Factors affecting land use choices and agronomic practices: Agri-environmental policy design and evaluation

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Canadian agri-environmental policy

Direct regulation

- Livestock barn setback restrictions
- Nutrient management restrictions

“Subsidized” conservation

- Payments to maintain current conservation activity
  - Conservation easements
  - Early ALUS programming (in Manitoba)
- Cost share payments for adoption of beneficial management practices

Subsidized conservation

Private landowners cannot extract social value from conservation

Conservation on privately-owned land

- Conservation practitioners cannot be dictated unilaterally
- Coordination of individual landowners is challenging

Subsidized conservation programs are voluntary

- Producers agree to enter into conservation agreements
- Producers choose to participate in cost-share BMP programs

Design challenges in subsidized conservation

1. Targeting:
   - Maximize the benefit/cost of conservation investment

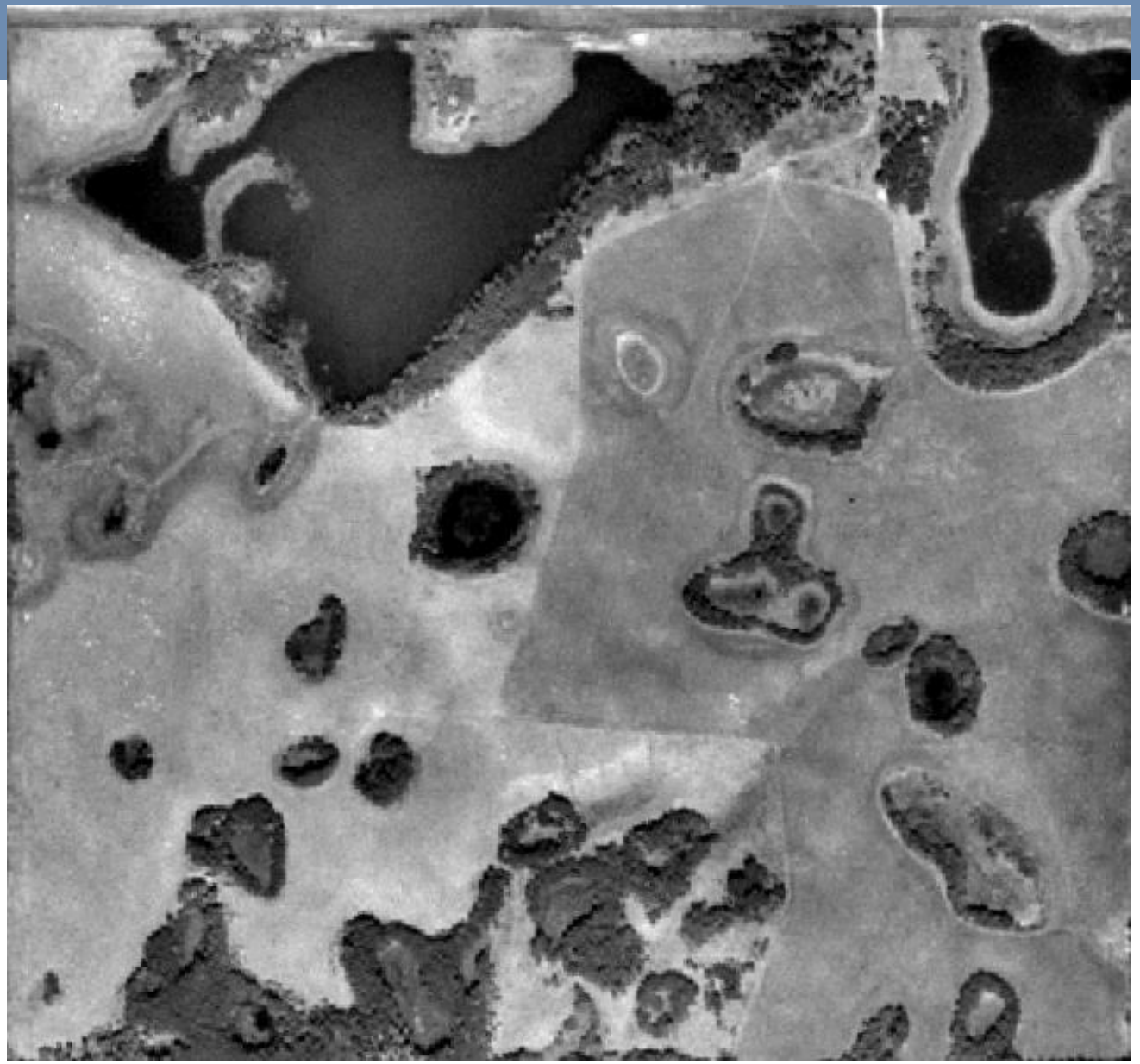
2. Additionality
   - How much conservation would have occurred without the program?

3. Slippage:
   - New activity induced by conservation counteracts intended outcomes

Incentives for land use change

- Returns to crop production, relative to livestock production
- Improved crop productivity
- Climate change
- Subsidized crop insurance
- Adoption of larger machinery

1990



2006

1990

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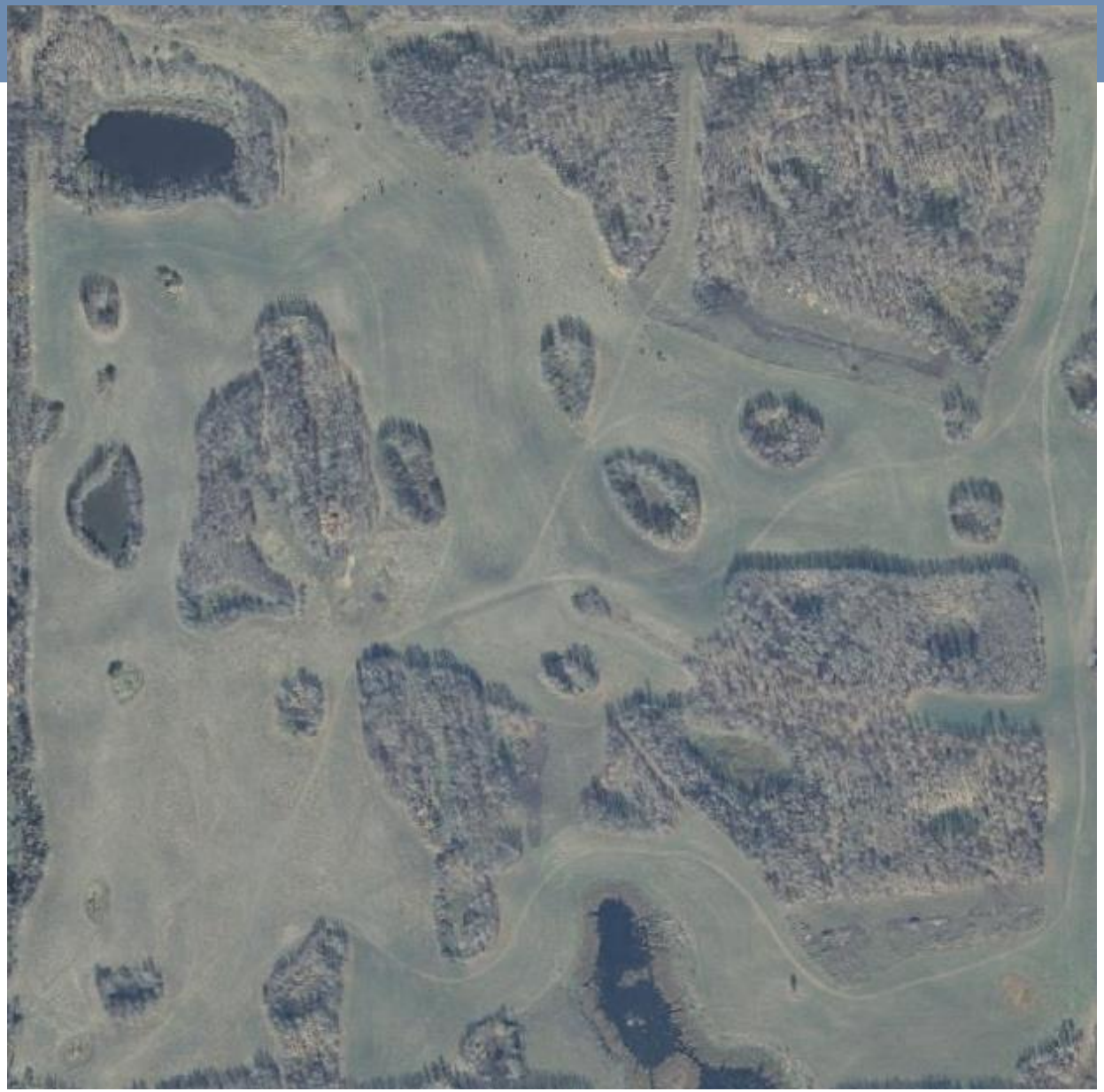

