



DRAFT REPORT

Eastern Snake Plain Aquifer (ESPA)

Review of Comprehensive Managed
Aquifer Recharge Program

PREPARED FOR



PREPARED BY

ch2m.

NOVEMBER 2015



Project Objective and Overview

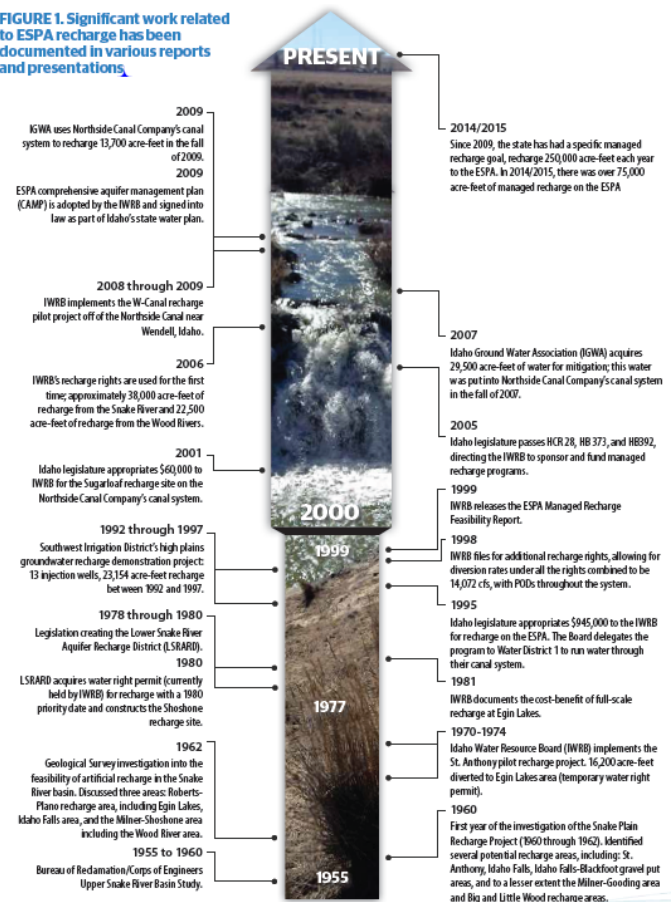
Objective

- Provide an independent, technical review of the state's managed recharge program

Overview

- Review and summarize existing reports
 - » *Summary of the recharge program and its evolution over time*
- Summarize basin hydrogeology and limits to managed recharge
- Summarize water rights and water supply availability for managed recharge

FIGURE 1. Significant work related to ESPA recharge has been documented in various reports and presentations



Results

- We believe the state is on the right path
- Sufficient water is available for recharging 150 to 250 thousand acre-feet annually
- To consistently achieve this goal, there may be site-specific improvements needed at recharge locations to overcome limitations, such as diversion, infiltration, and recharge capacity
 - » *Managed recharge site identification and canal system improvements/modifications to capitalize on the 500 to 1,000 cfs of water available nearly every day of every winter downstream of Minidoka.*
 - » *Canal capacity improvements upstream of Minidoka, combined with funding for operational flexibility to accommodate opportunistic availability of late-winter recharge upstream of Minidoka.*
 - » *Expansion of canal capacity at key points of diversion throughout the basin to capture water that is available for recharge in the spring.*
- The State is implementing an adaptive implementation strategy, per the 2009 ESPA CAMP, and we believe this approach is appropriate. This phased approach provides an opportunity to adapt to future conditions

Availability of water for managed recharge

Outline

- Policies guiding availability of water for managed recharge
- Physical and legal availability of water in Water District 01
- Methods of analysis
- Primary results
 - » *Timing and diversion rates*
 - » *Annual volumes and duration*
 - » *Limiting constraints*
- Other factors affecting recharge availability
 - » *Climate*
 - » *Capitalizing on availability: winter versus summer*
 - » *Fish and wildlife needs*
 - » *Water rights*
 - » *Recharge in tributary basins*

Policies governing water availability

Managed recharge on ESPA...

