

Amendments/Transfers (Change Authorizations)

Diverted Volume/Consumptive Use
Montana's View



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Overview

- Background
- MT Change Authorization Specifics
- Diverted Volumes and Consumptive Use Considerations per Purpose Type



Case Law, Administrative Rulings, and Water Law Literature

- *“Consumptive use may be defined as diversions less returns..... An appropriator may not increase, through reallocation (changes) or otherwise, the historic consumptive use of water to the injury of other appropriators. In general, any act that increases the quantity of water taken from and not returned to the source of supply constitutes an increase in historic consumptive use.” Robert E. Beck, Water and Water Rights.*

Background

- Not specific in statute, falls under adverse effect – holders of existing water rights are entitled to the continuation of stream conditions as they existed as the time they first made the appropriation.
- Definition of Consumptive Use:
 - ARM 36.12.101 (15) "Consumptive use" means the annual volume of water used for a beneficial purpose, such as water transpired by growing vegetation, evaporated from soils or water surfaces, or incorporated into products that does not return to ground or surface water.

Change Authorizations in General

- Two general types
 - Stand – Alone
 - Combined (where the change authorization provides mitigation for a new use in a permit application – mostly in Closed Basins, so the permitted use has to line out consumed/non-consumed volume, too, to get the net depletion amount to surface water that mitigation is needed for)
- Time component
 - For historical water rights (Statements of Claims), historical use and amounts are calculated based on data prior to July 1, 1973

Change Authorizations in General

- Applicant must prove following criteria by a preponderance of evidence:
 - Historic use/historic consumptive use
 - No adverse effect to senior or junior appropriators
 - Adequate means of diversion
 - Beneficial use
 - Possessory interest



Change Authorizations in General

- Reform
 - We just significantly changed our permit/change process to where DNRC gathers and calculates more information needed for application – this has driven the setting of standards for how diverted/consumptive volume is calculated. Previously, applicants were able to provide reasonable numbers.



Purpose Types

- Irrigation
- Instream Flow for Fisheries, Temporary Change Type (often change in purpose from irrigation)
- Stock
- Municipal/Multiple Domestic/Domestic
- Other



Irrigation Purpose

- Consumptive Components that we break out
 - Crop Consumption
 - Irrecoverable Losses
 - Conveyance Losses (evaporation/evapotranspiration)
- Diverted Volume Calculation
 - Standard approach today is to take IWR Crop Consumption and then back out on efficiencies to get diverted volume (conveyance loss also included seepage)
 - Past approaches included diverted flow rate over time

Historic Diverted Volume =

$$(\text{Volume}_{\text{historic consumptive use}} / \text{On-farm efficiency}) + \text{Volume}_{\text{conveyance loss}}$$

Irrigation Purpose

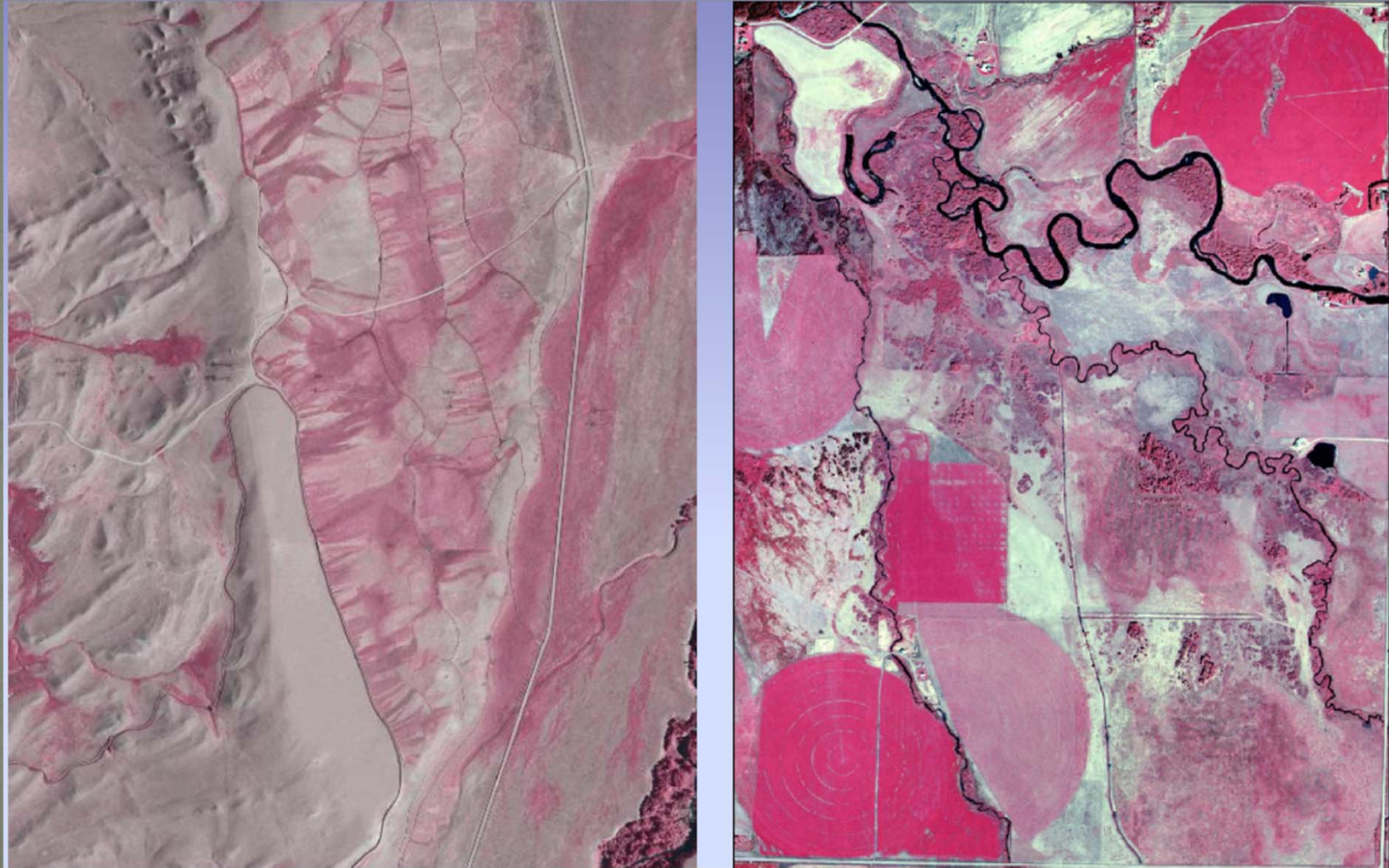
- Crop Consumption – focus on historical water rights (pre-July 1, 1973), but similar process on permitted water rights
 - Consumptive Use Rule - ARM 36.12.1902 (16)