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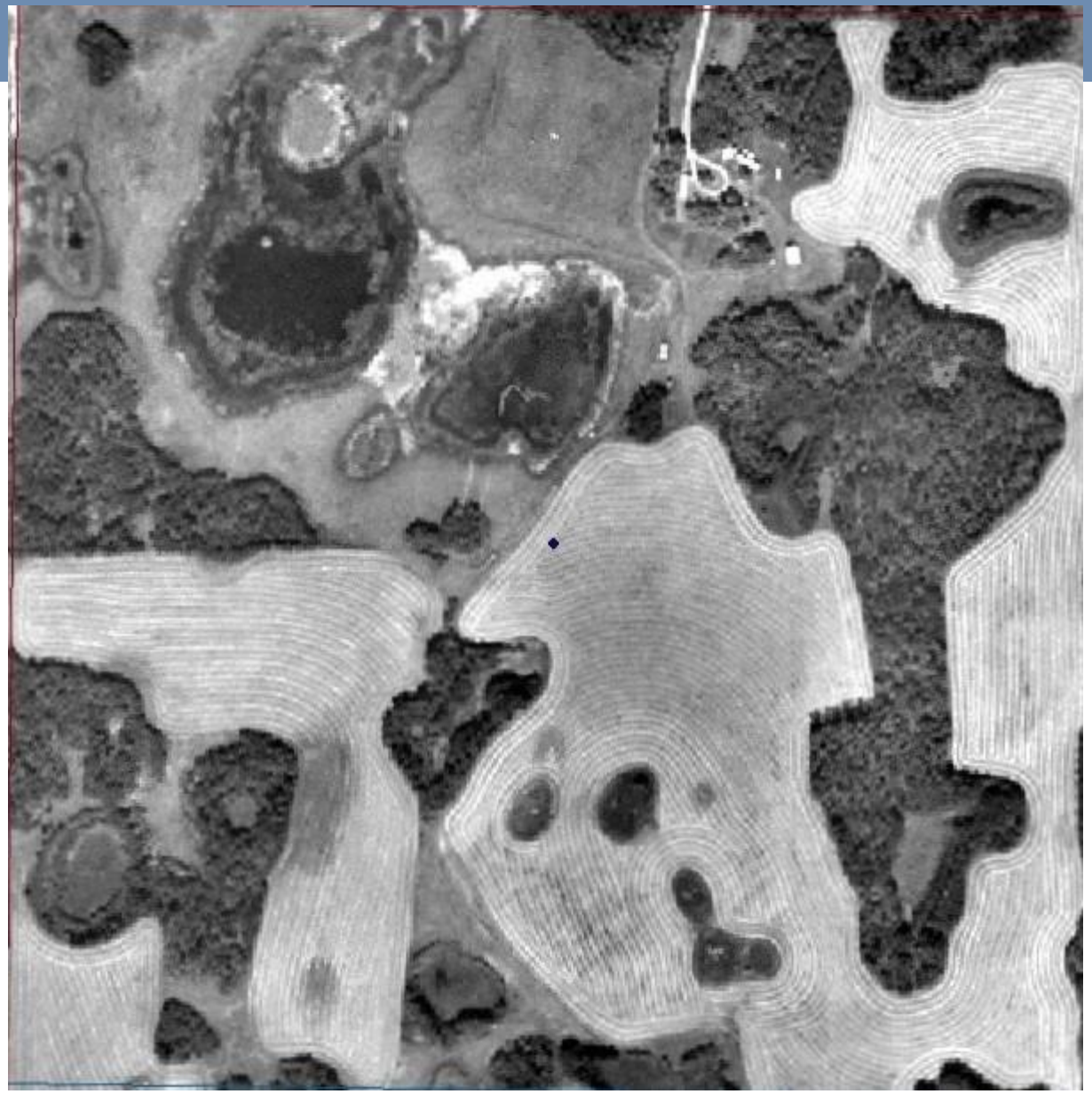

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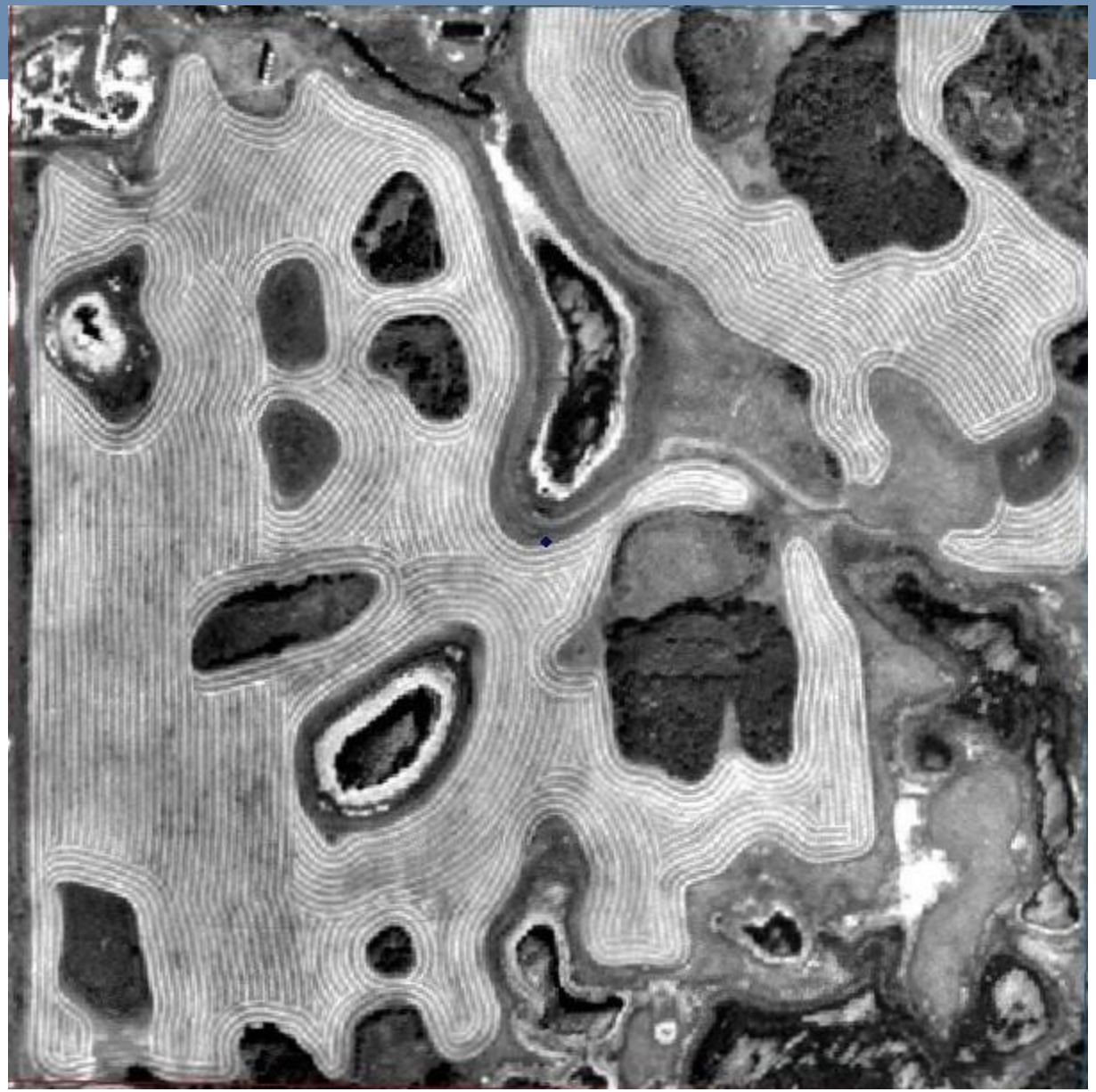

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Incentives for land use change

- Returns to crop production, relative to livestock production
- Improved crop productivity
- Climate change
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How can we quantify changes in incentives for land use change?

- Look at the impact of less desirable land uses on agricultural land values

Changes in Implicit Prices of Prairie Pothole Habitat

Chad Lawley

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I estimate changes in agricultural land value discounts due to prairie pothole habitat. The implicit prices of pothole habitat acreage are estimated from a series of hedonic models using Manitoba agricultural land transaction data from 1990 to 2009. I find that the discount on wetland acreage increased by at least 40%, suggesting that significant unanticipated increases in the benefits of converting wetlands emerged over the course of the study period. I also estimate a series of quantile regression hedonic models. The quantile regression models indicate that the land value discounts on prairie pothole acreage as a percent of per acre sales prices are constant across the land value distribution. These results have implications for the design of habitat conservation programs, particularly those involving long-term agreements between landowners and conservation agencies.

Estimated discounts due to non-cropland acreage

Table 3. Semi-log least squares hedonic model

	1990–93		1994–97		1998–01		2002–05		2006–09	
	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.	Coef.	Std. Err.
Wetland	−0.0105	0.0011***	−0.0105	0.0011***	−0.0115	0.0014***	−0.0115	0.0021***	−0.0146	0.0016***
Bush/pasture	−0.0084	0.0013***	−0.0075	0.0014***	−0.0076	0.0013***	−0.0085	0.0008***	−0.0090	0.0011***
Native hay	−0.0059	0.0013***	−0.0060	0.0009***	−0.0048	0.0008***	−0.0067	0.0011***	−0.0076	0.0009***
Other acreage	−0.0049	0.0015**	−0.0048	0.0015**	−0.0037	0.0011**	−0.0065	0.0021**	−0.0082	0.0037*
High prod soil	0.0046	0.0010***	0.0044	0.0007***	0.0043	0.0013**	0.0041	0.0010***	0.0037	0.0013**
Med prod soil	0.0025	0.0004***	0.0021	0.0005***	0.0026	0.0009**	0.0017	0.0006**	0.0017	0.0007**
Mean latitude	−0.0022	0.0009**	−0.0017	0.0009*	−0.0009	0.0009	−0.0006	0.0008	0.0004	0.0010
Mean longitude	−0.0022	0.0019	−0.0013	0.0017	−0.0008	0.0024	−0.0003	0.0022	0.0022	0.0029
log(dist to elevator)	−13.68	82.24	18.76	33.20	17.58	42.19	12.12	62.97	29.74	64.44
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log(elevation)	0.3996	0.2777	0.3706	0.2254	0.1842	0.2260	0.3174	0.2130	0.3791	0.3923
Total sale acres	−0.0002	0.0001**	−0.0003	0.0001***	−0.0002	0.0001**	−0.0002	0.0001**	−0.0002	0.0001***
R^2	0.51		0.48		0.43		0.51		0.56	
Observations	2,471		2,609		2,044		1,987		1,791	

Notes: Coefficients are from an ordinary least squares regression where the dependent variable is the logarithm of the per acre sales price (2002 CAD) and additional independent variables include MASC risk zone dummy variables and year dummy variables. Robust standard errors adjusted for clustering by MASC risk zones are reported. The symbols *, **, and *** on the standard errors indicate that the coefficient is statistically different from 0 at the 10, 5, and 1% level, respectively.