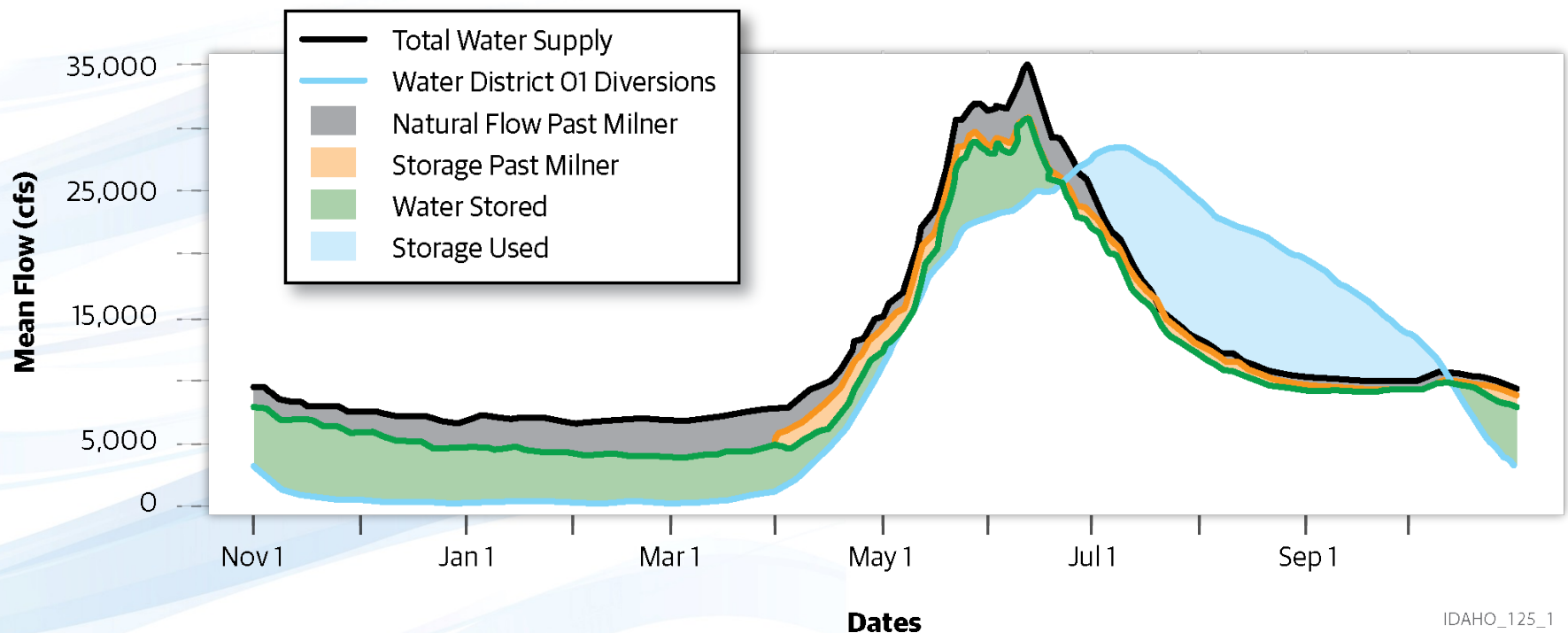
- Is an opportunistic use of *available natural flow* in upper Snake River
- Shall not interfere with optimal storage in upper Snake reservoirs
- Will be conducted in accordance with prior appropriation doctrine
- Will be consistent with water-rights administration in WD01
- Shall not interfere with USBR's unsubordinated Minidoka power right
- Will be consistent with State Water Plan and ESPA CAMP