Column A	Column B	Column C	Column D	Column E	Column F
County	Weather Station	Elevation	IWR Flood Irrigation, Wheeline & Handline Seasonal ET (inches)	IWR Center Pivot Irrigation Seasonal ET (inches)	Management Factor Percentage 1964 - 1973
	Whitefish	3100	15.74	18.61	
Gallatin	Bozeman Exp Farm	4775	16.84	19.55	73.5%
	Bozeman MT State	4913	18.42	21.39	
	Hebgen Dam	6667	10.09	12.77	

Irrigation Purpose

- Crop Consumption - Consumptive Use Rule (cont)
 - **Example:** Retiring 30 irrigated (flood) acres for mitigating a new public supply well
 - Pick representative weather station (climatic conditions and elevation are the key elements)—we will pick Bozeman Exp. Farm
 - Numbers we will use—30 acres, 16.84 inches of ET seasonally, management factor of 73.5%
 - $16.84 \times 0.735 = 12.38$ inches consumed per irrigated acre
 - $30 \text{ acres} \times 12.38 \text{ inches} = 371.4 \text{ inches} \div 12 \text{ inches per foot} = 30.95 \text{ acre-ft}$
 - **Management Factor Derivation**

Management Factor



Irrigation Purpose

- Irrecoverable Losses
 - 5% up front assumption for flood irrigation
 - 10% up front assumption for sprinkler irrigation
- Conveyance Losses
 - Seepage Loss + Vegetation Loss + Evaporation

$$\text{Seepage Loss} = \frac{(\text{wetted perimeter})(\text{ditch length})(\text{loss rate})(\text{days})}{43,560 \text{ ft}^2/\text{acre}}$$

(NEH 1993)

$$\text{Vegetation Loss} = (\% \text{ loss/mile})(\text{flow})(\text{days})(\text{ditch length})(2) \quad (\text{user supplied and NEH standard})$$