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An increase in the share of the parcel in wetland reduces land sale price by 1%

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Changes in land value discounts

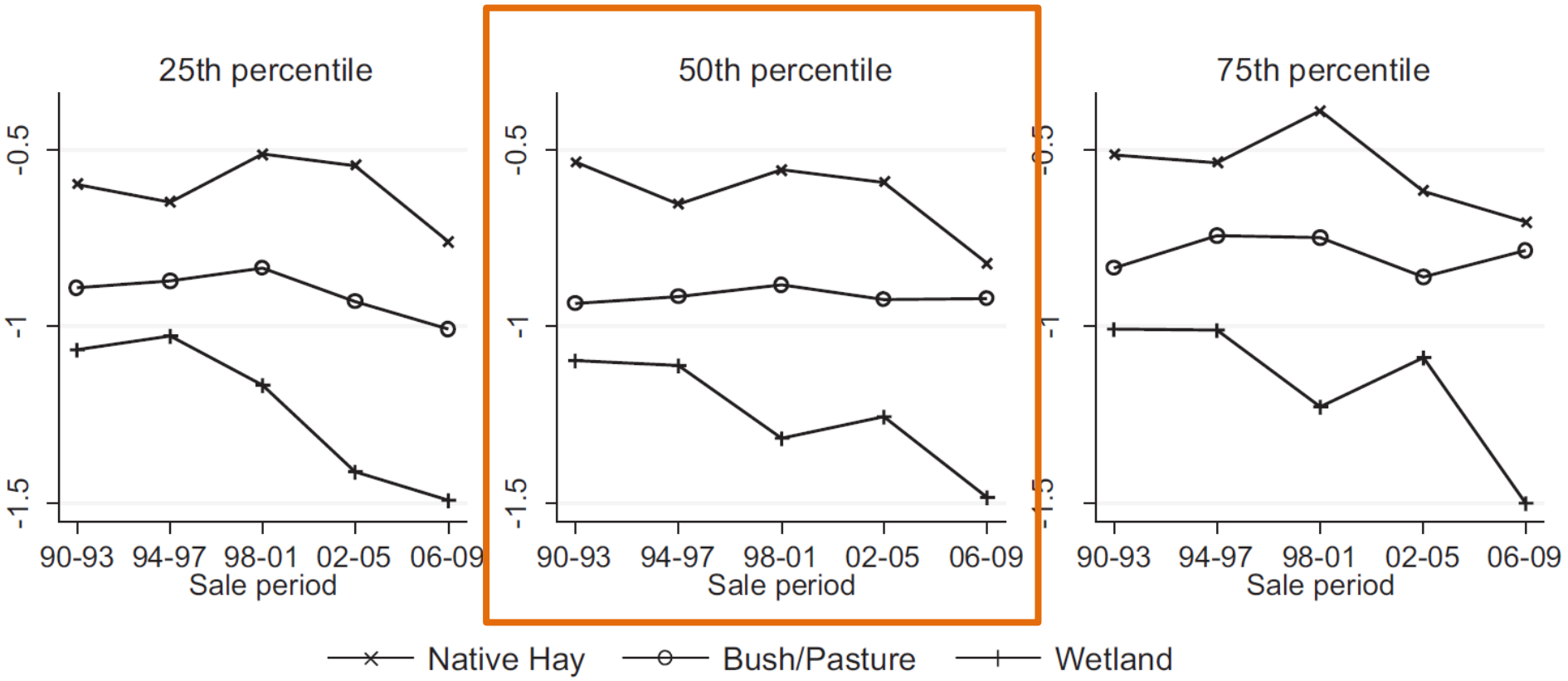

Figure 3. Semi-log quantile regression estimates of habitat discounts

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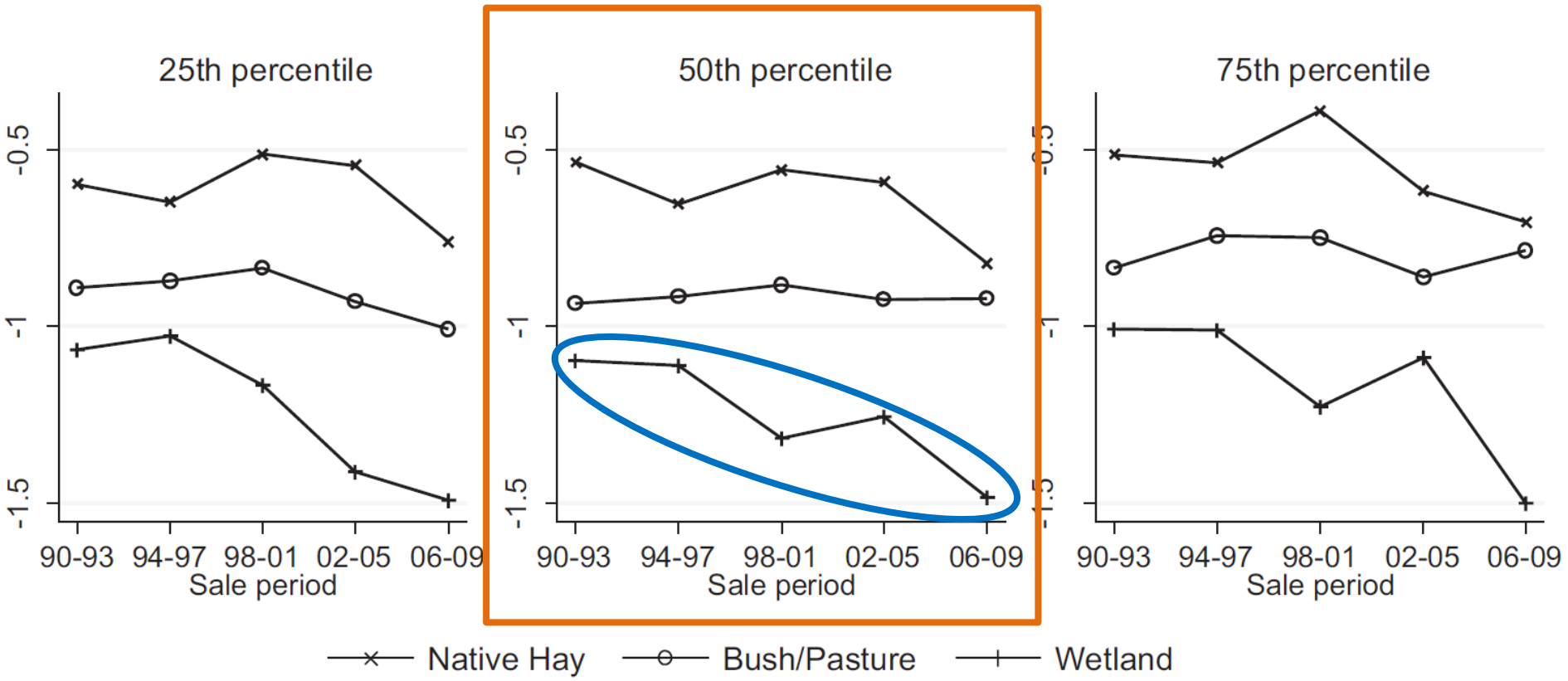

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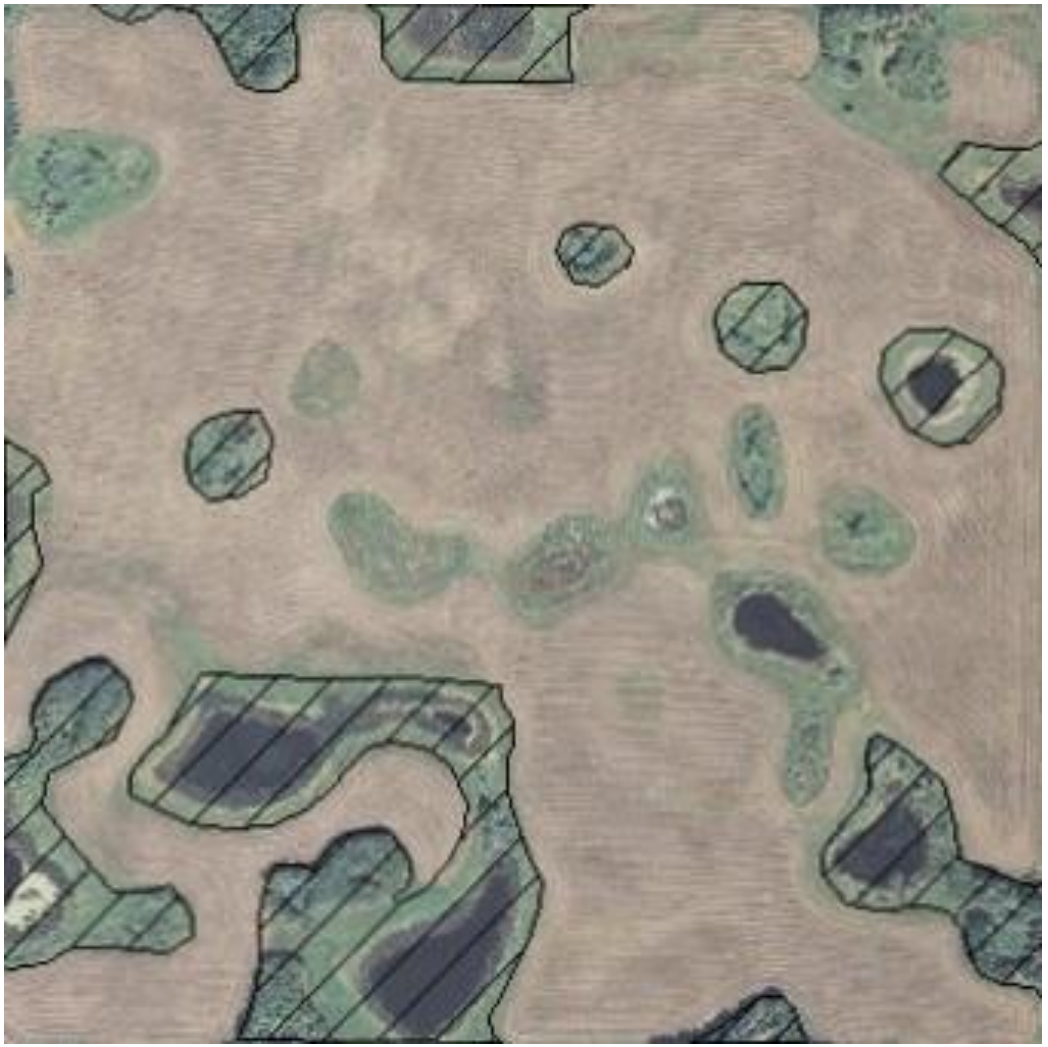
Conservation easements

Conservation easements on wetlands/upland habitat

- Agreement between landowner and conservation agency
- One time payment to maintain existing habitat
- Easement follows land title in perpetuity
- Agencies monitor and enforce easements

