



Investment Management Concepts

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What is Intergenerational Equity?

The Trustees of endowed institutions are the guardians of the future against the claims of the present. Their task is to preserve equity among generations.

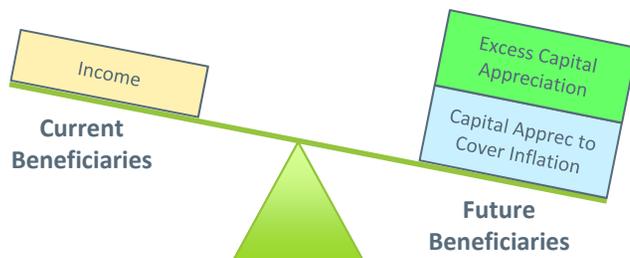
- James Tobin, Economist and Nobel Laureate

Intergenerational Equity Illustration

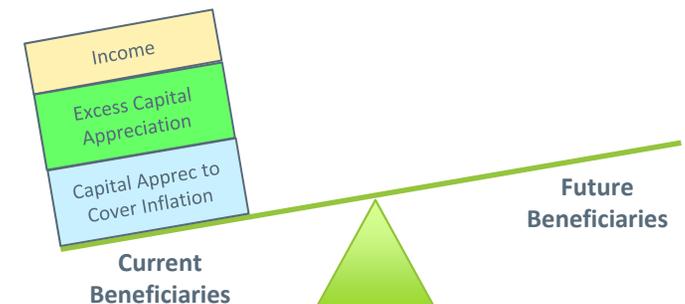
Balanced Allocation



Net Benefit to Future Beneficiaries



Net Benefit to Current Beneficiaries



Land Trust Missions

Key Objectives

**Core Economic Objective:
Intergenerational Equity**

1. Provide income to support the needs of current beneficiaries
2. Preserve the value of the corpus to support the needs of future beneficiaries
3. Provide sound stewardship and preserve the health of land assets for use of future generations

Ideal Inputs to Gauge Intergenerational Equity

Asset Valuations

Valuations for all assets (land, minerals, natural resources, real estate, and financial investments) are regularly updated and reasonably reflective of current market values.

Total Return Expectations

Long term total return expectations are regularly updated and properly customized to represent the unique assets held by the trust.

Yield Expectations

Long term yield expectations for all assets are regularly updated and properly customized to represent the unique assets held by the trust.

Inflation Expectations

Long term inflation expectations are properly reflective of the unique sensitivities of Trust beneficiaries.

Governance

Governance across all trust assets is well coordinated or centralized to ensure a holistic evaluation of investment strategy and decisions.

Investment Flexibility

Trust maintains sufficient flexibility to make adjustments to investments to optimize intergenerational equity and maximize risk-adjusted returns.

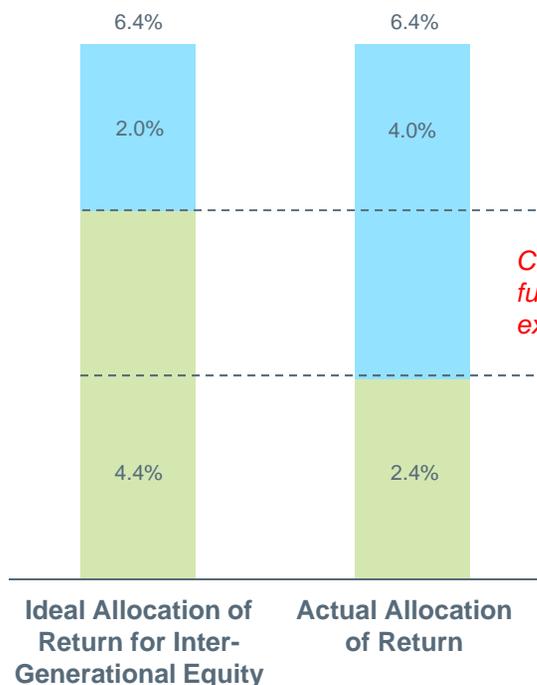
Hypothetical Framework

Key Assumptions and Valuation Data

	Current Valuation (\$M)	Allocation (%)	Expected Long Term Yield	Expected Long Term Return
Land	\$500	20%	0.5%	4.0%
Minerals/Natural Resources	\$750	30%	2.0%	8.0%
Commercial Real Estate	\$250	10%	5.0%	8.0%
Financial Assets	\$1,000	40%	3.0%	6.0%
Total	\$2,500	100%	2.4%	6.4%