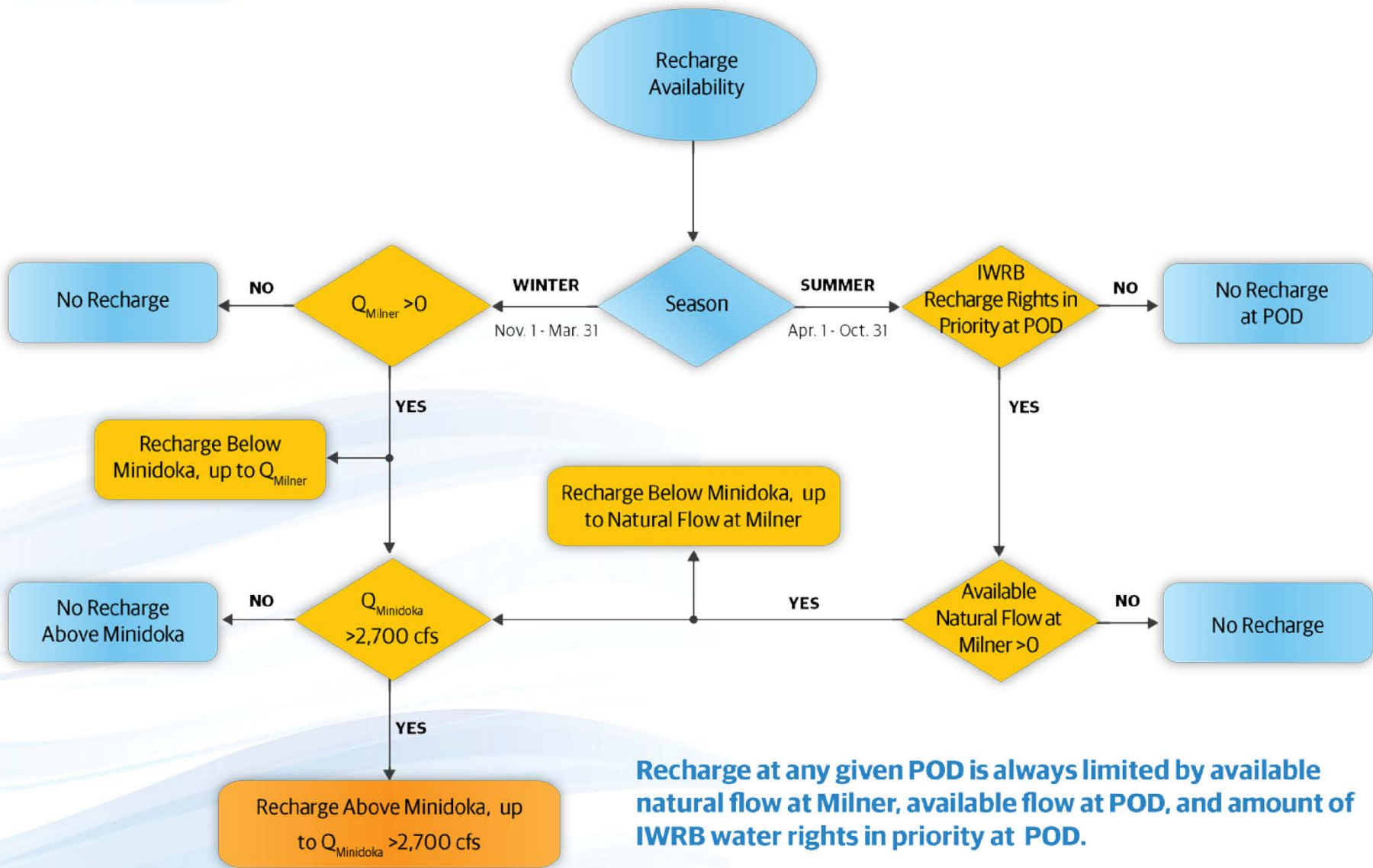
Physical and legal water availability

- Natural flow past Milner Dam is available for managed recharge

Upper Snake River System



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Recharge at any given POD is always limited by available natural flow at Milner, available flow at POD, and amount of IWRB water rights in priority at POD.