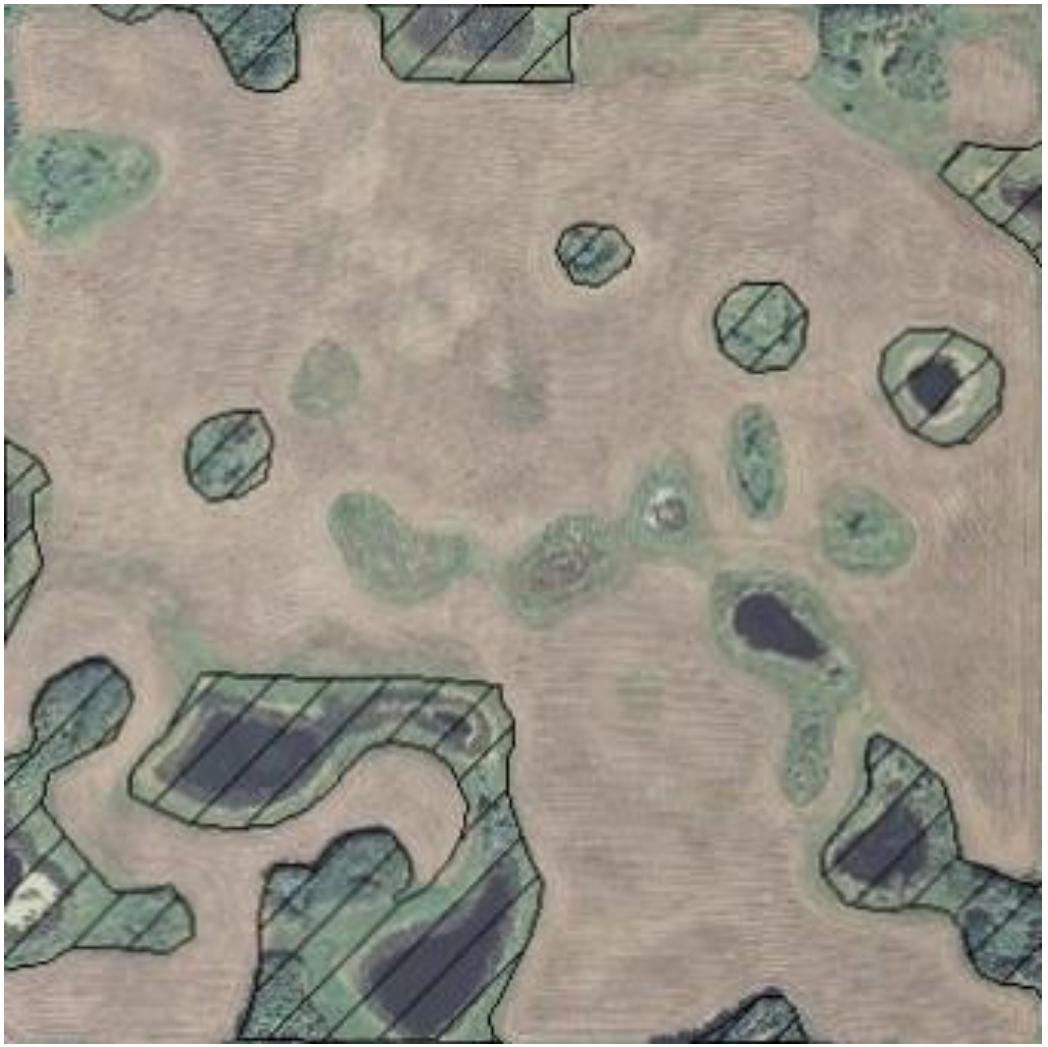


Source: Manitoba Habitat Heritage Corporation
http://www.mhhc.mb.ca/learn_more/what-is-a-conservation-agreement

Habitat conservation easements and additionality

Would this habitat be converted without the conservation easement?

“Additionality”



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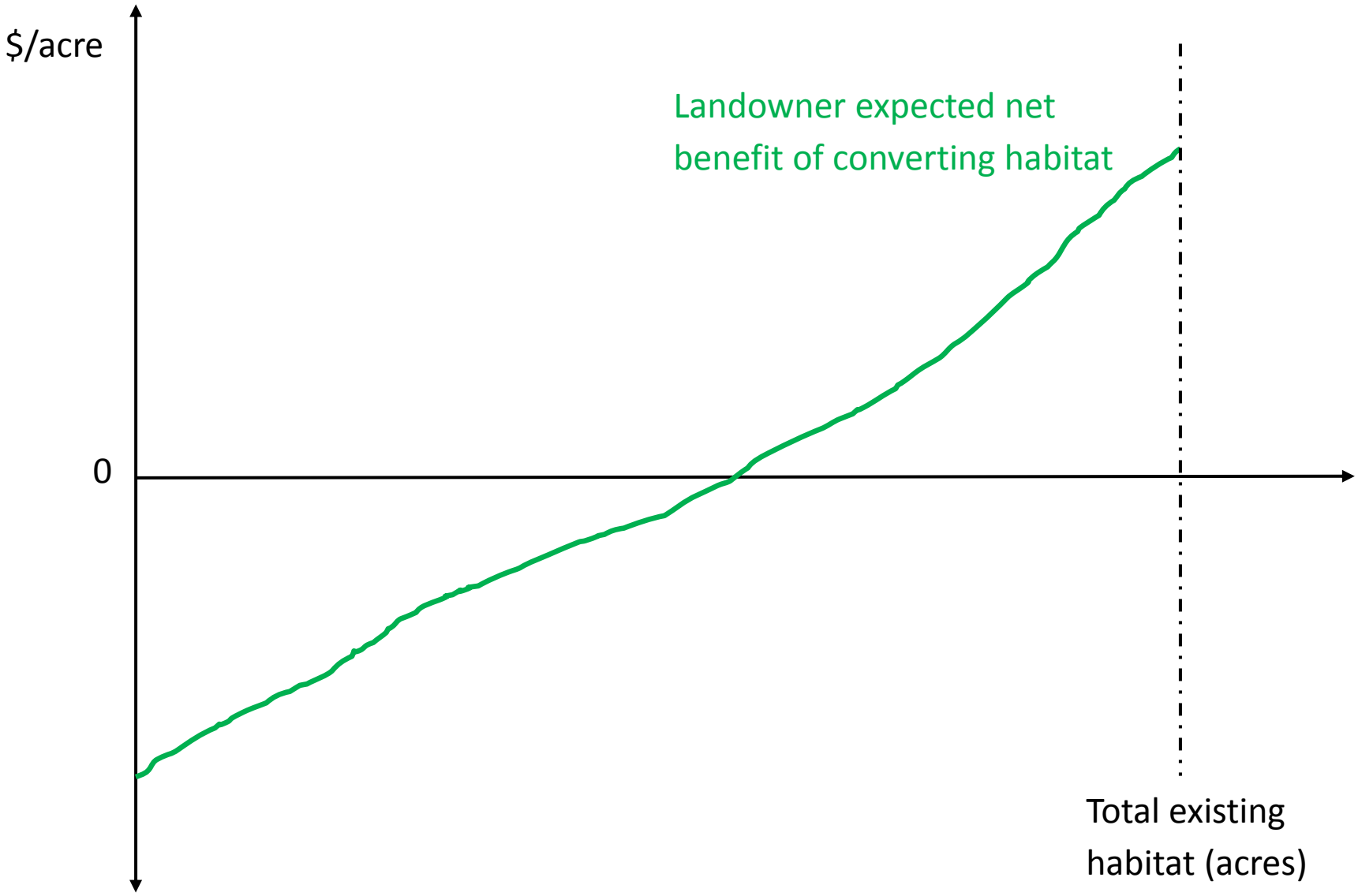
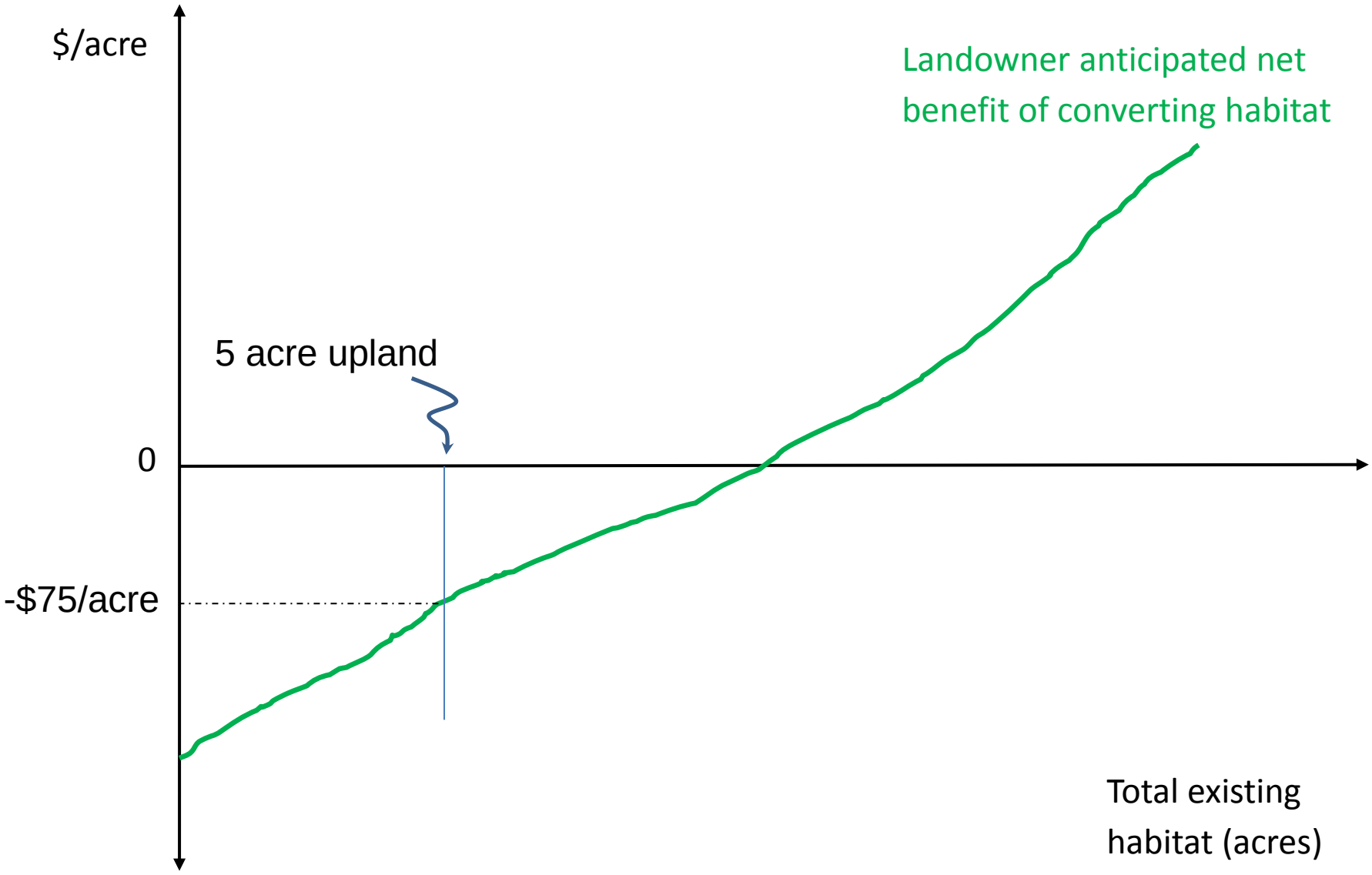
Landowner benefits and costs



