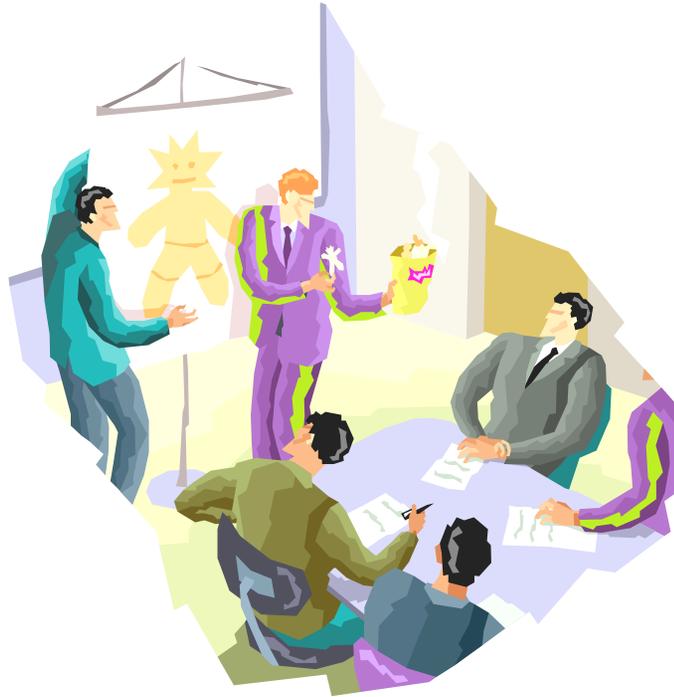


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Discussion

Do the models include all the key issues?





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Overview of Basic Alternative Development Strategy



- Simulate the effects of operating the reservoirs for the benefit of a single objective such as flood control, recreation, or environmental benefits.
- Use the single-objective results for trade-off analyses.
- Use trade-off analysis to guide “balanced” multi-objective plan development.
- Analyze operating plans with STELLA and select one that meets study goals.



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Single-Objective Alternatives

- Developed in PRM by placing nearly all emphasis on operation for a given objective.
- Used to confirm the overlay models are producing the desired results.
- Gives a reference for the maximum possible benefit.
- Helps show the potential impacts that would occur to other objectives if single-objective alternatives were adopted.



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Trade-Off Curves

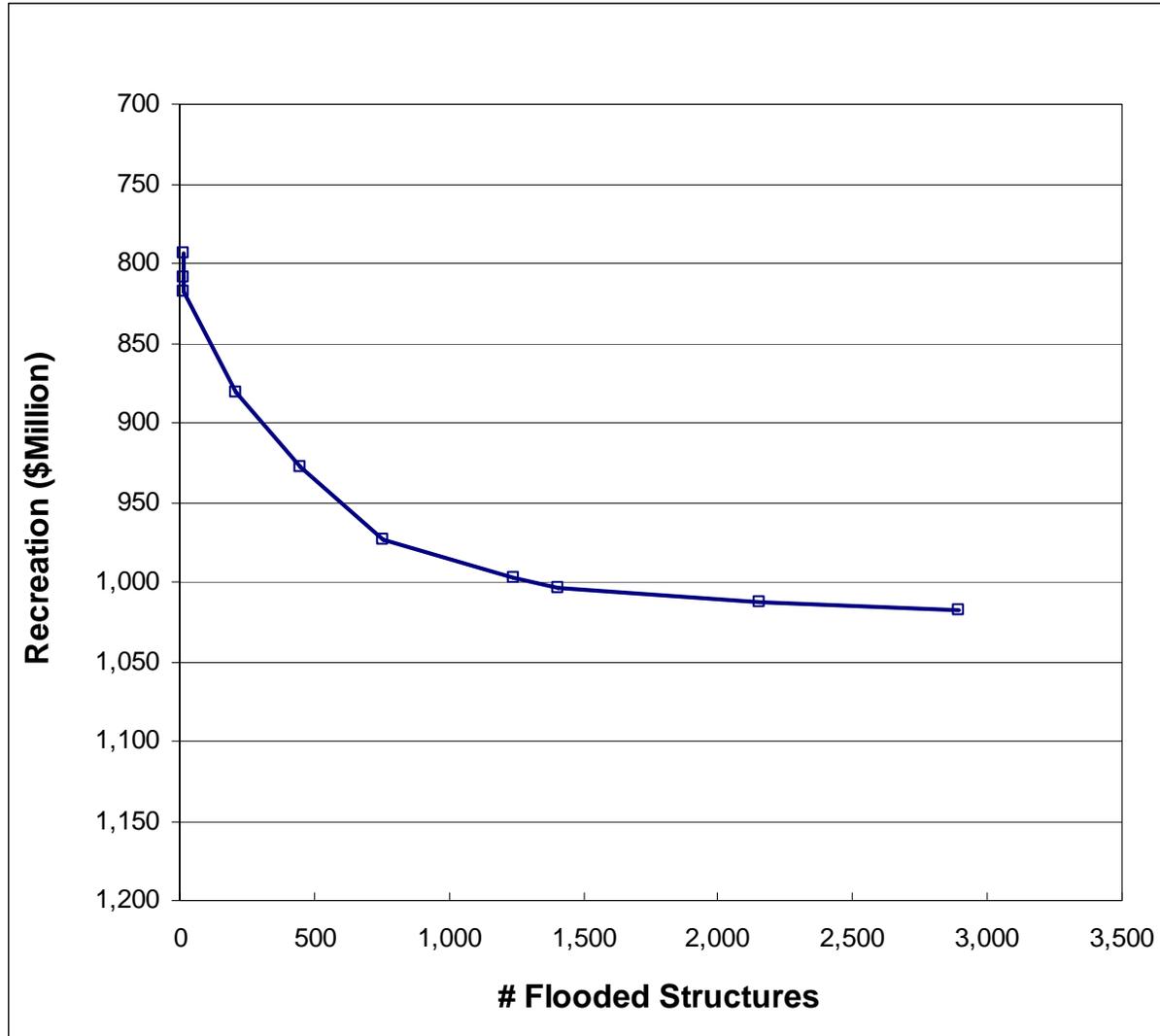
- Two objectives run repetitively with various amounts of emphasis placed on each.
- Shows the amount of benefit gained for one objective and the expense to another.
- Will assist with multi-objective alternative development by assisting in the reasonable application of “weighting” on different resources.
- Examples being presented are system-wide and not location-specific.