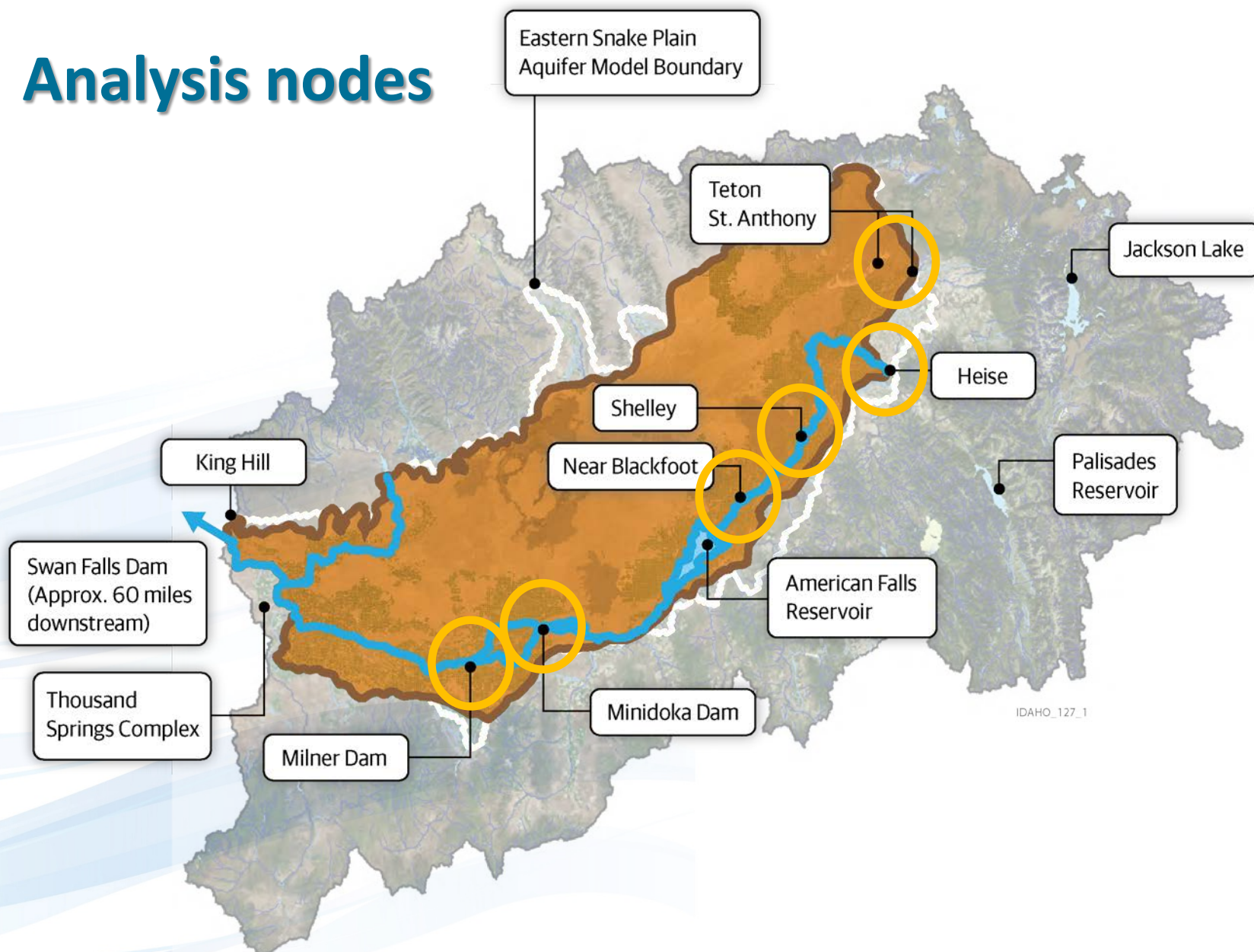
IWRB recharge rights

ID Number(s)	Type	Priority Date	Diversion (cfs)	Point(s) of Diversion
01-7054	Permit	8/25/1980	1,200	Any (by current water supply bank rental agreement)
01-7142	Application	3/20/1998	2,831	Milner
01-10609	Application	3/20/1998	3,738	Minidoka to Milner
01-10612	Application	3/20/1998	2,106	Menan to Blackfoot
01-10613	Application	3/20/1998	3,206	SF: Heise to Lorenzo
21-7577, 7578, 7580, 13160	Application	3/20/1998	2,191	HF: Fall River, Henrys Fork, Teton River
TOTAL			15,272	