Landowner benefits and costs



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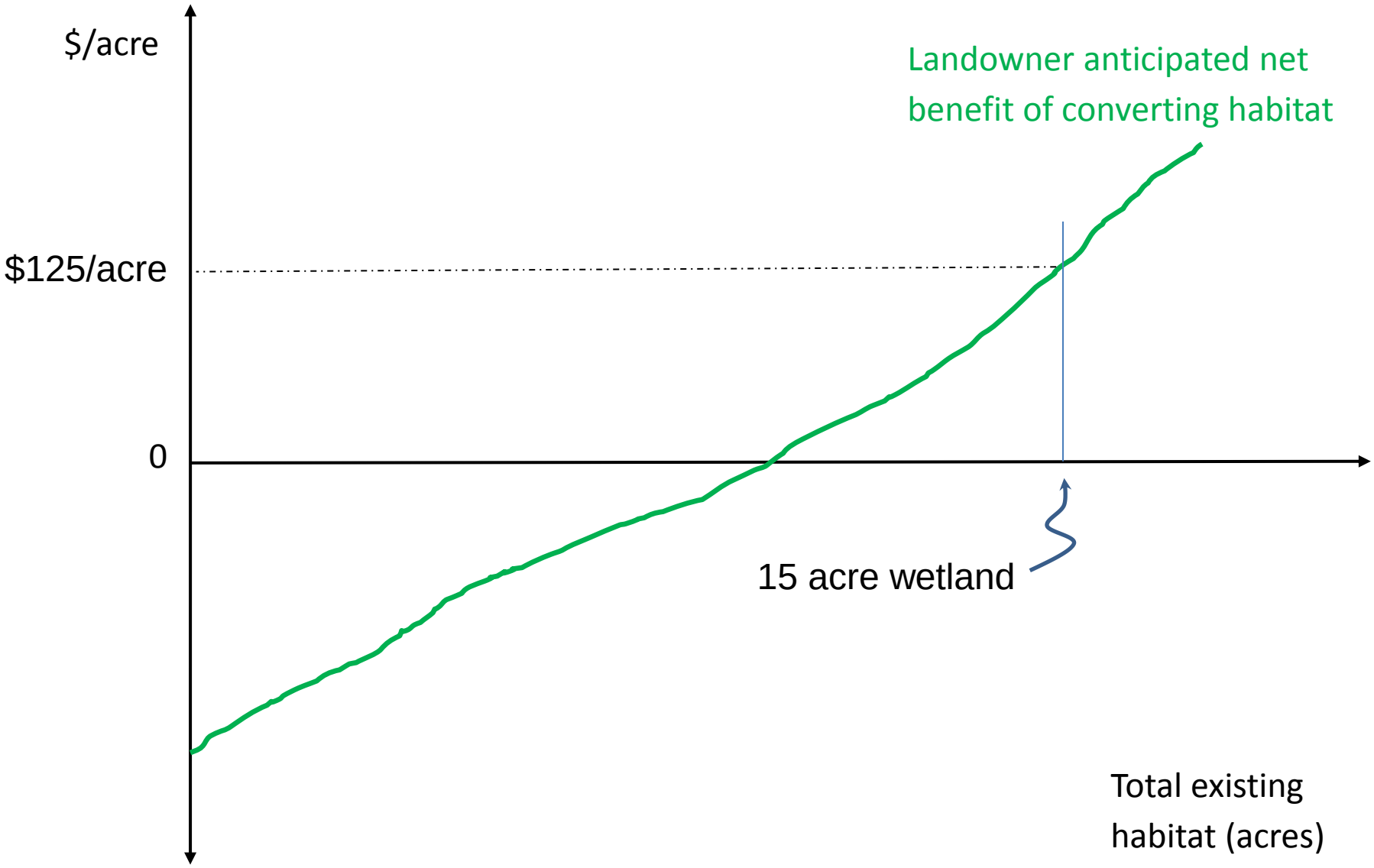
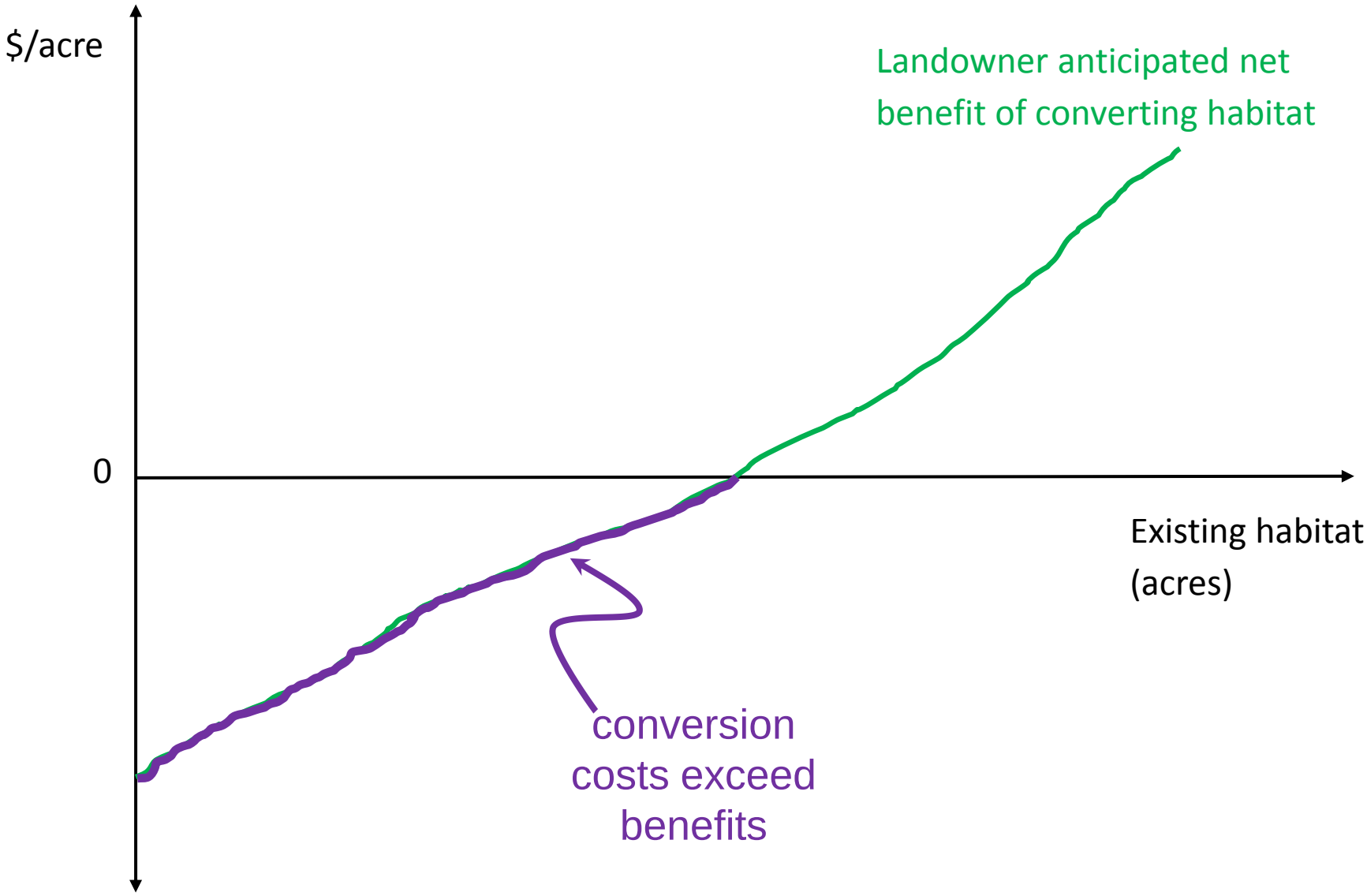
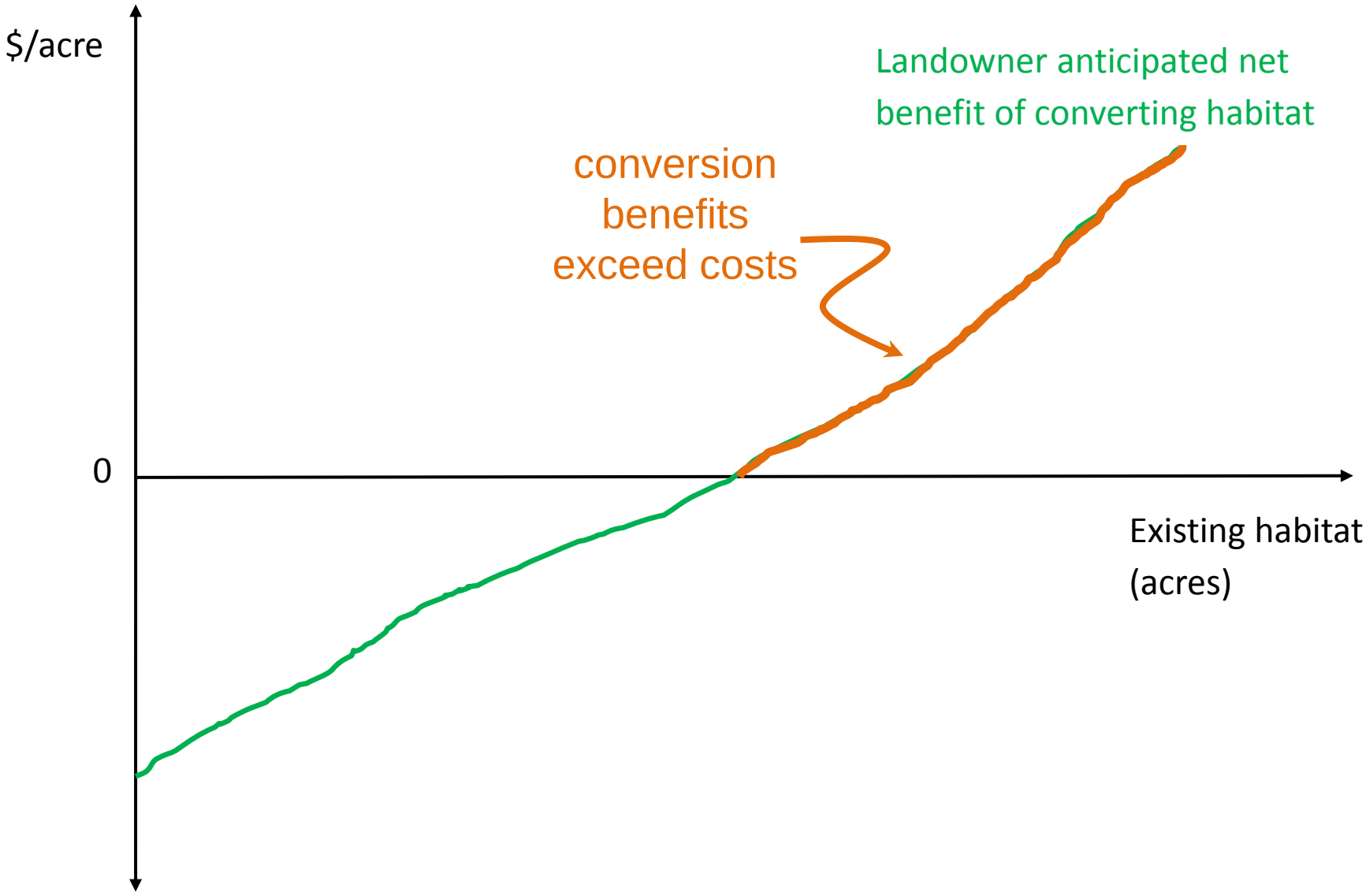