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Trade-Off Curves

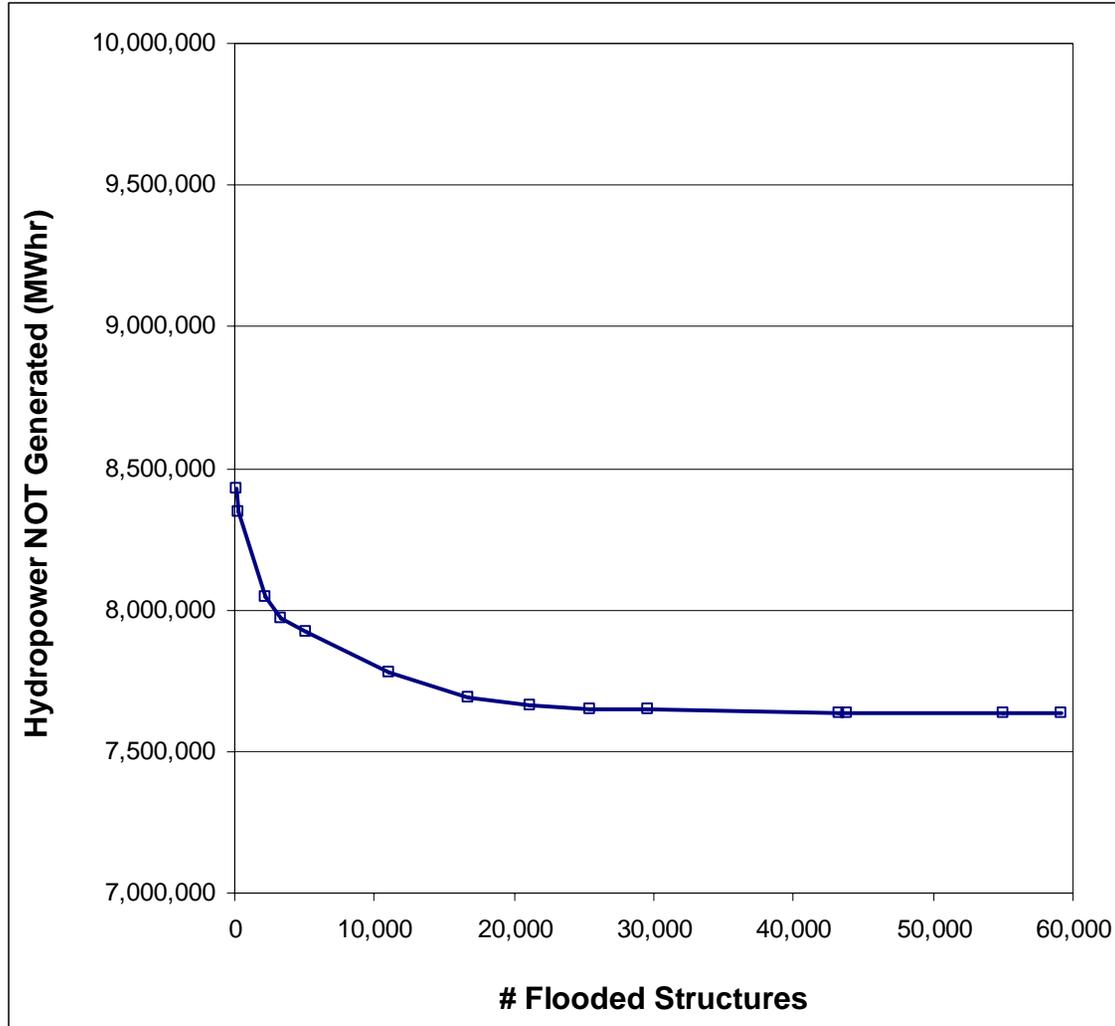




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Trade-Off Curves

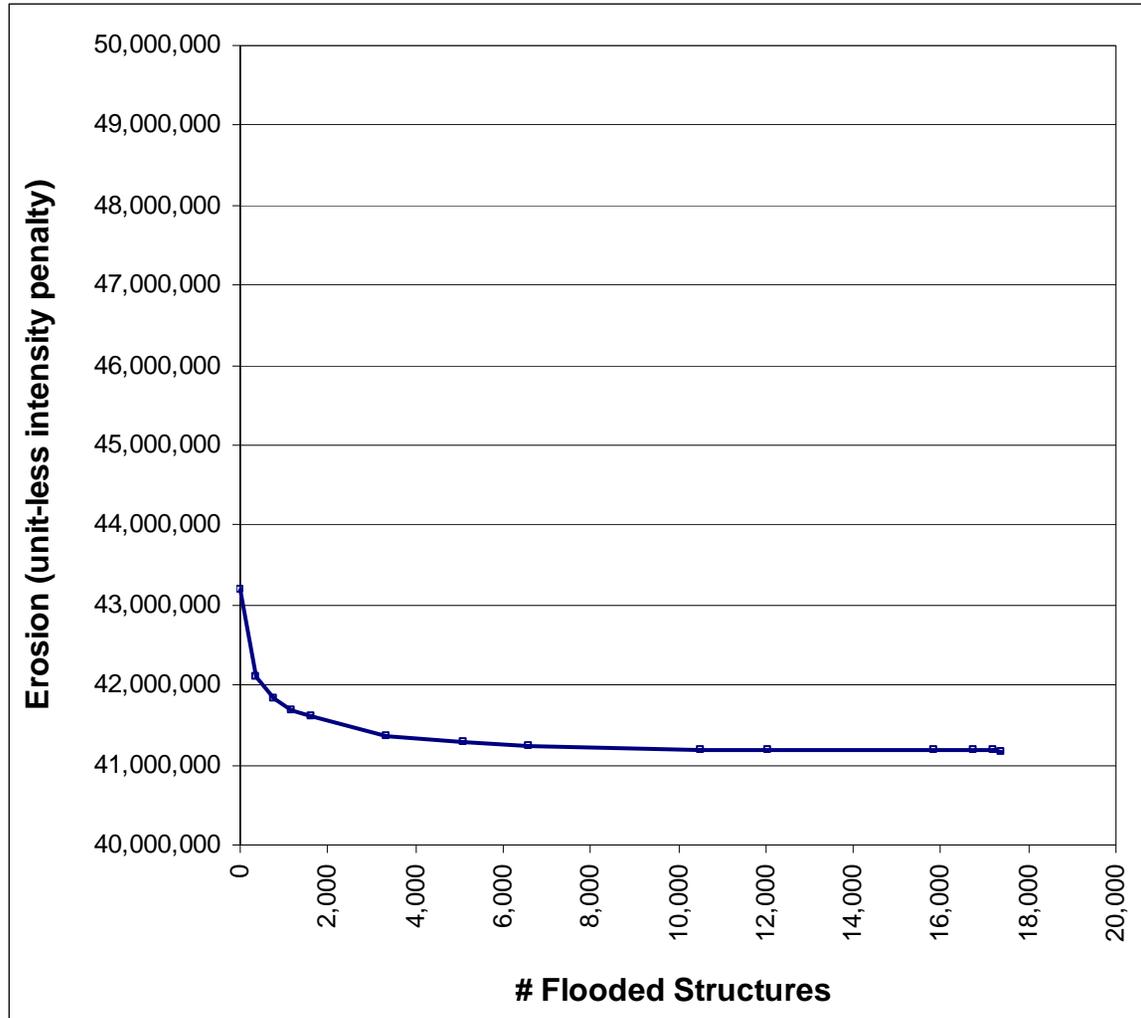




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Trade-Off Curves

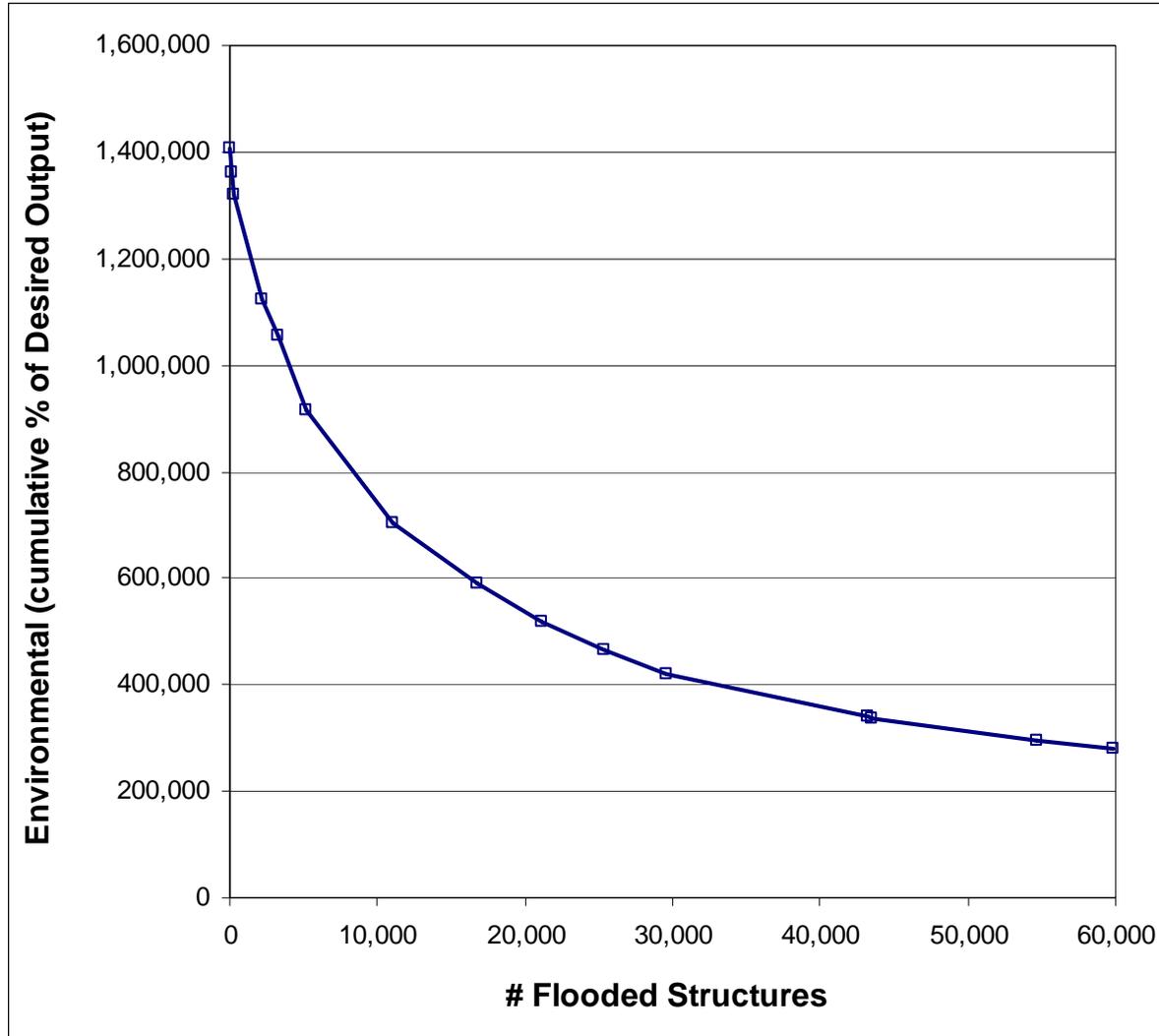




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Trade-Off Curves



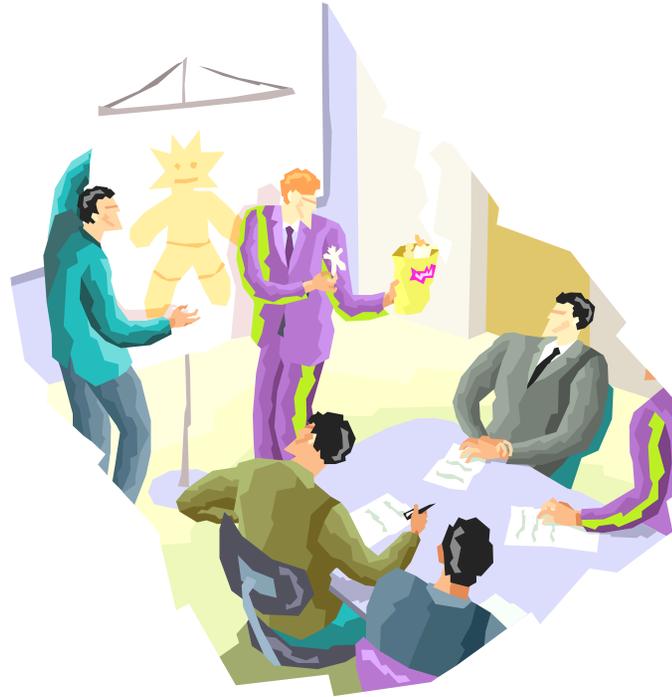


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Discussion

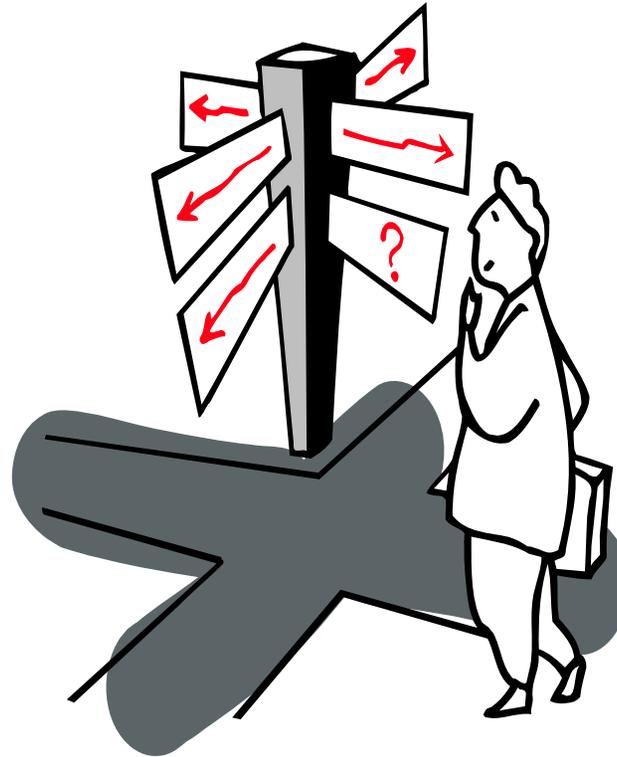
What are reasonable trade-offs of key issues?





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Break for Lunch

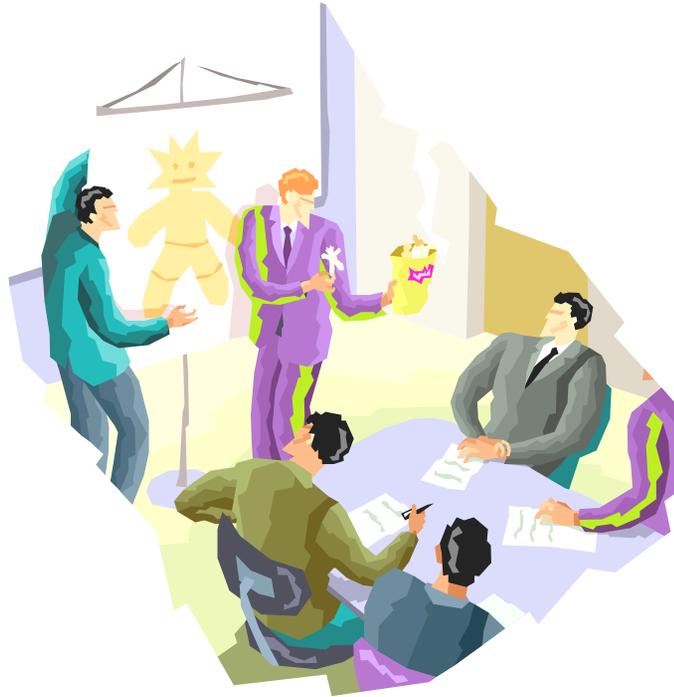




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Review of Trade-Off Curve Exercise





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ROPE Plan Selection

Key Points

- Three basic groups of alternative operating plans:
 - No-action, or keeping the existing operating plan without changes.
 - Single-objective operating plans
 - Multi-objective operating plans