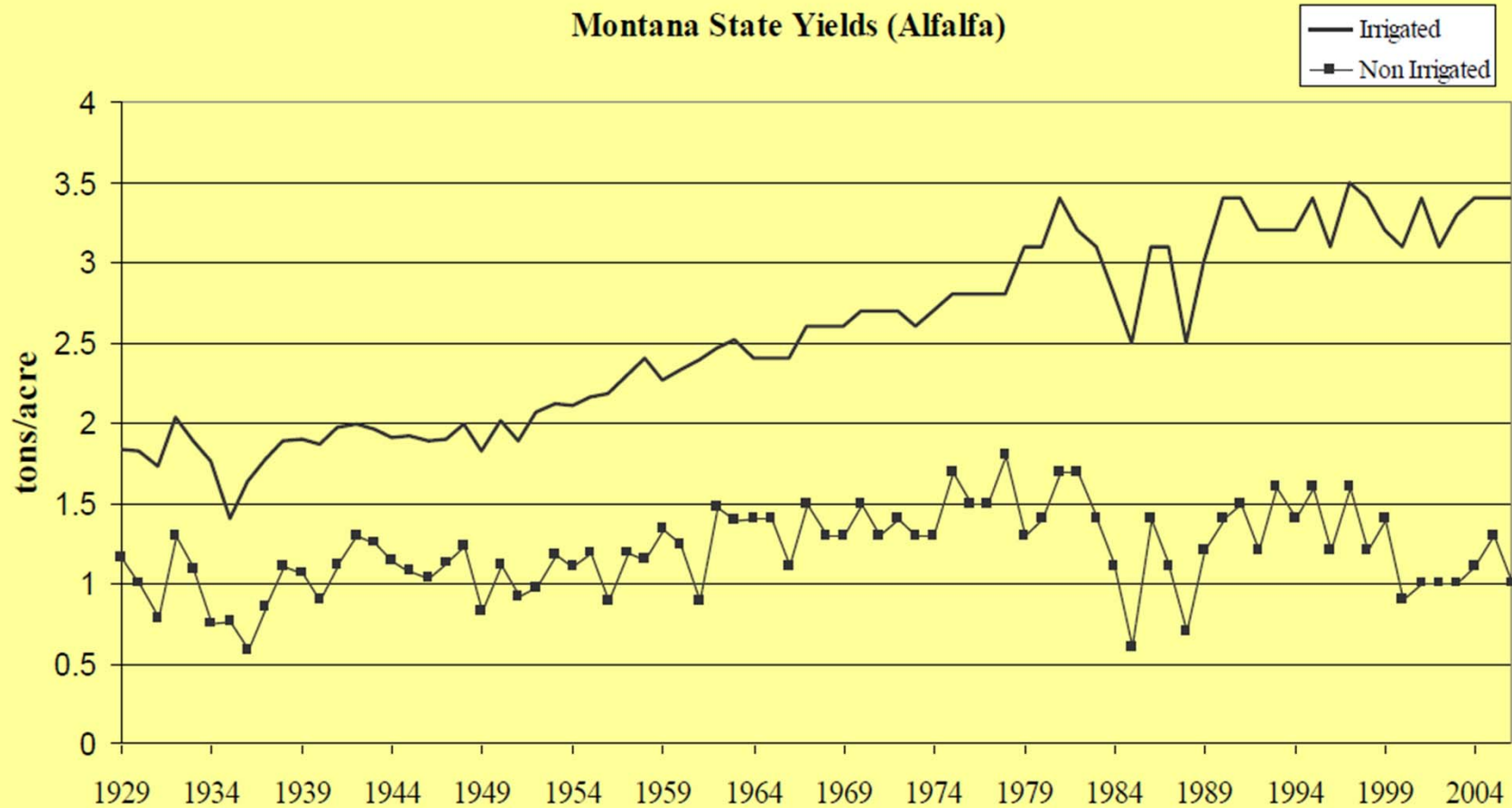
$$\text{Ditch evaporation} = (\text{surface area of ditch})(\text{evaporation rate})/43,560 \text{ ft}^2/\text{acre} \quad (\text{Potts, 1988})$$

Irrigation Purpose

- Challenges
 - Flood to Sprinkler conversions in the same footprint
 - Low efficiencies
 - Salvage Water Statute



Montana Agriculture Statistics



Increasing Trend: sprinkler irrigation improvements
flood irrigation improvements (gated pipe, land leveling, etc.)
improvements in genetics and fertilizers

1964-73 = 2.51 tons/ac, 1973-2006 = 3.03 tons/ac, 1997-2006 = 3.22 tons/ac

Instream Flow for Fisheries Purpose

- Temporary Change with separate statutes
 - Exempt from Possessory Interest and Adequate Means of Diversion Criteria (no permanent change or new permit option due to these criteria)
 - Case law specifies for instream fisheries a special circumstance of “consumed from the source” water



Stock Purpose

- 100% Consumptive
- Diverted Volume (30 GPM pre-1973, 15 GPM post)
 - Moving off source, stock tank additions are most common. If tank float on stock tank, then assume conditions on source remains the same. If not, then water has to return immediately (<1 mile) to the source.



Municipal/Multiple Domestic Purpose

- Diverted volume can vary, based on plans
- See Table below, wide range depending on treatment type.

Table 1: Percentage consumption for domestic use by wastewater disposal and treatment.

Wastewater Treatment / Disposal	Consumed
Individual drainfields	10 %
Central treatment facility with minimal consumption	5 %
Evaporation basin or land application	100 %

- Challenge – Change in treatment method (EPA, MT DEQ regulations)



Other Purposes/Situations

- Reservoirs
 - Groundwater Pits – 1 capacity fill plus annual evaporation is considered consumed and is the total volume typically
 - Non-perennial stock ponds – typically considered 100% consumptive (often includes carryover volume)
- Snowmaking – 18.5% consumed (as presented in one application)
- Marketing – 100% (for hydrofracking)
- Non-Consumptive
 - Geothermal Heating/Cooling
 - Hydropower



Questions/Discussion