	Benefit Source	Annual Estimate
Current Beneficiaries	Income	2.4%
Future Beneficiaries	Capital Appreciation	4.0%
TOTAL Return		6.4%
Expected Inflation	2.0%	
Yield Required for Intergenerational Equity	4.0%	
Current Intergenerational Equity Balance		
Allocation of Total Return to Current Beneficiaries	30%	
Allocation of Total Return to Future Beneficiaries	70%	

Analysis of Intergenerational Equity



Current allocation of total return is strongly biased toward future beneficiaries as capital appreciation exceeds the expected rate of inflation by 240 bps.

- Capital Appreciation
- Income

Real World Challenges for Land Trusts

Concentration of assets in illiquid land and natural resource investments creates several unique challenges for land trusts:

1. High Level of Valuation Uncertainty
2. Returns from Illiquid Assets are Structurally More Beneficial to Future Generations
3. Financial Investment Constraints Limit Strategy Adjustments
4. Decentralization of Asset Class Management May Impede Decision-Making

Challenge 1: Valuation Uncertainty

Asset Type	Percent Reporting No Formal Valuation Method	Average Age of Most Recent Valuation for Those Conducting Valuations
Land	28%	1.25 years
Commercial Real Estate	43%	1 year
Natural Resources	28%	2 years
Financial Assets	100%	Current

Sources of Valuation Uncertainty

1. Future prices for natural resources
2. Value of undiscovered natural resources
3. Future market value and/or income from raw land assets
4. Future returns for various liquid asset classes (e.g., equity, fixed income)

Challenge 2: Structural Bias Toward Future Beneficiaries

	Stated Objective	Self Assessment of Strategy	Actual Expected Distribution of Benefits ¹
Current Beneficiaries	51%	54%	38%
Future Beneficiaries	49%	46%	62%

¹ The average total return expectation among respondents was 6.38% and the average expected long-term yield was 3.63%. Assuming a 30-year inflation rate of 1.61% (consistent with current breakeven rates), intergenerational equity would be achieved with a payout rate of 4.71%. Given that the payout rate is only 76% of the required rate, we have estimated that current beneficiaries are only receiving 38% of the benefit from the total return.

Challenge 3: Investment Constraints

1. Financial assets restricted to only fixed income
2. Restrictions on investments in foreign assets
3. Restrictions on the use of higher yielding, non-government securities
4. Restrictions on the use of alternative asset classes (e.g., MLPs)
5. Restrictions on the use of private assets

Challenge 4: Governance Decentralization

1. Separate governance structures for different trust assets
2. Incomplete control over asset allocation

Discussion

Discussion Framework

I

Asset Valuation Uncertainty

- Lack of recent comparable transactions
- Uncertainty of future commodity and natural resource prices
- Uncertainty of expected financial asset class returns

II

Structural Bias of Illiquid Assets toward Future Beneficiaries

- Low income yield on land assets
- Low income yield on equity-oriented and private investments
- Low income yield on fixed income securities

III

Financial Investment Constraints

- Constitutional constraints on investment options
- Institutional constraints on investment flexibility

IV

Decentralization of Trust Governance

- Separate oversight over asset pools (e.g., Land vs. Financial Assets)

Potential Tactics

- Colorado Comprehensive Asset Valuation Study*

- Income-Enhanced Investment Portfolios*
- Land Exchanges*
- Total Return Distribution Method*