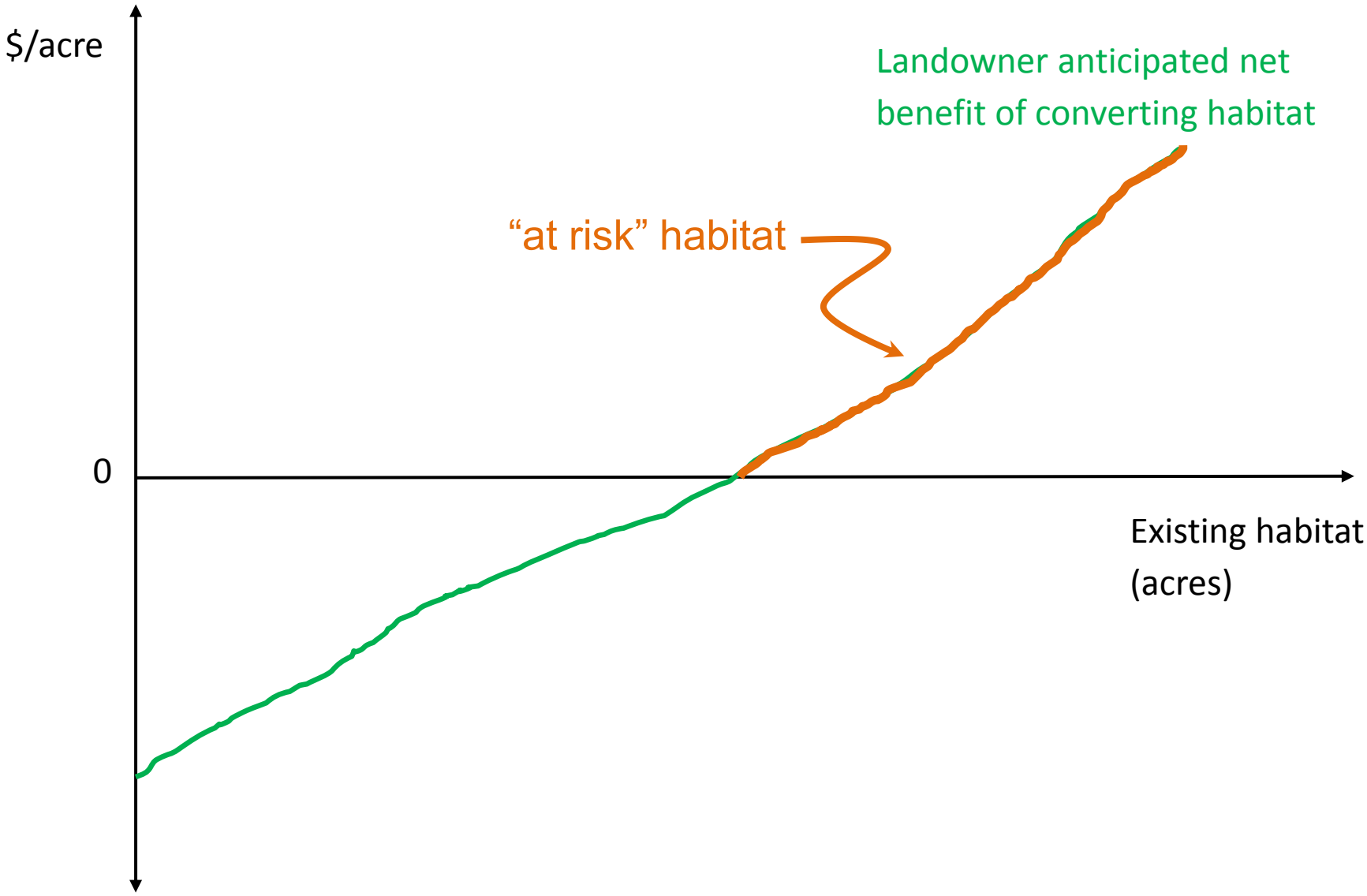
Landowner benefits and costs



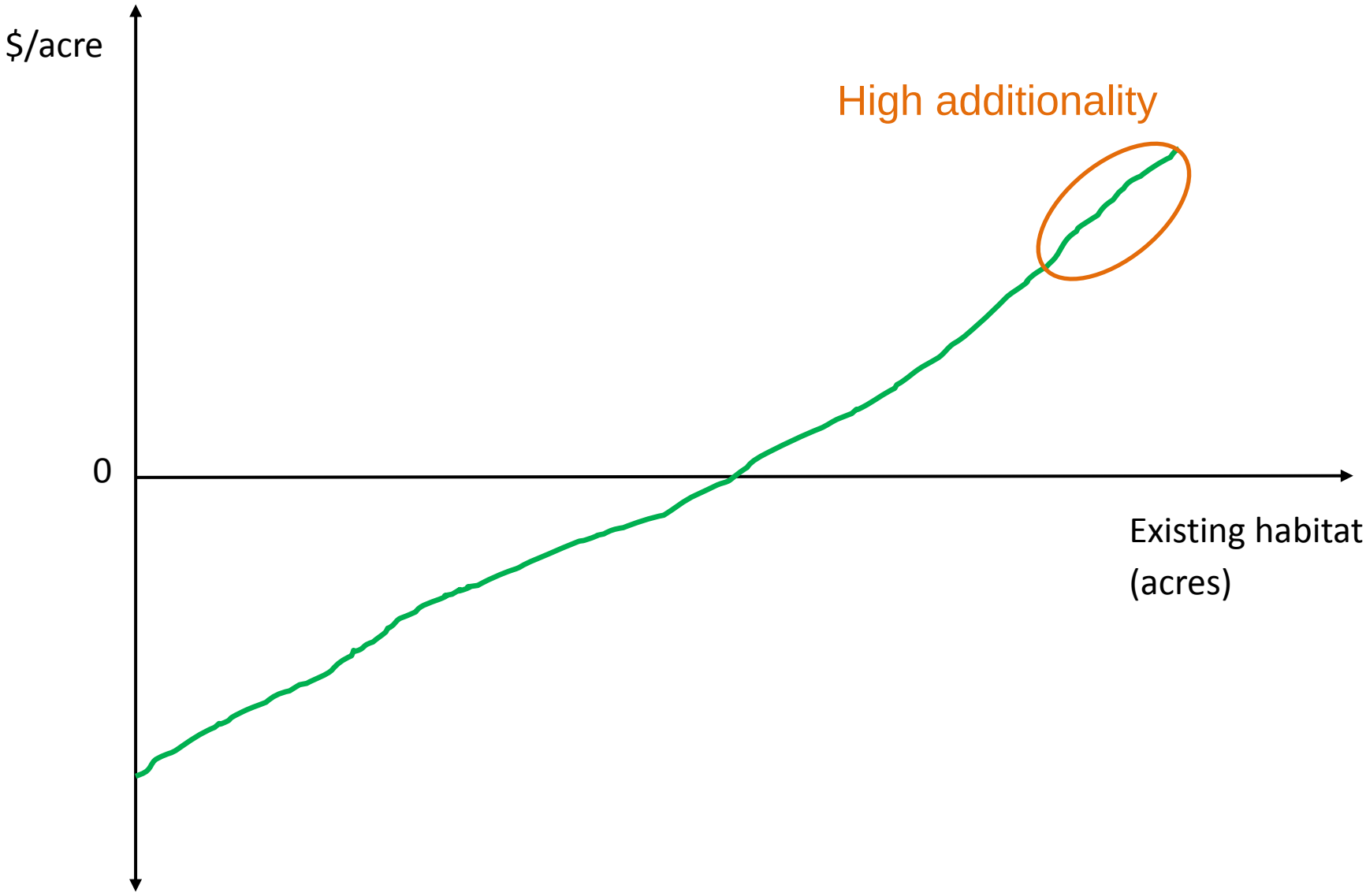
Landowner benefits and costs



Landowner benefits and costs