- Decision Model will be used to review plan effects during the plan selection process.



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ROPE Plan Selection

Key Points

- Balancing of potential effects throughout the system will be considered.
 - The relative importance of factors differs from one area to another.
 - Reservoirs vs. rivers
 - Flood control upstream vs. downstream
 - Environmental and Tribal concerns differ based on location.



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Single-Objective Alternatives



- Flood control
- Recreation
- Environmental
- Tribal
- Hydropower
- Water Supply
- Erosion
- Archeological



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Single-Objective Alternative Applications



- Overlay model verification
- Reference of maximum possible benefits for each resource.
- Tradeoff analysis to help develop acceptable multi-objective alternatives
- Ensure the review of a full range of operating plan alternatives.



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No-Action Multi-Objective Alternative

- Maintain the current operation as review this morning.
- Reservoirs are primarily operated to meet flood damage reduction and recreation purposes.
- This operating plan is currently about 40 years old and conditions have changed.



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“Balanced” Multi-Objective Alternative

- Flood damage reduction benefits would be evaluated and balanced throughout the system.
- Recreational benefits would be considered for downstream areas.
- Tribal and environmental interests would be considered throughout the system rather than at a few key locations.
- Hydropower, water supply, erosion, and archeological resources would be considered.



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Decision Model Output Review

- Stella outputs data for each node in the system and each resource modeled.
- This data is fed into the Decision Model, which processes it into tables and graphs to facilitate understanding.
- Operating plans can be compared to each other and to the current operating plan in total for the system, or at individual locations.



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Example No-Action and Unregulated Alternatives