- Colorado Investment Management Legislation*

- Comprehensive Investment Committees*

Distribution Methodologies

	Benefits	Drawbacks
<p>1. Income Only Annual distributions are restricted to only income portions of return (interest, rent, & dividends).</p> <p><i>Spending_n = Dividends + Interest + Rents</i></p>	<ul style="list-style-type: none"> <input type="checkbox"/> Easy to calculate <input type="checkbox"/> Can help force conservatism with investments (if this is needed) 	<ul style="list-style-type: none"> <input type="checkbox"/> Less flexibility with asset allocation <input type="checkbox"/> Potential shortfalls in stressed markets
<p>2. Moving Average Annual spending is based on a set rate that is applied to an average market value over various time periods (typically 3-year quarterly average).</p> <p><i>Spending_n = Spending Rate × $\left(\frac{\sum_1^{12} MV_n}{12}\right)$</i></p>	<ul style="list-style-type: none"> <input type="checkbox"/> Greater flexibility of asset allocation <input type="checkbox"/> Greater stability of annual spending distributions 	<ul style="list-style-type: none"> <input type="checkbox"/> Implementation challenges with illiquid portfolios <input type="checkbox"/> Risk of overspending in low return environments
<p>3. Hybrid (Yale Rule) Spending is based on 80% of the prior year's spending adjusted for inflation and 20% passed on fixed spending rate multiplied by the market value of the endowment.</p> <p><i>Spending_n = (80% × Spending_{n-1} × inflation) + (20% × Spending Rate × MV_n)</i></p>	<ul style="list-style-type: none"> <input type="checkbox"/> Greater stability in annual spending 	<ul style="list-style-type: none"> <input type="checkbox"/> Risk of overspending in sustained bear market <input type="checkbox"/> Greater complexity

Appendix A: Colorado Asset Valuation Report





COLORADO

State Land Board

Department of Natural Resources

To: Colorado State Board of Land Commissioners

From: Tobin Follenweider, Deputy Director

William Martin, GIS Planner

Bill Gaertner, Inventory Manager

Mike McAninch, Investment Officer

Date: 10.2.2015

Re: Portfolio Analysis

SUMMARY

This memo concerns the Portfolio Analysis as anticipated by the Strategic Plan. The following summarizes our analysis:

- Portfolio Valuation and Return - 2015
 - \$4.2 billion School Trust estimated value
 - \$2.7 billion land
 - \$516 million minerals
 - \$157 million commercial
 - \$817 million cash (Perm Fund)
 - Estimated School Trust return
 - 4.9% income

- Portfolio Characteristics
 - Landscape parcels and small isolated parcels
 - Located on Eastern Plains
 - Generally adjacent to public roads
 - 4.8 million acres trust land granted
 - 36% disposed in first 100 years
 - 8% disposed in last 40 years



BACKGROUND

The portfolio analysis project is intended to meet several of the Board's Strategic Plan objectives and builds on past portfolio presentations and initiatives.

Strategic Plan

Strategic Plan objectives (see below) include the development of portfolio management tools and the establishment of portfolio goals. Over the past 3 years, we built and improved the portfolio analysis tools and sought to identify appropriate portfolio goals.

- Strategic Objective #1.1 - *Develop a robust approach to and appropriate tools for portfolio management that create diversification and reasonable and consistent revenues over time.*
- Strategic Objective #1.2 - *Set goals for portfolio performance that will guide all portfolio recommendations brought forward by the staff for board decisions.*

DISCUSSION

Portfolio Analysis

For this analysis, we looked at portfolio characteristics and portfolio valuation and return

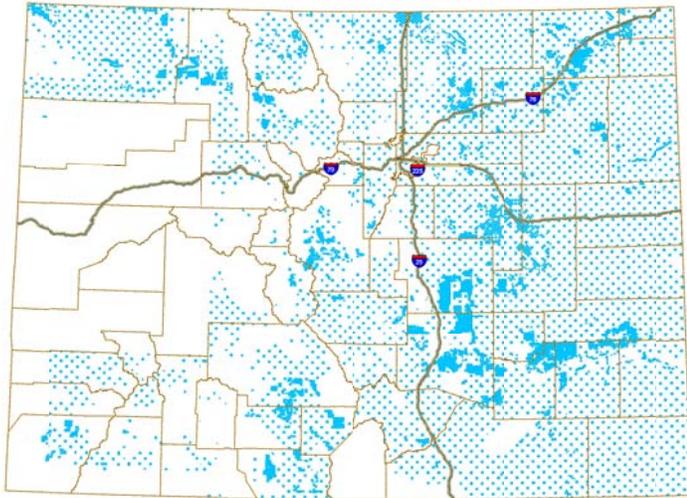
Portfolio Characteristics

While the state land board has a relatively good understanding of what it owns today, we have never had a complete picture of when and how we received these assets. Generating this picture is important for both operational needs and portfolio analysis. We learned through several Lean evaluations during FY 2012-13, that staff did not have a single source to validate and in some cases even identify exactly what we owned.