Methods of analysis

- Applied availability flow chart to WD01 accounting data.
- Assumed diversion occurs under IWRB 1980- and 1998-priority rights.
- Analyzed irrigation years 1980-2014 ($n = 35$ years).
- Used daily time step, but summarized statistics over irrigation years.
- Conducted analysis independently at seven system nodes:
 - » *Milner*
 - » *Minidoka*
 - » *Near Blackfoot*
 - » *Shelley*
 - » *Heise*
 - » *Henrys Fork at St. Anthony*
 - » *Teton River at St. Anthony*

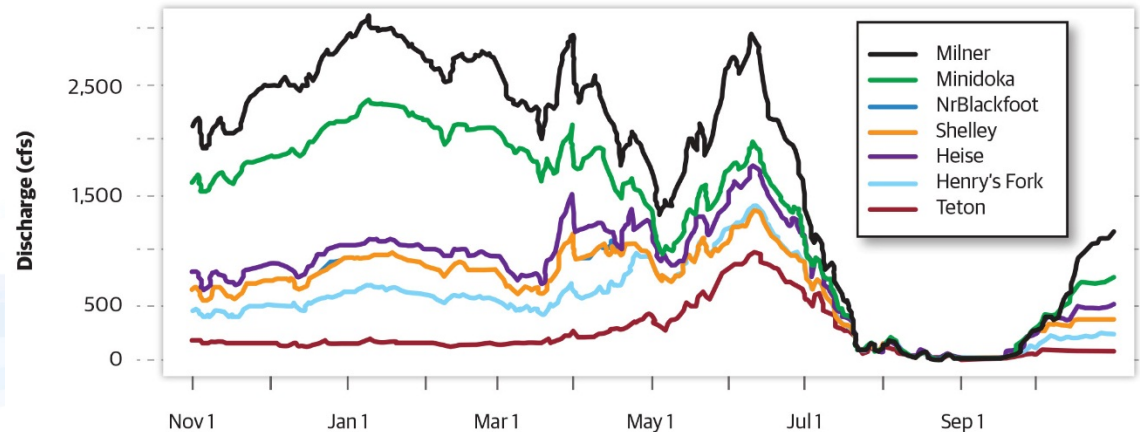
Analysis nodes



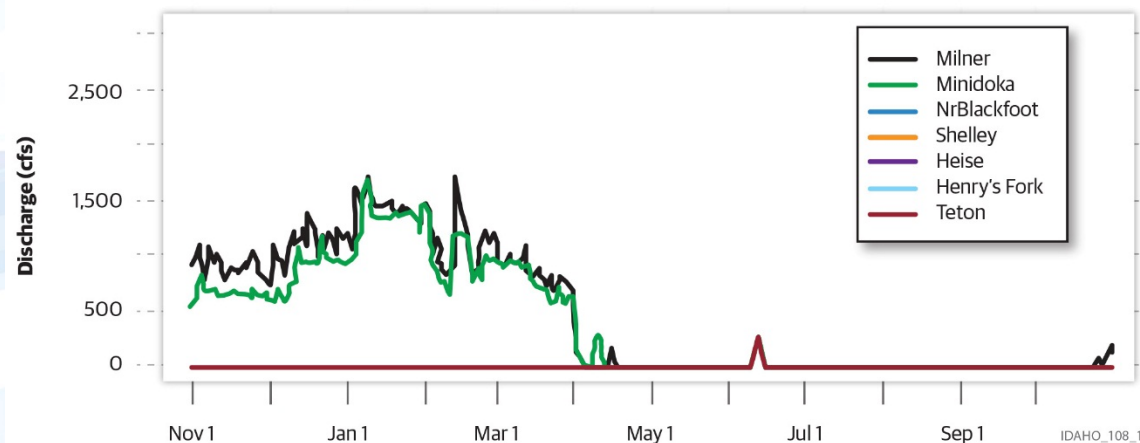
Timing and Diversion Rates

- Availability generally decreases with distance upstream.
- ~1000 cfs available below Minidoka every day of winter during median year.
- Water not available during summer in about half of years.
- Water never available late August- late September.