Summary of Performance for Selected Plans

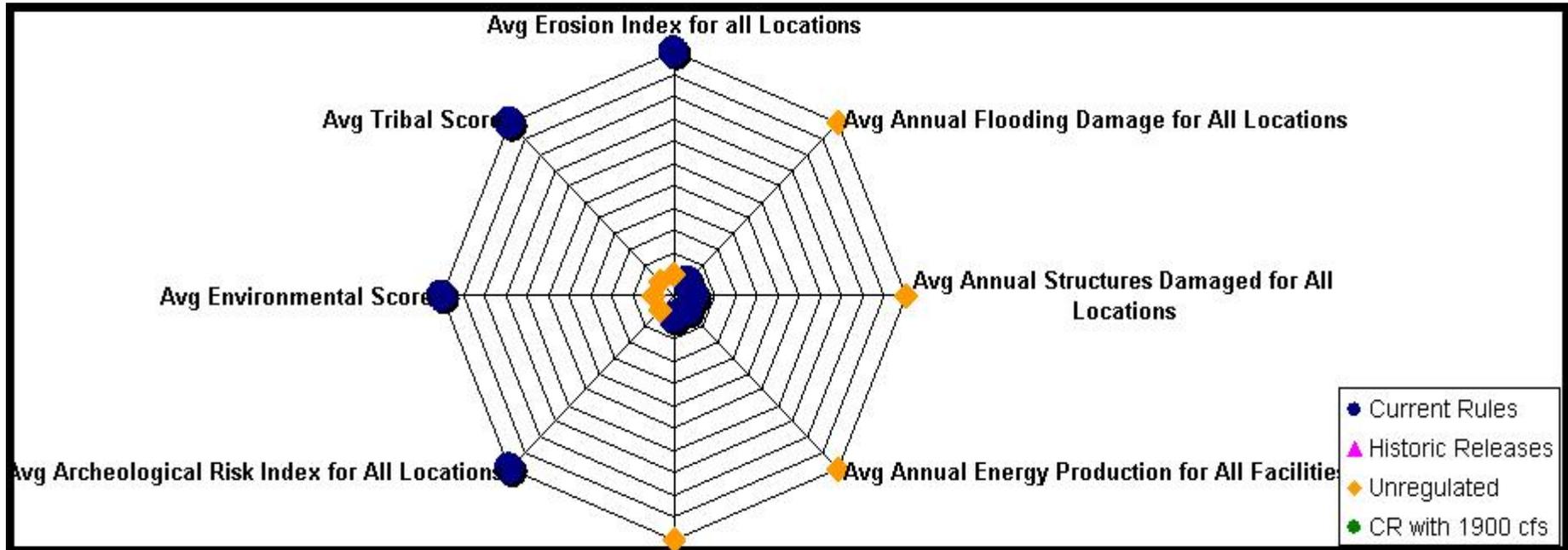
	<i>Current Rules</i>	<i>CR with 1900 cfs</i>	<i>Unregulated</i>	<i>Natural Flow</i>
Avg Erosion Index for all Locations	2.11	1.94	2.96	0.70
Avg Annual Flooding Damage for All Locations (\$1000s)	1413	1860	1354	902
Avg Annual Structures Damaged for All Locations	0.07	0.06	0.05	0.04
Avg Annual Energy Production for All Facilities (MWh)	4630	4682	4482	4685
Avg Annual Recreation Benefits for All Locations (\$1000s)	11663	11489	11350	8079
Avg Archeological Risk Index for All Locations	0.110	0.105	0.119	0.039
Avg Environmental Score	14.693	14.658	16.663	11.942
Avg Tribal Score	14.758	14.702	16.606	12.019



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Example No-Action and Unregulated Alternatives



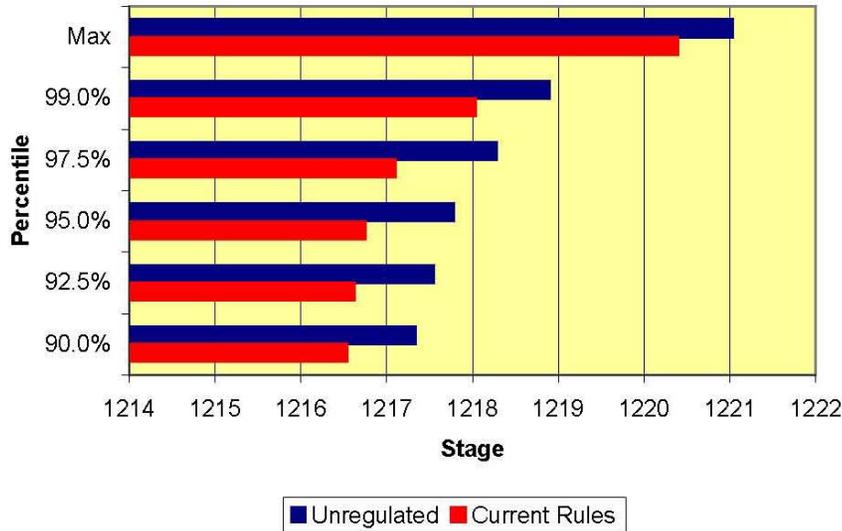


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Example Flood Damages Output



Frequency of High Levels



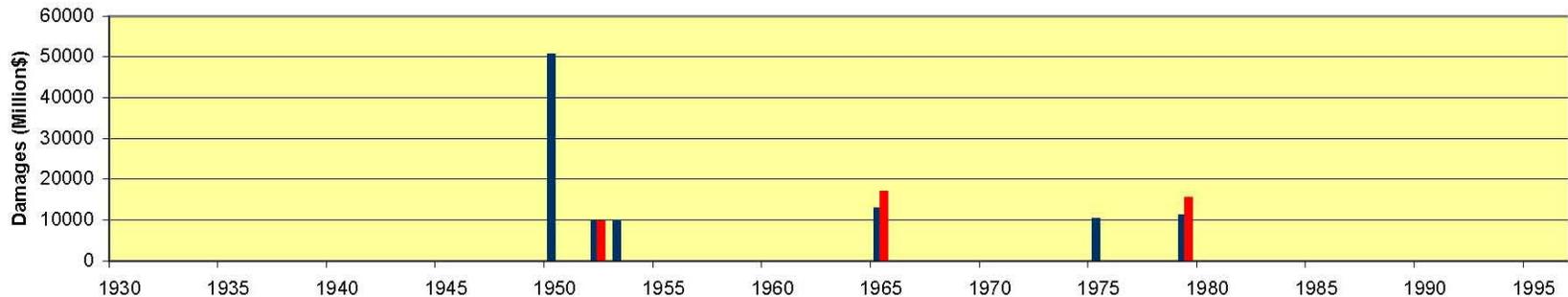
Statistics for Big Sandy Lake Flooding

	Unregulated	Current Rules
Number of Floods	12	5
Damages Per Event	\$8,682	\$8,376
Avg Annual Damages	\$1,432	\$576
Structures Damaged	10	5
Avg Annual Ag Damages	\$0	\$0
Worst Flood	\$33,448	\$13,947
Highest Stage	1221.03	1220.39

Choose a Plan to Graph
 Unregulated ▼

Choose a Location to Graph
 Big Sandy Lake ▼

Big Sandy Lake Flooding Damages Each Year Under Plan Current Rules and Unregulated