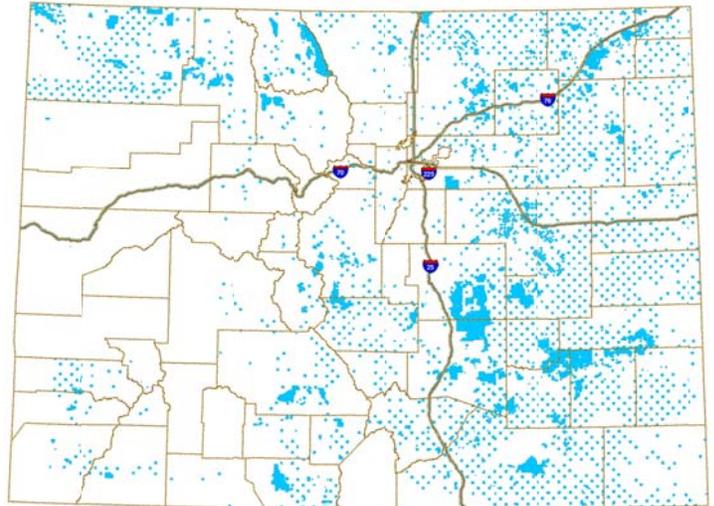
We have spent the last year developing a GIS map that holds all essential information about ownership including all the original granted land. We learned that over a third of the granted acreage was sold during the State Land Board's first 100 years and that less than ten percent has been sold since 1976.



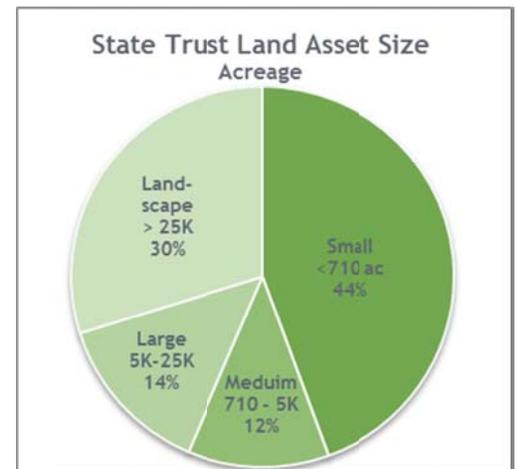
Original Federal Grants Lands



Current Trust Lands



As has been reported in other presentations, the current state trust land portfolio has a number of notable characteristics. The chart to the left shows that state trust land is weighted towards two ends of the ownership spectrum. About three-fourths of the ownership is concentrated in either small parcels (<710 acres) or very large or “landscape” parcels (>25,000 acres). Large and medium acreage properties account for only a quarter of the trust property. State Land Board field staff believe that it takes between 5,000 acres and 10,000 acres to support a family grazing operation on the Eastern Plains.



Other significant characteristics of the state trust portfolio include:

- Over 70 percent of trust land is on the Eastern Plains
- About 60 percent of trust land is adjacent to public roads
- About 30 percent (approximately 1.2 million acres) of the mineral estate is severed
- Annual trust revenues are primarily from oil and gas (82 percent in FY 2014-15)