Additionality



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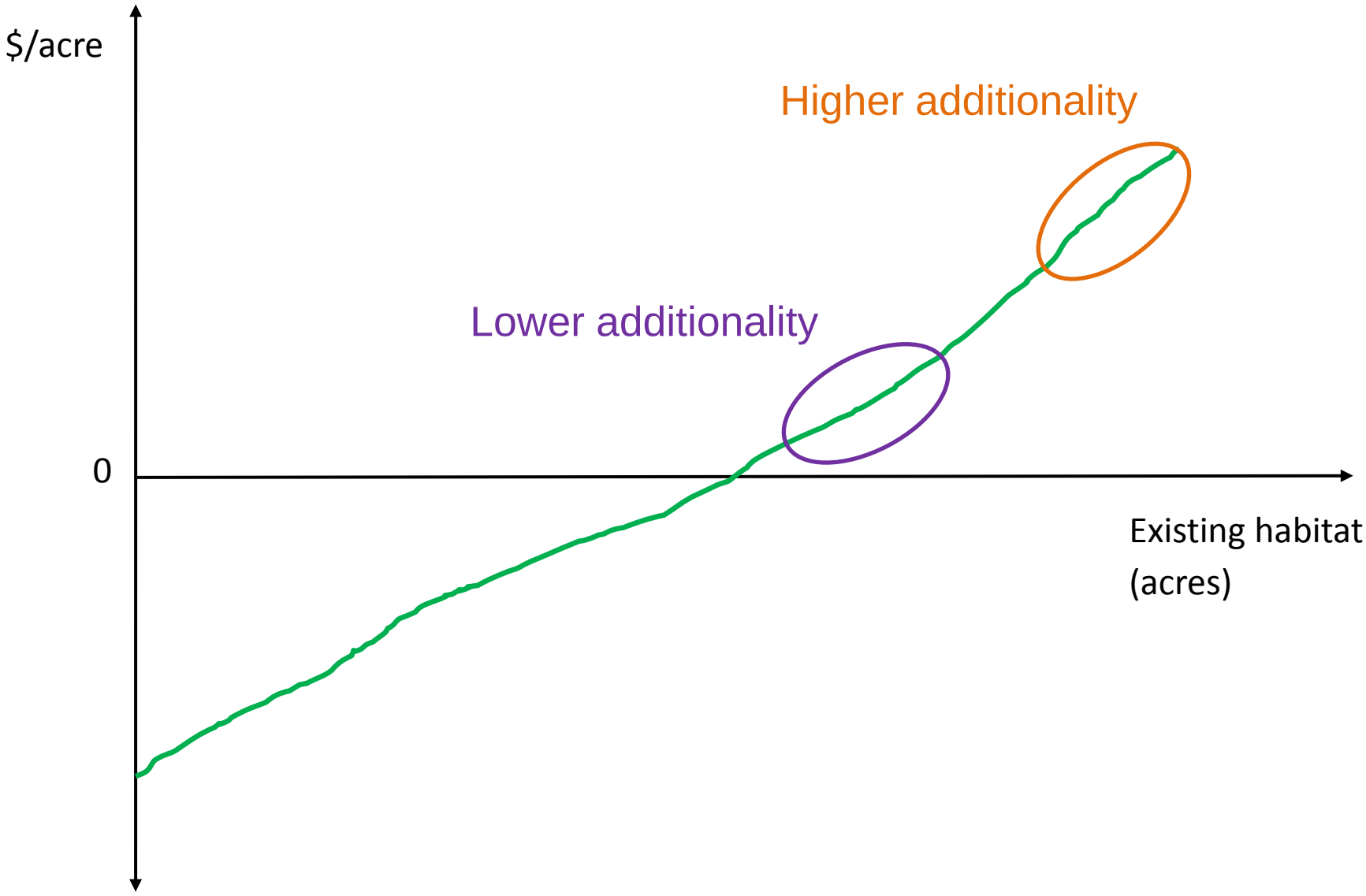
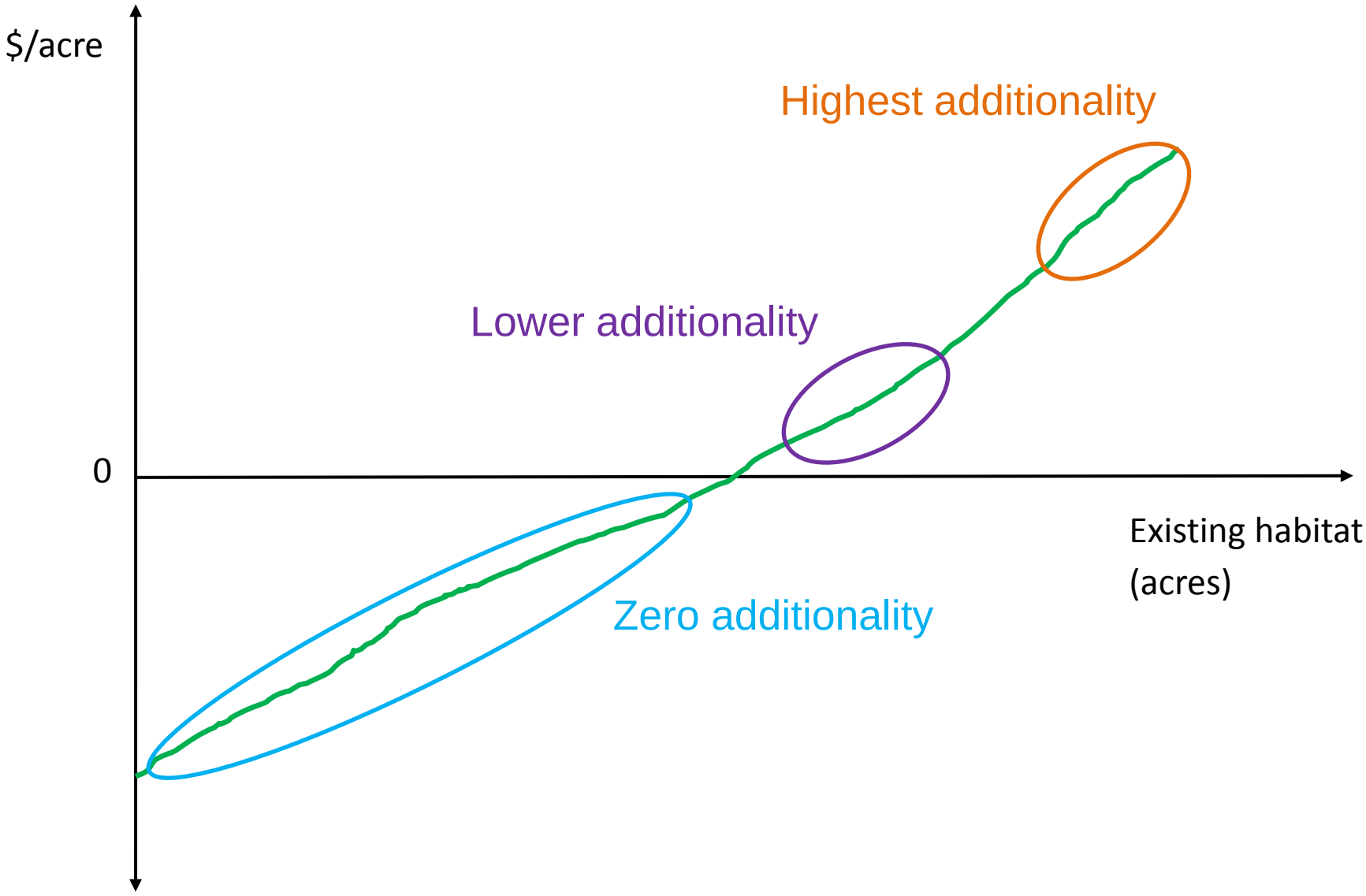


