Water Management on the Sun River
The Time for Modernization
Erling A. Juel, PE
GID – BACKGROUND

- GID comprises over 132,760 acres
- Our operations span Cascade, Teton and Lewis & Clark Counties
- We are part of the USBR’s Sun River Project along with Fort Shaw Irrigation District
- GID relies on the Sun River and is dependent on a healthy watershed and sound forest management practices
GID – OPERATIONS

- Irrigation season between April 1st and Oct 31st
- Water Rights allow irrigation up to 83,231.72 Ac
- District delivers water to over 1625 individual farm units
- There are 812 land owners and/or water users
- Manage over 23,000 acres of Grazing Land
GID – O&M SCOPE

- Responsible for operation and maintenance of infrastructure including
  - Gibson Dam, Willow Creek Dam, Pishkun Reservoir
  - 52 miles of major supply canals
  - Over 600 miles of laterals & sub-laterals
  - Over 350 miles of drains
  - 10% ownership of Turnbull Hydro, 13MW
  - Manage the daily flows of the Sun River
GID – EARLY HISTORY

- Irrigation on the Sun River dates back to the 1880’s related to the military installation at Fort Shaw.
- Sun River Project was authorized by the Reclamation Service in 1906.
- 1st water delivery to Ft Shaw Div. in 1909.
- 1st water delivery to Greenfields Div. in 1920.
- Greenfields Irrigation District (GID) was formed in 1925.
GID – 2016 IRRIGATION & CROPS

- Irrigation Methods
  - About 60% under Pivots & Wheel Lines
  - About 40% via Flood Irrigation
- Malting/Feed Barley - 47,710 Acres
- Hay/Alfalfa – 23,681 Acres
- Pasture – 7,207 Acres
- Winter/Spring Wheat - 846 Acres
- Canola/Mint/Peas/Other – 1,521 Acres
- 2014 Economic Impact - $46M
- 2015 & 2016 Impact - $37M to $31M
Sun River Watershed includes 1.4 million acres
GID represents nearly 10% of the Sun River Watershed
3 other IDs and numerous private irrigators
Basin wide there is approx. 120,000 acres of irrigation; GID accounts for over nearly 70%
Gibson inflows averaged 595 kac-ft since 1930, 440 kac-ft more recently
GID diverts the majority of Gibson inflow
DROUGHT IMPACTS

• 2015 & 2016 were water-short years
• Annual per acre irrigation allotment was reduced by 25%
• Irrigation season was cut short by 4 weeks
• Huge impact to hay growers and irrigated pastures; less of an impact for grain growers
• Economic impact in the millions
DROUGHT RESILIENCY & VULNERABILITY MITIGATION

- Since we can’t control mother nature…..
  - How to capture our water, i.e. supply & timing vs. available storage
  - How to better use our water, i.e. conservation, efficiency & enhanced management practices
- Extends our irrigation season
- Especially important during water short years and i.e. persistent drought conditions
BUILDING DROUGHT RESILIENCY & VULNERABILITY MITIGATION

- Four Main Deficiencies
  - Limited Storage Upstream of GID
  - Aging & Antiquated Infrastructure
  - Improper Mode of Canal Operations
  - Insufficient Conveyance Control
NEED FOR ADDITIONAL STORAGE

- GID relies on water storage, when our storage is depleted, our irrigation season is over
- Climate change – less precip. & higher temps.
- Deforestation of our watershed canopy upstream of Gibson Reservoir
- Cumulative effect – earlier runoff events
- Not conducive to our use pattern and available storage
Gibson, Pishkun & Willow Creek Reservoirs were planned and sized 100 years ago and with very limited hydrologic data.

If being built today, these dams and reservoirs would look very different.

Losing active storage in Gibson Reservoir due to sedimentation.
LEGAL ISSUES WITH NEW STORAGE

- Legally - DNRC permitting w.r.t. storage rights
- Sun River Basin is a Closed Basin
- Negative stigma associated with new storage
- Due to location, resistance to environmental permitting would be heightened
ARGUMENT FOR NEW STORAGE

• No new irrigation or expansion of irrigation is being proposed
• No expansion of our District boundaries is being considered
• No additional water users or uses of the water are being sought
• No increase of our water right
• GID just wants to be able to use our water as described in our water right
ENGINEERING & LOGISTICAL ISSUES

• New run-of-river dam is highly unlikely
• All the easy locations already developed
• May have to be a combination of gravity and pumped system
• GID is looking for creative, off-stream storage sites downstream of our river diversion
• Total Size?? In the 20-30 kac-ft range
• Financially – big commitment over a long time frame
CONDITION OF INFRASTRUCTURE

- GID’s infrastructure was built over 100 years ago
- Most is original equipment with varying degrees of band-aids
- Does not match current irrigation practices, i.e. pivots and other sprinklers
- Aging and in many cases, antiquated infrastructure
- If being built today, our District would look very different
MODERNIZATION CHALLENGES

- Originally, our infrastructure was built concurrently, on multiple fronts.
- Throughout the entire year.
- Today, because we must deliver water, the construction season is limited to October through April.
- Not the most ideal or productive time of year.
- Resources needed for “regular” maintenance.
- May involve ROWs & easements.
- Financially – another big commitment.
Currently GID operates in an Upstream, Supply Mode. Meaning……

- You order water from GID, we release water from Pishkun Reservoir
- We route this water through our system, eventually to your field turnout
- 1.5 to 2 days later you will get your water

Any change equates to lost water/inefficiencies

Need at look modern delivery methods, e.g. based on Downstream Demand
RETHINK CONVEYANCE CONTROLS

- GID operates in a Reactive Local, Manual Mode
  - Very little remote control and automation
  - Very little SCADA/centralized control
- Our system is complex & large, it is difficult to make the necessary & frequent adjustments to achieve the desired flow efficiencies
- Humans make mistakes as well as conscious flow alterations
- Humans need to sleep
ISSUES WITH CHANGING OUR METHODS OF MODE AND CONTROL

- Our canals and infrastructure system were built for rotational flood heads
- Today, with 60% sprinklers, canals must operate much differently
- Again, if we were designing GID’s infrastructure today, it would look very different
- Limited construction window, i.e. winter construction
- Financially – another big commitment
NEED FOR A COURSE CORRECTION

- The world is changing……
  - Climatically
  - Technology
  - Competing interests in our watershed
  - Worldwide, more food will be needed & less water consumption will be mandated
- Unfortunately, most 100-year old irrigation districts have not changed
- Drought Resiliency and Vulnerability Mitigation need to be started today so that they can be in-place tomorrow
WHERE TO START?

- The Sun River Watershed Group is a public-private collaboration of Basin stakeholders
- Start with a “to-do”/wish list
- Prioritize w.r.t. implementation time, costs & long term benefits
- Look for low-hanging fruit to gain momentum
- Don’t stop just because the drought cycle is officially over, there’s another one on the horizon
FLOOD VS PIVOT??
QUESTIONS????