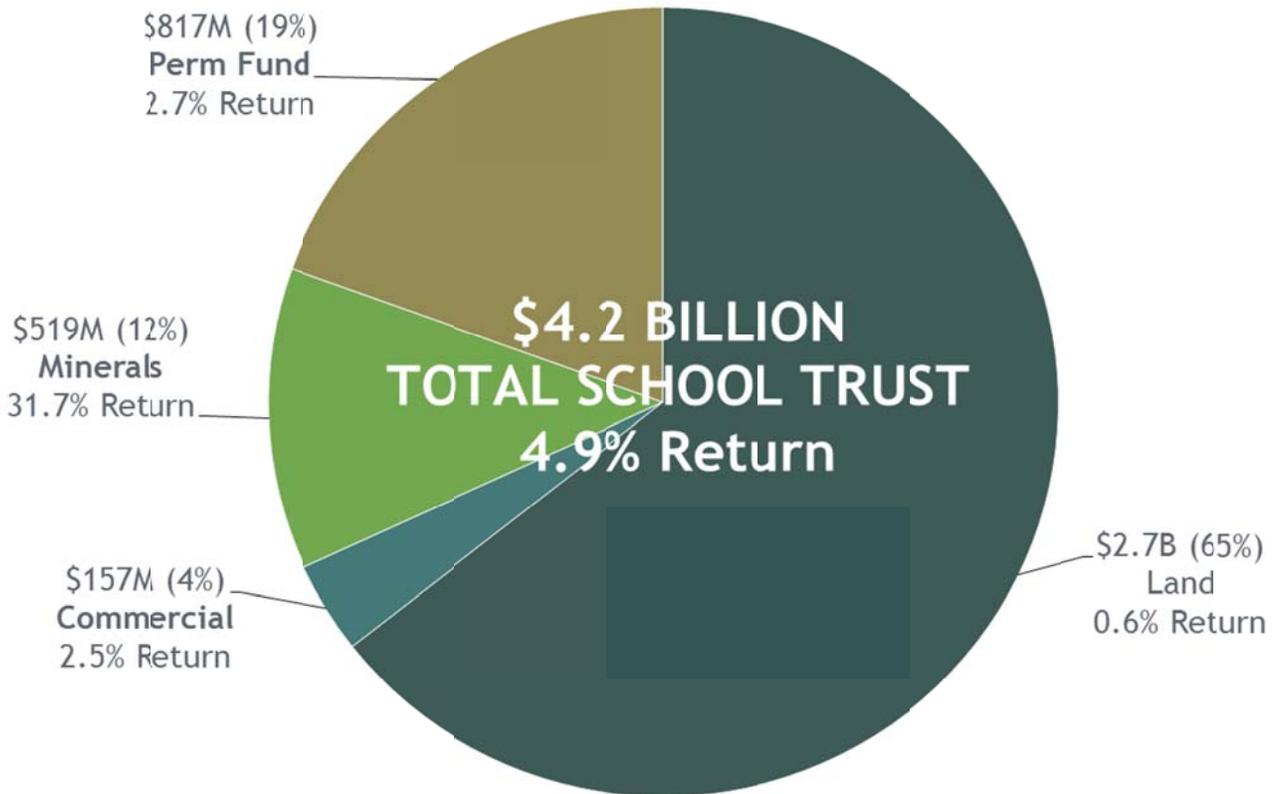


Current Market Valuation and Return

The 2015 baseline value estimate for state trust assets is \$ billion. Land is the largest component at \$2.7 billion or 65% of total value. School Trust mineral value is estimated at \$519 million or 12% of total value. Commercial properties are estimated to be \$157 million or 4% of the total value. The Permanent Fund at \$817 million accounts for the remaining 19% of total trust value.

School Trust Estimated Value and Returns 2015

Category	Valuation	Revenue (excl. NSE & interest)	Income Return (1yr)
Land (include commercial)	\$2.7 billion	\$16 million	0.6%
Minerals	\$519 million	\$165 million	31.7%
Commercial	\$157 million	\$4 million	2.5%
Cash (Perm Fund)	\$817 million	\$22 million	2.7%
TOTAL SCHOOL TRUST	\$4.2 billion	\$207 million	4.9%



As of June 30, 2015



Valuation Methodology

We identified six asset classes for portfolio valuation; land, oil, gas, bonus, other mineral, and commercial. While there are numerous methodologies for asset valuation, we focused on three:

1. *Market/Comparable Sales*: Estimating value of an asset compared to similar assets that have been sold. This was used for the land valuation.
2. *Intrinsic Valuation*: Estimating value of an asset based on the present value of expected future cash flows. The most common intrinsic valuation approach is discounted cash flow (DCF). This was used for the mineral valuation.
3. *Income (Capitalization) Approach*: Estimating value of an asset based on “capitalizing” the current year’s net operating income (gross revenue minus operating expenses). The Cap Rate serves as a proxy for risk and reasonable return. This was the approach used for commercial asset valuation.