Mean Recharge Availability



Median Recharge Availability



Volume and Duration

MEDIAN STATS

• Volume:

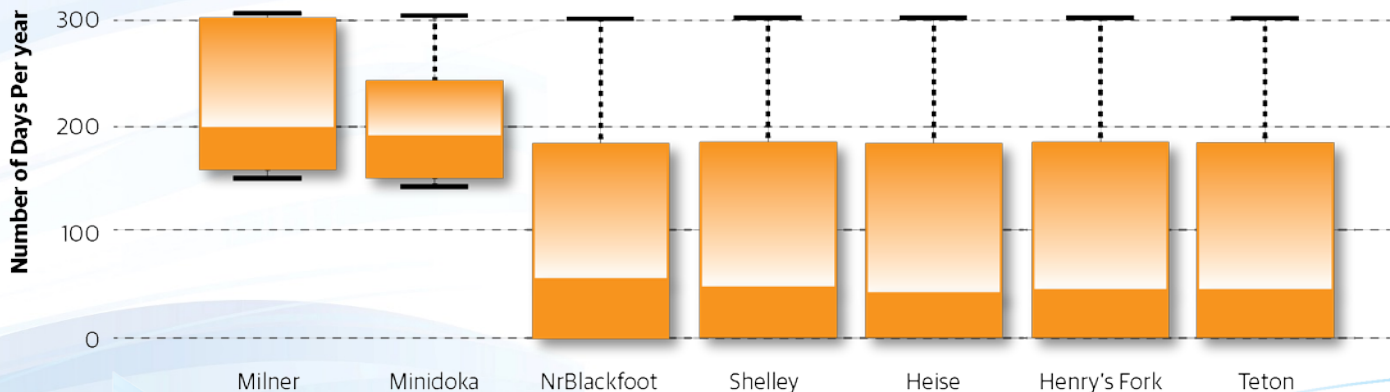
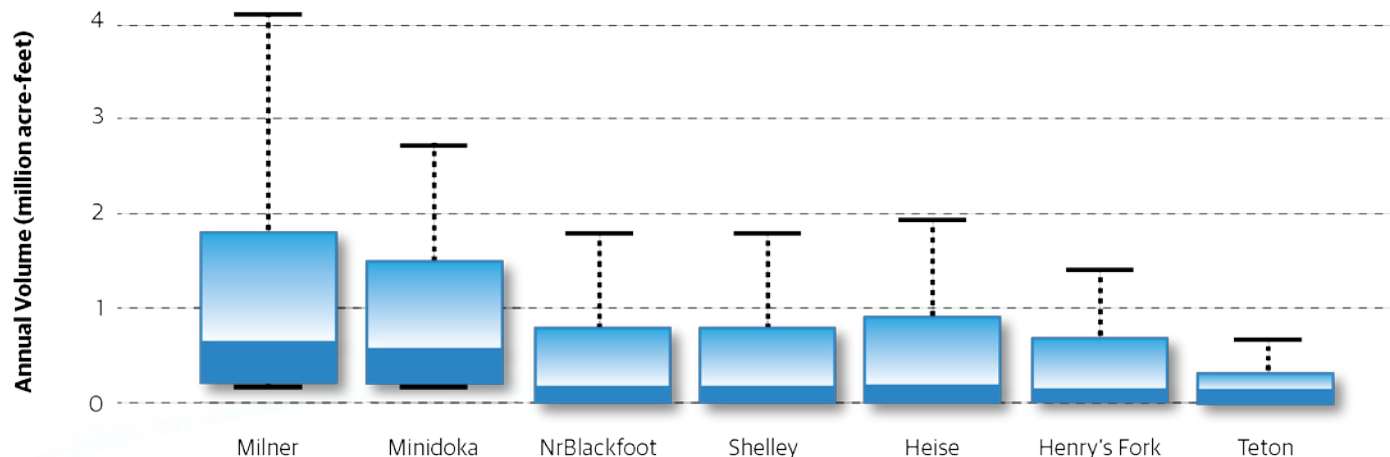
627k af/yr blw.
Minidoka