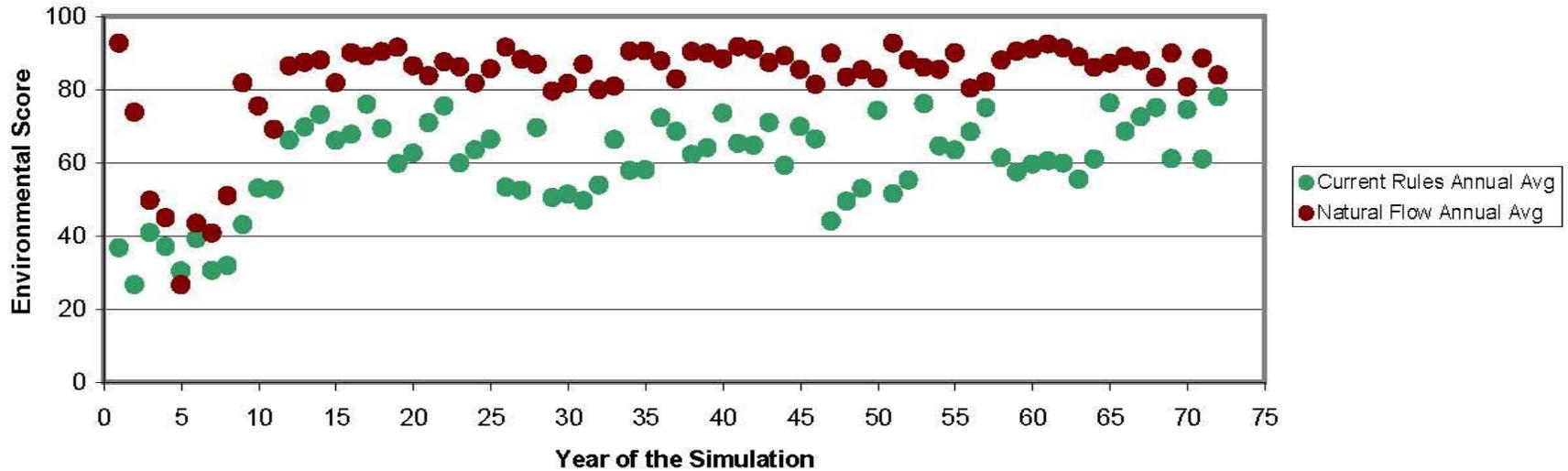


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Example Environmental and Tribal Output



Environmental Results -- Avg Scores for Each Year

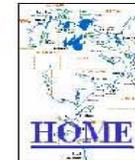


Select Two Plans to Compare

Plan 1	Plan 2
Current Rules	Natural Flow

Select an Environmental Score to Graph

Leech Outflow Environmental



[View Summary Table of Environmental Results](#)

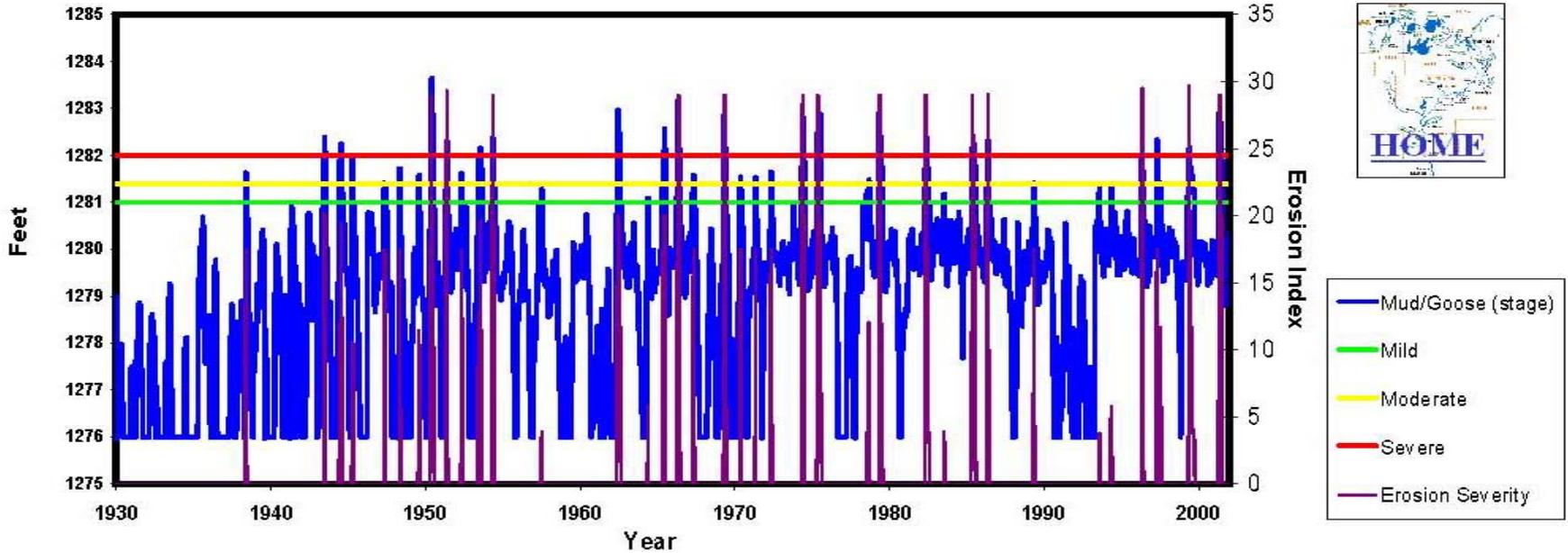


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Example Erosion Output



Mud/Goose (stage) and the Erosion Impacts



Choose a Lake to Show on the Graph
Mud/Goose (stage) ▼

Choose a Plan to Graph
Unregulated ▼ | —

Comparison with Current Regulation Rules

	Avg Erosion Index Score
Unregulated	1.13
Current Rules	0.11

Unregulated scores as good or better than Current Rules 98.7% of the time. It's worse 1.3% of the time.

[Click here to see a summary table of erosion impacts](#)