Land Valuation

The School Trust land valuation is based on market sales comparable approach. The land valuation model utilizes the Ranchland sales database and GIS. The Ranchland sales database contains more than 30,000 property sales transactions (some dating back 15 years) for most Colorado counties. The transactions are gathered from county assessors, cleaned and when appropriate, aggregated.

The sales transactions are mapped using each transaction’s legal description or other mappable data (e.g. GIS layer, physical address, etc.) and we create a township-based average per acre sale price (see below) using a 3 years average sales price. The township per acre value was used to establish the value of the trust land within the township.

Following the Great Recession, Colorado experienced a significant increase in land values. The average price per acre for vacant sales in Colorado grew from \$ in 2012 to \$y in 2014. This sustained increase drove a double digit increase in the 3 year rolling average that we use to generate the School Trust land valuation. The average per acre vacant land sales from 2011 to 2013 was \$1429 and from 2012 to 2014 was \$1599 or about 12% higher. One major factor was a sudden rise in the average vacant land sales between 2013 and 2014.

The following assumptions were used for the land valuation model:

- All sales of vacant land that have occurred between January 2012-December 2014
- Sales over 100 acres
- Price per acre for transactions are between \$50-\$10,000/acre
- Average price per acre for township-range



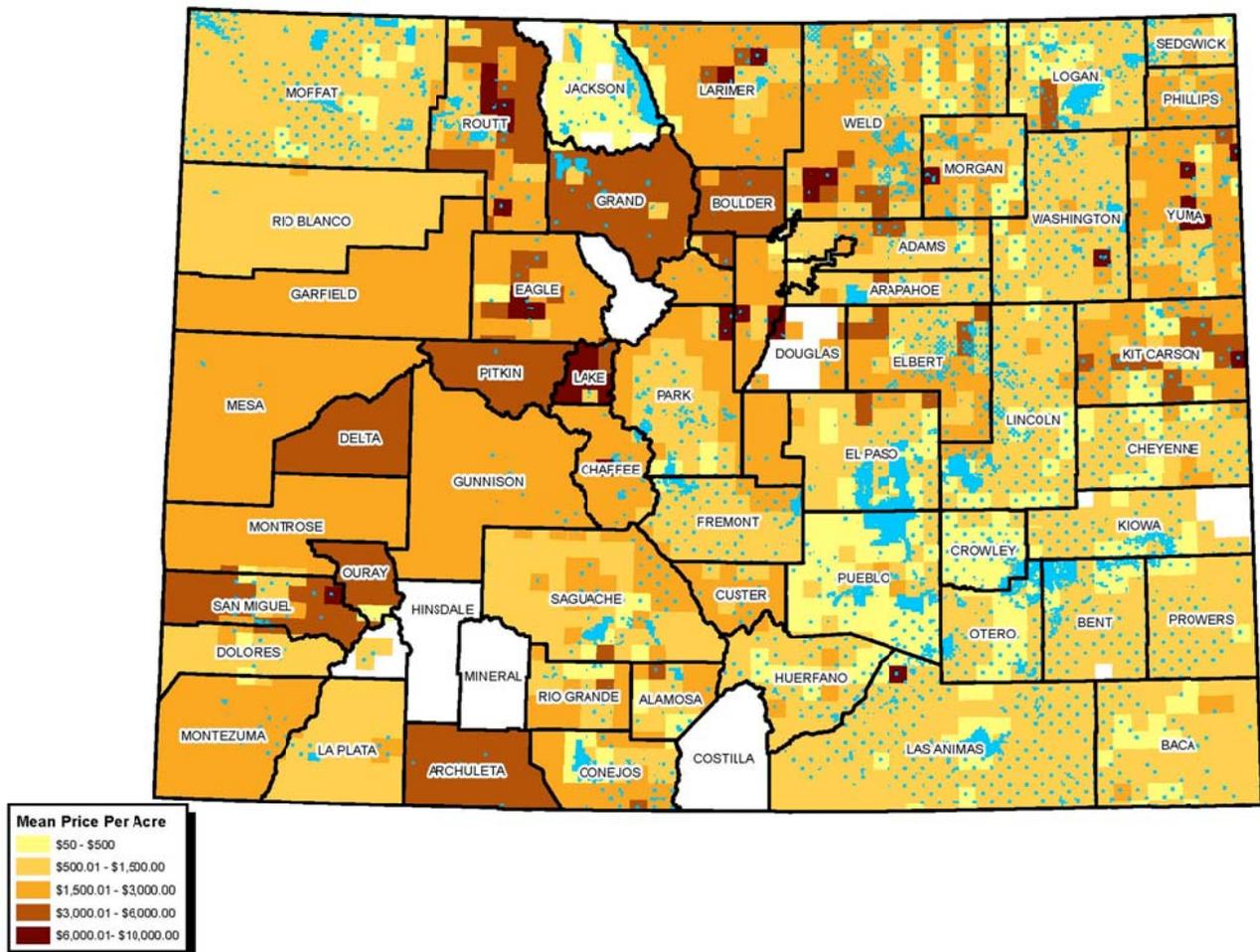
Exhibit 1 - School Trust Portfolio Valuation - Updated for 2015