149k af/yr ab.
Mindoka

• Duration:

205 days/yr
blw. Minidoka
(151 winter)

55 days/yr
ab. Minidoka
(3 winter)



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Limiting constraints: winter (151 days)

Median number of days limited by given constraint

Constraint	Milner	Mid-Valley	South Fork	Henrys Fork
No recharge: 0 flow at Milner	0	0	0	0
No recharge: Power right	NA	145	145	145
Recharge: flow at Milner	151	0	0	0
Recharge: Power right	NA	3	3	0
Recharge: flow at POD	151	0	0	0
Recharge: water rights div. rate	0	0	0	0

Limiting constraints: summer (214 days)

Median number of days limited by given constraint

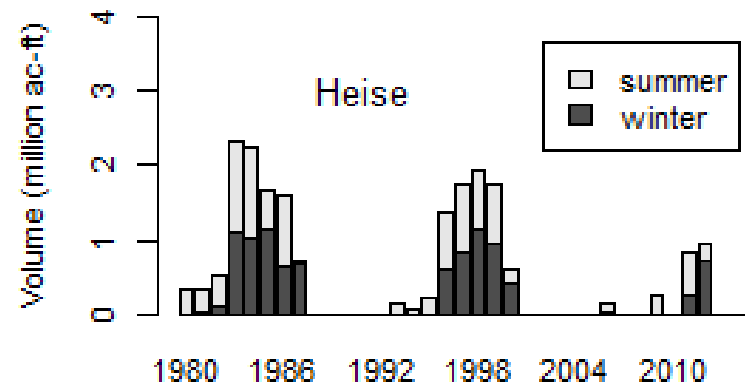
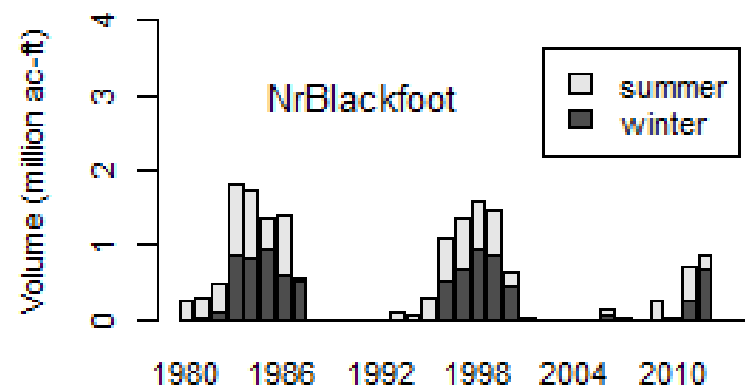
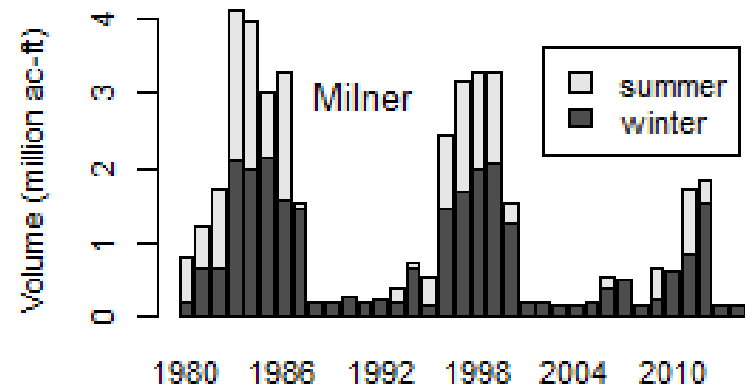
Constraint	Milner	Mid-Valley	South Fork	Henrys Fork
No recharge: water-rights priority	151	163	167	163
No recharge: 0 flow at Milner	0	0	0	0
No recharge: Power right	NA	0	0	0
Recharge: flow at Milner	31	11	13	10
Recharge: Power right	NA	0	0	0
Recharge: flow at POD	31	0	0	2
Recharge: water rights div. rate	0	6	3	1