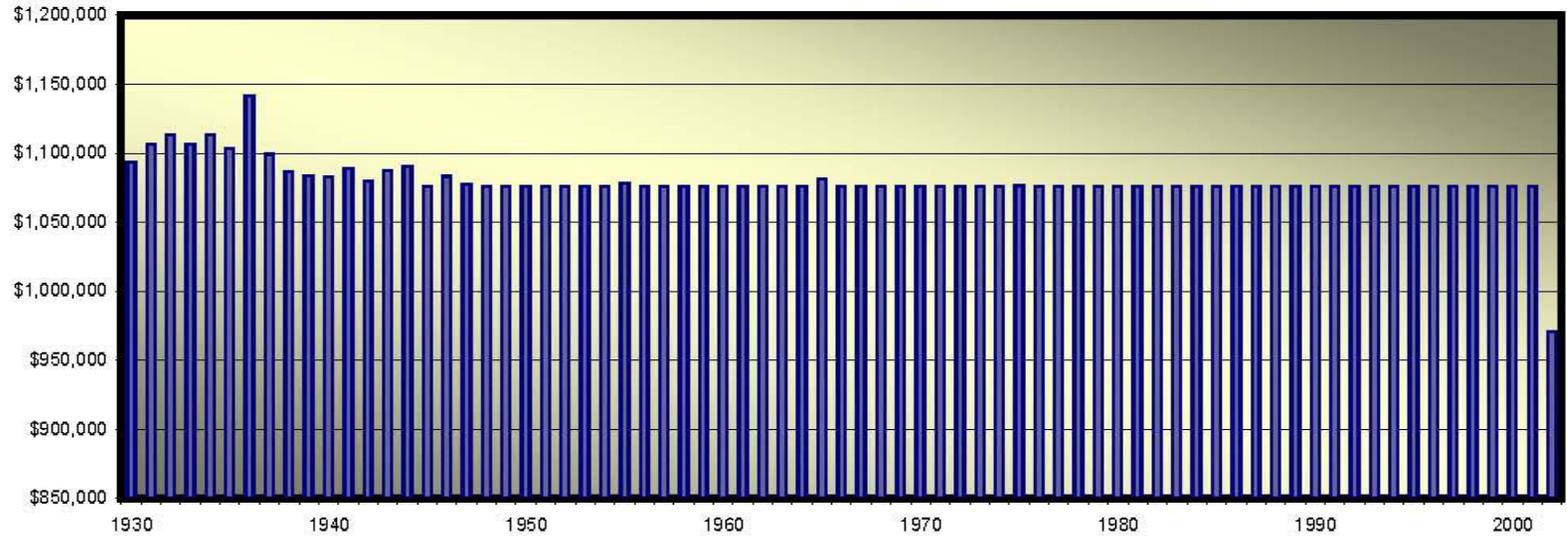


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Example Recreation Output



Annual Cross Lake Recreation Under PRM Recr



Choose a Lake to Graph

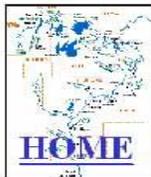
Choose a Plan to Graph

Cross Lake Recreation

PRM Recr

*Statistics for Cross Lake Recreation Under
Plan PRM Recr*

Average Per Boating Season	\$1,079,677
Best Year	\$1,141,580
Worst Year	\$970,830



[To Summary Table of Recreation Results](#)



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Example Hydropower Output



Summary of Results for Power Production

Table shows average annual MWh production from each facility

Blue numbers indicate the plan with the best performance for that facility

Red number indicate the plan with the worst performance for that facility

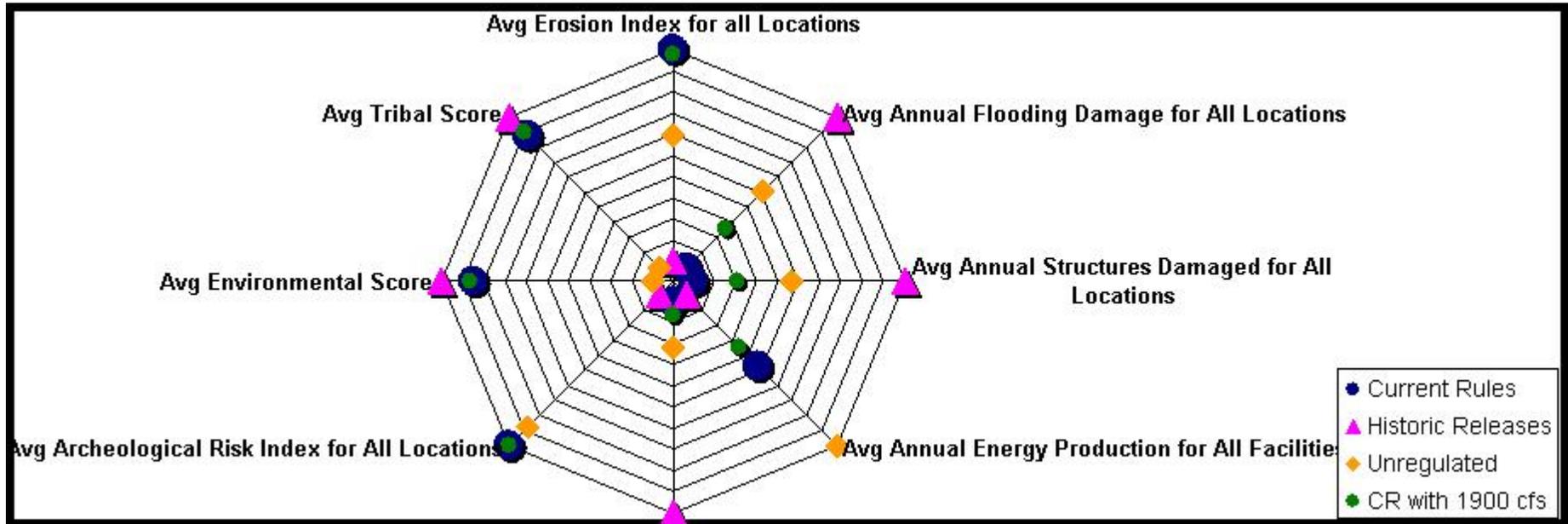
	Current Rules	CR with 1900 cfs	Unregulated	Natural Flow
HYDROPOWER				
Otter Tail Bemidji	10.80	10.80	7.47	7.93
Blandin Grand Rapids	92.54	98.72	111.42	125.76
Potlatch Brainerd	168.19	172.15	168.56	182.00
Little Falls	312.83	317.17	306.58	321.37
Sylvan Dam	10.75	9.65	3.17	1.53
Blanchard Royalton	870	877	838	871
Champion Sartell	504	513	482	510
St. Cloud	517	521	499	519
Coon Rapids	459	462	444	460
Crown Mpls, USAF	202	203	198	205
XCEL Mpls, USAF	607	615	579	606
Ford St. Paul, L&D 1	875	882	846	876
TOTAL HYDROPOWER	4630	4682	4482	4685
OTHER POWER				
Sherburn Steam Becker	213952	213842	210791	213959
Monticello Nuc	55525	55497	54793	55482
TOTAL - OTHER POWER	269476	269339	265585	269441



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Example “Balanced” Multi-Objective Alternative