- If no sales exist within a specific township-range, used county average
- If no sales exist within a specific township-range and county, developed estimate
- All landscape parcels (>25,000 acre) were valued between \$100 to \$500 per acre.

Based on the assumptions listed above, the 2015 land valuation is based on about 1,800 “comparable” sales as well as the independent \$/acre values on the landscape parcels. These sales occurred across the state. However, there are certain areas where there were no sales or has limited sales during the past three years. The number of comparable sales and their location is certainly a limitation of this model.

Estimated land value ≈ \$2.7 billion

Township Valuation Estimate 2015



Mineral Valuation

The School Trust mineral valuation was based on the discounted value of future cash flows from producing or “proven” reserves. Except for the lease bonus value, the valuation model does not attempt to capture unproven reserves or resource potential. The mineral valuation includes four different subclasses: oil, gas, bonus, and other mineral.

1. Oil Valuation

We utilized the discounted cash flow (DCF) valuation method for the oil valuation, which included both vertical oil production and horizontal oil production. Vertical production uses a 10 year DCF model and the horizontal production valuation utilized data from existing horizontal wells to determine initial production figures and build an average decline curve for new wells.

The following assumptions were used in the vertical oil valuation model:

- 158,000 barrels of oil from vertical production
- 1% decline each year
- Oil price = \$35
- 9% discount rate
- 10 Year cash flow
- Terminal value = Year 11 cash flow/ discount rate (perpetuity formula)
- Vertical Estimated Value ≈ \$56 million

The following assumptions were used in the horizontal oil valuation model:

- Initial production 10,000 bbls.
- Decline curve - Based on historical average monthly well production
- Oil price - \$35
- 8.0 % decimal interest
- 9% discount rate
- Well starts:
 - 2014 - 180
 - 2015 - 173
 - 2016 - 82
 - 2017 - 75
 - 2018 - 43
- 3 year decline curve
- Terminal value is 150 bbls. monthly production
- Horizontal Production Estimate ≈ \$102 million

Estimated oil value ≈ \$158 million



2. Gas Valuation

Valuing gas is more complex than oil because gas contains a number of individual marketable products (e.g. reservoir gas, liquids, etc) with individual production amounts. Moreover, the State Land Board only began regularly tracking this information on July 1st. 2014.

Until there is sufficient data, the gas valuation model uses an approach that includes 10 year DCF model, gas income valuation multiple, and a comparison to oil valuation in order to arrive at estimated value.

The following assumptions were used in the gas valuation model:

- Normalized 5 year historic gas cash flow
- 9.0% discount rate
- 10 year DCF model
- Perpetuity formula at terminal value

Estimated gas value ≈ \$205 million

3. Bonus Valuation

The bonus valuation is based on projected bonus revenue after July 1, 2015. The bonus valuation is comprised of the bonus revenue received from quarterly auctions as well as the bonus received from both Lowry Ranch and 70 Ranch.