Other factors: climate

- Winter water available below Minidoka in all years
- Winter water available above Minidoka in years with high carryover
- Summer water available only in high-runoff years, regardless of location
- Period of record is reason for small differences between our results and IDWR 2000-2012 analysis

Mean/median annual availability (ac-ft)

Climatic period	Below Minidoka	Above Minidoka
1980-2014	1,200,000 600,000	500,000 150,000
2000-2014	600,000 200,000	200,000 7,000



Capitalizing on availability

- Winter

- » *Recharge 500-1000 cfs all winter downstream of Minidoka.*
- » *Establish administrative and logistical flexibility to recharge upstream of Minidoka on short notice late in winter.*
- » *Ice and snow in canals may limit opportunities for late-winter recharge.*
- » *Canals in Henrys Fork basin that divert water during winter for sub-irrigation and stock water provide opportunity for late-winter recharge.*

- Summer

- » *Canals already convey irrigation water when summer recharge becomes available during spring freshet.*
- » *Expanding canal capacity at key locations may be needed to capitalize on summer recharge availability.*

Other factors: fish and wildlife needs

- Key stream reaches of concern
 - » *Henrys Fork: Downstream of Fall River*
 - » *South Fork Snake River: Heise to Menan*
 - » *SNAKE River: Menan to American Falls Reservoir*
- Primary streamflow needs
 - » *Sufficient winter flow for juvenile trout survival*
 - » *Spring-time freshet for channel and floodplain habitat maintenance*
- Potential effects of diversion for managed recharge
 - » *Minidoka power right prevents winter recharge except when flows are already high, minimizing potential effects of winter recharge.*
 - » *Substantial effects likely only if Minidoka power constraint is relaxed.*
 - » *Water-rights priorities limit spring-time recharge to those years when high flows have greatest potential to benefit channel and floodplain.*
 - » *Potential spring-timer effects are greatest in Shelley-American Falls reach.*



Other factors: water rights and tributary basins

- Permitted and pending water rights for managed recharge:
 - » *15,272 cfs IWRB + 3,985 cfs private = 19,257 cfs*
 - » *Available natural flow exceeded this on less than 0.5% of days in 1980-2014.*
- Henrys Fork traditional winter diversion (sub-irrigation, stock water)
 - » *17 private rights with priorities 1902 or earlier*
 - » *Maximum rate: 1,912 cfs*
 - » *Historic rate: 329 cfs mean = 98,000 ac-ft/yr incidental recharge*
 - » *Recommend encouraging this historic winter diversion but not counting it toward managed recharge goals.*
- Recharge in ESPA tributary basins:
 - » *will not reduce managed recharge water availability in WD01*
 - » *is neutral to ESPA unless it uses water that historically reached Snake River as surface flow*
 - » *is not helpful to ESPA if it simply offsets increased consumptive use (Wood R.)*

Conclusions

- Water is available almost every day of every winter below Minidoka.
- Power right prevents winter recharge above Minidoka in half of years.
- Water available system-wide in half of years for ~30 days in May-June.
- Future availability depends on whether climate includes sequences of wet years like 1980-1987 and 1995-1999.
 - » *If so, median availability is 600 kaf below Minidoka and 150,000 kaf above.*
 - » *If not, median availability is 200 kaf below Minidoka and 7,000 kaf above.*
- Need to recharge 500-1000 cfs downstream of Minidoka all winter and be able to divert late-winter water upstream on short notice.
- Using spring freshet may require expanded canal capacity.
- If all applications are permitted, existing recharge rights are sufficient.
- Canal capacity, administrative and physical logistics, weather, and fish/wildlife concerns may limit recharge before water supply does.