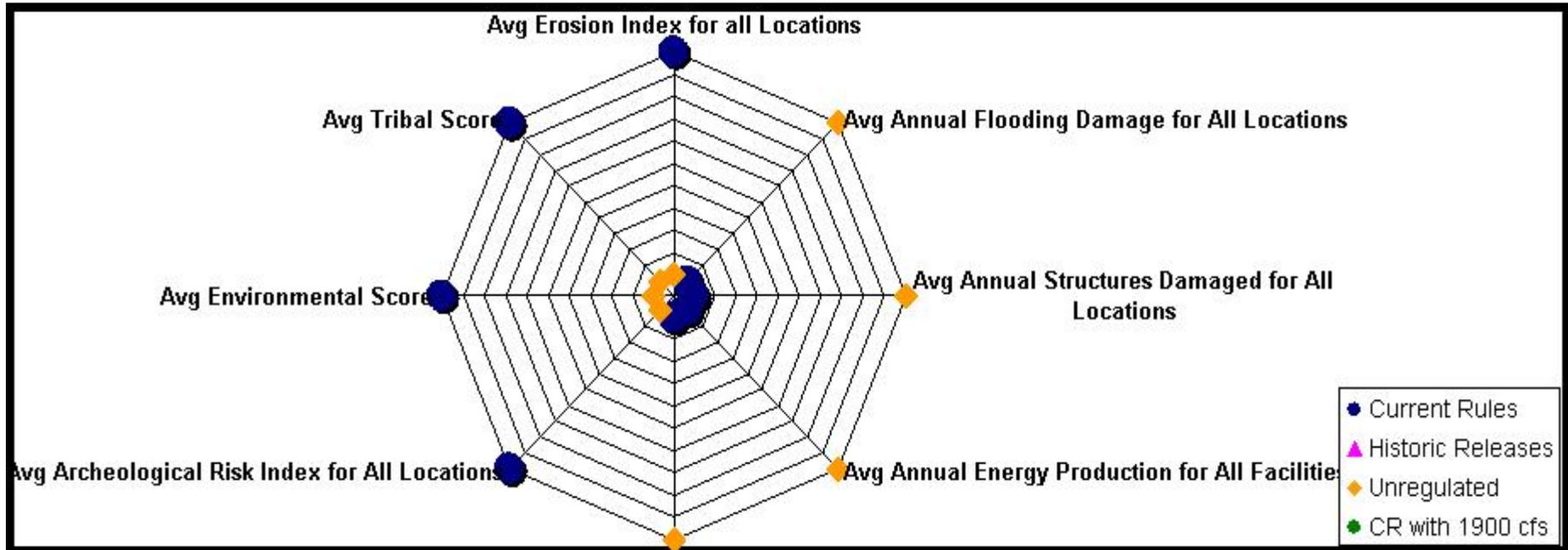




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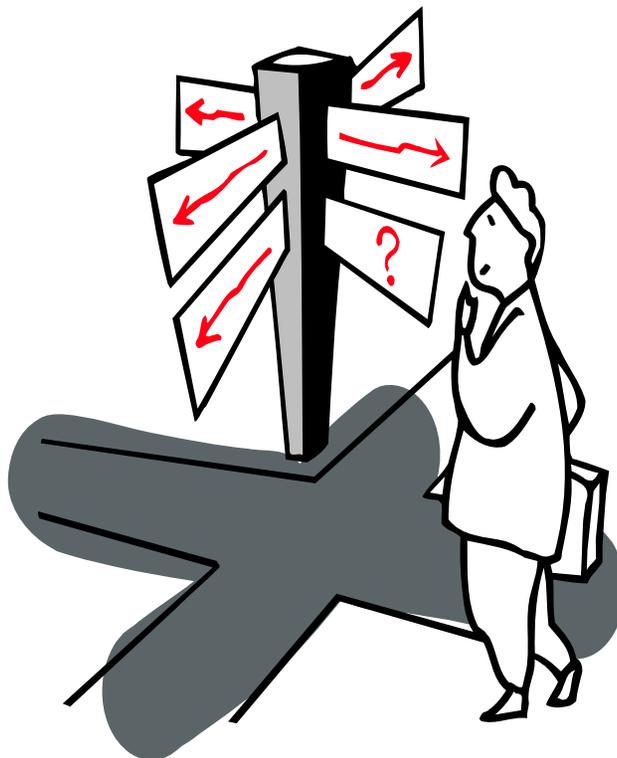
Example No-Action and Unregulated Alternatives





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Break





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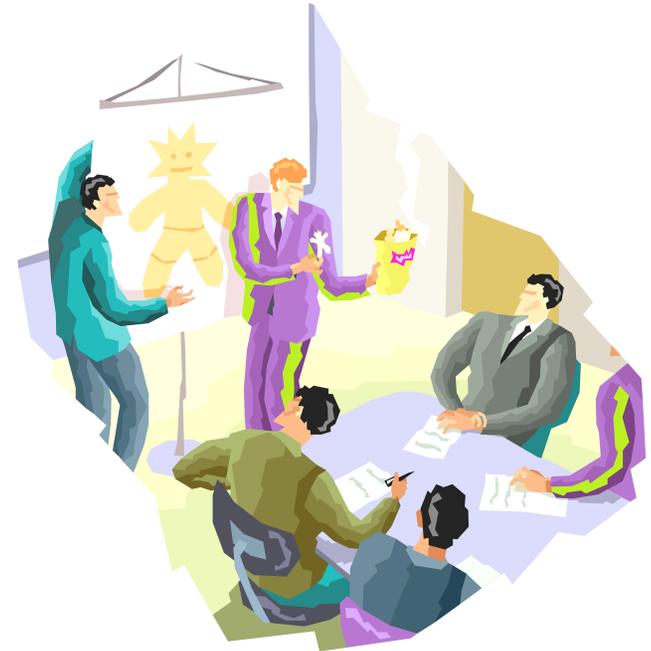
Open Discussion and Expectations of Stakeholders



What are the important factors to display in the Decision Model?

Ideas on other important factors to consider for alternative selection.

Recommendations for balancing benefits across the system – “area-specific issues”.





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Defining Future Partnering Success

- Continued support of personnel from your respective agencies and organizations involved in the study.
- Continued advocacy of the ROPE Study.
- Continued function as a conduit relaying public opinion of the ROPE Study to the study team.



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Future ROPE Milestones

Plan Formulation Workshop (Partnering group participation welcome)	Early May
Identify Initially Preferred Plan	Early July
Distribute “In-House” Draft Report and EIS (Partnering Group Review)	Early August
Release Draft Report and EIS for Public Review (Partnering Group Review)	Early October
Release Final Report and EIS for Public Review (Partnering Group Review)	January of 2007
Sign Record of Decision and Begin Operating Under new Plan	Spring of 2007



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Action Items

- Review of action items resulting from today's meeting.
 - Meeting minutes will be posted on the ROPE website by Monday and an email notification of this will be sent out.
 - See flip-chart for others.



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THANKS



**Thank-you for
taking time to
participate !**

*Please take a moment to
sign the attendance roster
and check to be sure we
have your correct mailing
address.*