The following assumptions were used in the standard bonus valuation model:

- Terminal Value forecasted based on FY 2015-16 projected revenue
- Discount rate is 15% due to highly volatile revenue stream
- Perpetuity formula for terminal value
- Auction Bonus ≈ \$51 million

The following assumptions were used in the Lowry/70 Ranch Bonus valuation model:

- Actual bonus revenue anticipated
- Discount Rate = 3.0%
- Lowry/70 Ranch ≈ \$49 million

Estimated bonus value ≈ \$100 million



4. Other Minerals

The valuation of other mineral revenues is based on a 10 DCF year model.

The following important assumptions were used in the other mineral valuation model:

- Normalized 5 year historic cash flow
- 10 year DCF model
- 10% discount rate
- Perpetuity formula at terminal value
- Coal valued independently at \$9 million

Estimated other mineral value ≈ \$56 million

Commercial Valuation

The value of a commercial real estate investment is directly related to the investment’s ability to produce an “acceptable return.” While there are a variety of ways to determine the acceptable return, one of the most common methods for valuing investments in real estate is the income (capitalization) approach.

There are three ways in which capitalization rates are generally established. One is to use the average capitalization rate of similar properties that have sold recently. The second is to use surveys to obtain an estimate of the cap rates used by other real estate investors. The third is to estimate the cap rate from a discounted cash flow model. We used an industry-average cap rate to estimate the value of the State Land Board commercial assets.

The following assumptions were used in the commercial real estate valuation model:

- Cap Rate of 8.0%
- Next year’s forecasted operating earnings

Estimated value of income properties ≈ \$52 million

The State Land Board also owns commercial properties that have value but are currently not producing significant revenue. These properties were valued using the most recent appraisals, comps, or market established price per square foot to come up with the estimated value.

Estimated value of other commercial properties ≈ \$105 million

Estimated commercial value ≈ \$157 million

	value
Arista	\$1,500,000
Erie	\$14,700,000
48th and Tower	\$9,500,000
Arvada Ridge	\$7,800,000
Berthoud	\$3,000,000
6th and Kipling	\$5,000,000
Dowd Junction	\$20,000,000
Granby	\$2,500,000
EBY	\$2,500,000
Sherman Building	\$2,200,000
Arapahoe Square	\$12,000,000
Arrowhead	\$12,000,000
Centennial	\$12,800,000
Total Non-income	\$105,500,000



Exhibit 1 - School Trust Portfolio Valuation - Updated for 2015

Scenario Analysis - Oil Value

- Table 1 represents a constant 9.00 discount rate but with changing initial production and/or oil price.
- Table 2 represents a constant \$35 price of oil but with changing discount rate and/or initial production.

		OIL VALUE				
		Average Initial Monthly Production				
		9,000	9,500	10,000	10,500	11,000
	\$25.00	\$108,086,543	\$110,516,813	\$112,947,083	\$115,377,353	\$117,807,623
	\$30.00	\$129,703,863	\$132,620,188	\$135,536,512	\$138,452,836	\$141,369,160
Oil Price	\$35.00	\$151,321,184	\$154,723,562	\$158,125,940	\$161,528,318	\$164,930,696
	\$40.00	\$172,938,504	\$176,826,936	\$180,715,368	\$184,603,801	\$188,492,233
	\$60.00	\$259,407,786	\$265,240,434	\$271,073,082	\$276,905,730	\$282,738,379
	\$85.00	\$367,494,387	\$375,757,306	\$384,020,224	\$392,283,142	\$400,546,061
		OIL VALUE				
		Average Initial Monthly Production				
		9,000	9,500	10,000	10,500	11,000
	6.00%	\$201,156,250	\$204,711,266	\$208,266,282	\$211,821,299	\$215,376,315
	7.00%	\$179,967,191	\$183,469,685	\$186,972,180	\$190,474,674	\$193,977,168
Discount Rate	8.00%	\$163,926,921	\$167,378,560	\$170,830,200	\$174,281,839	\$177,733,479
	9.00%	\$151,321,184	\$154,723,562	\$158,125,940	\$161,528,318	\$164,930,696
	10.00%	\$141,121,848	\$144,476,489	\$147,831,129	\$151,185,769	\$154,540,410
	11.00%	\$132,674,938	\$135,983,299	\$139,291,659	\$142,600,020	\$145,908,380