Additionality



Capitalized Costs of Habitat Conservation Easements

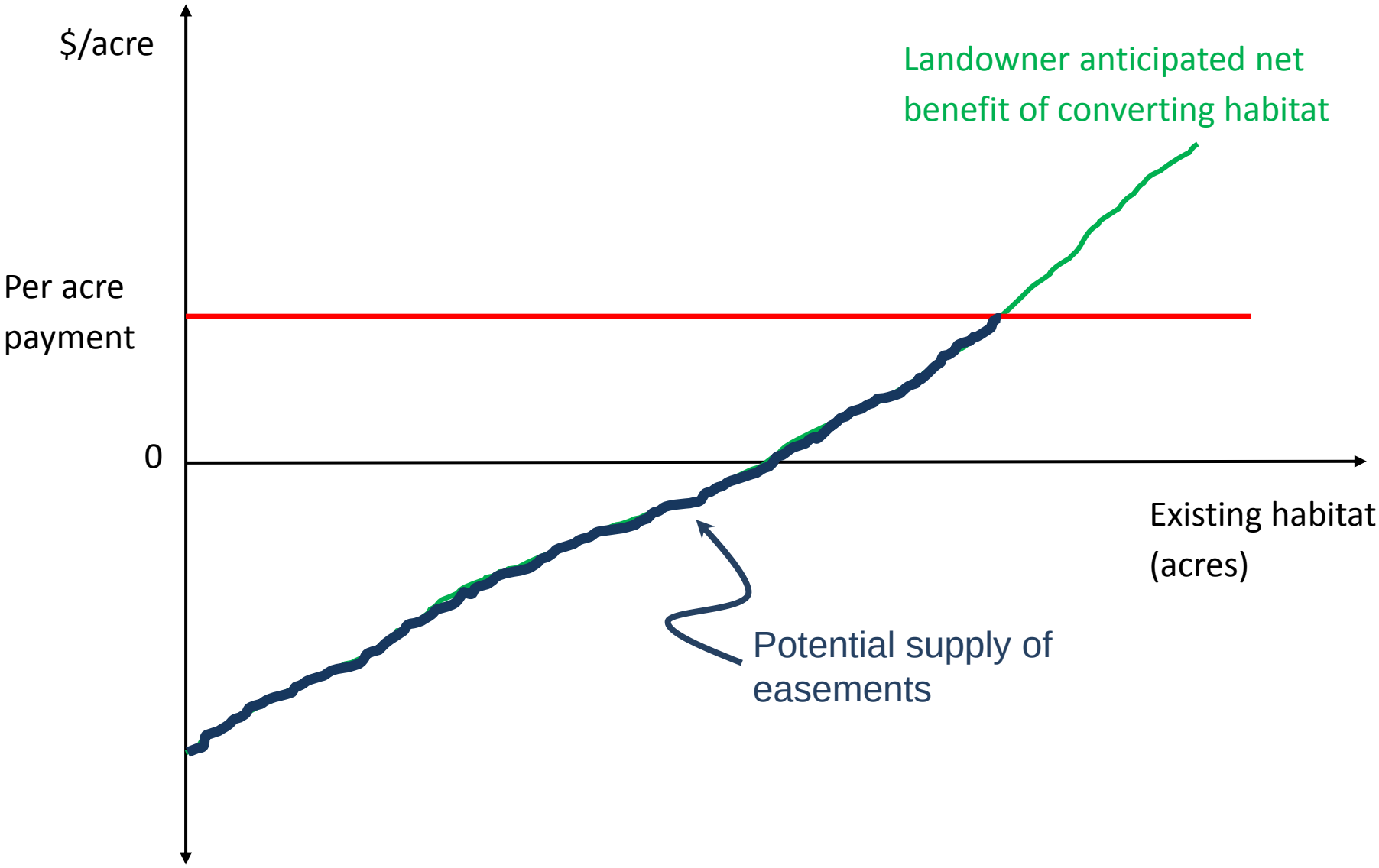
Chad Lawley and Charles Towe

Perpetual conservation easements permanently remove the option to convert existing habitat to more intensive agricultural production. If existing habitat is at threat of conversion, removing the option to convert will reduce land values. In this article, we estimate the land value discount resulting from perpetual habitat conservation easements by using propensity score matching. We find that on the average eased parcel, land values fall by approximately $86 per acre for every acre of eased habitat. On average, our results suggest that landowners have been adequately compensated and conservation agencies have successfully secured habitat at risk of conversion.

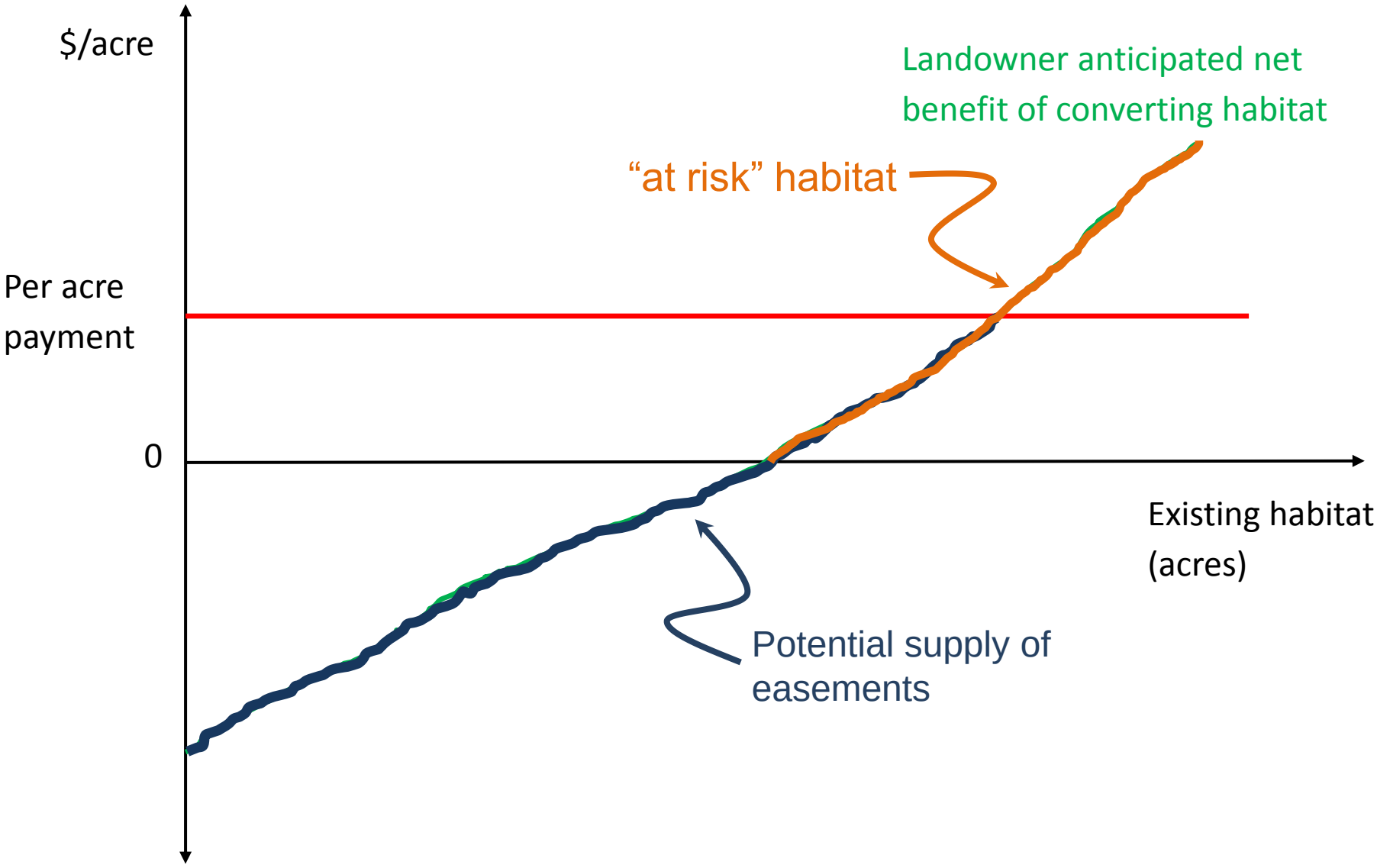
Key words: Additionality, conservation easements, habitat conversion, land use, land values, prairie pothole habitat, propensity score, wetlands.

Fixed payment

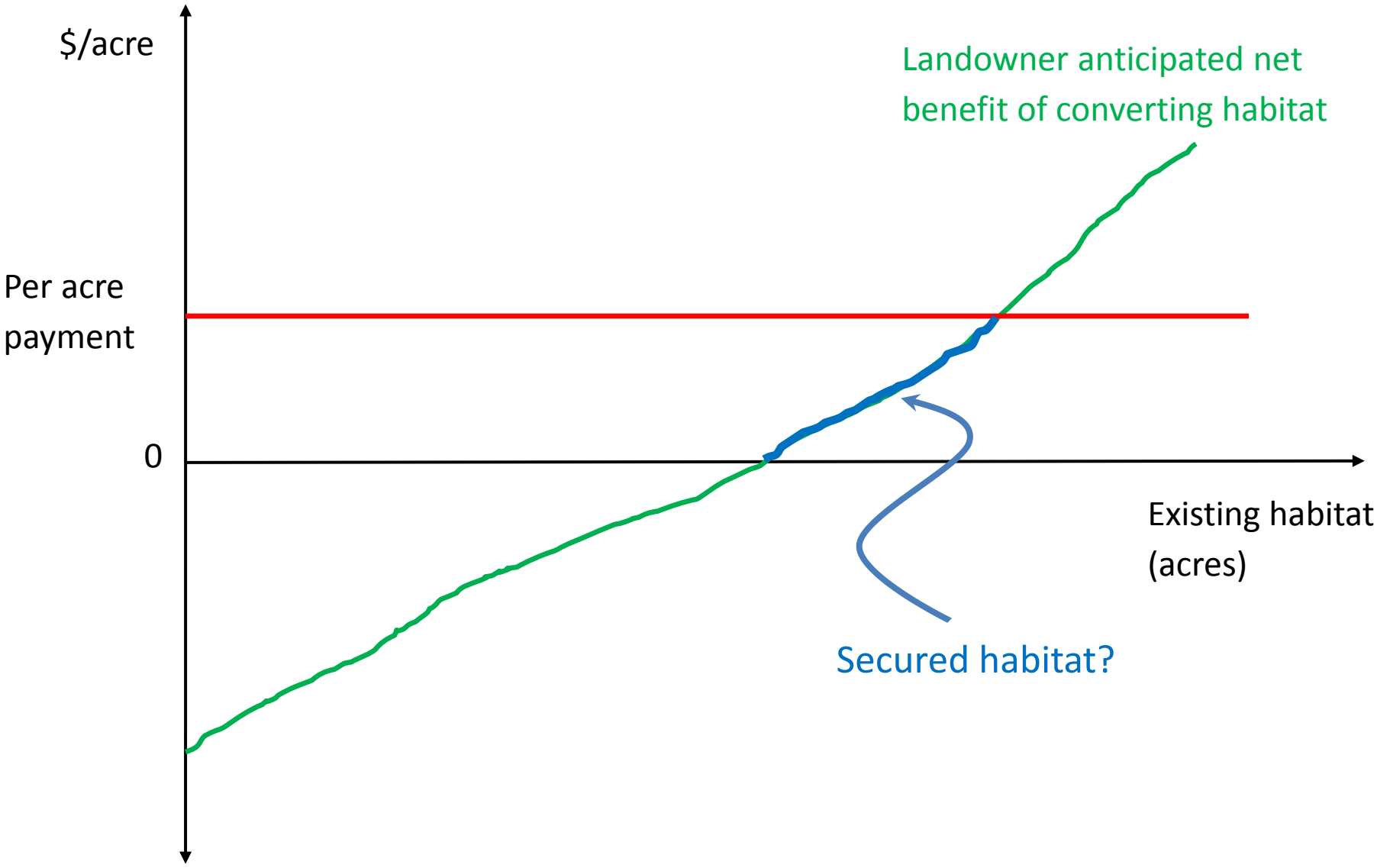
Potential supply



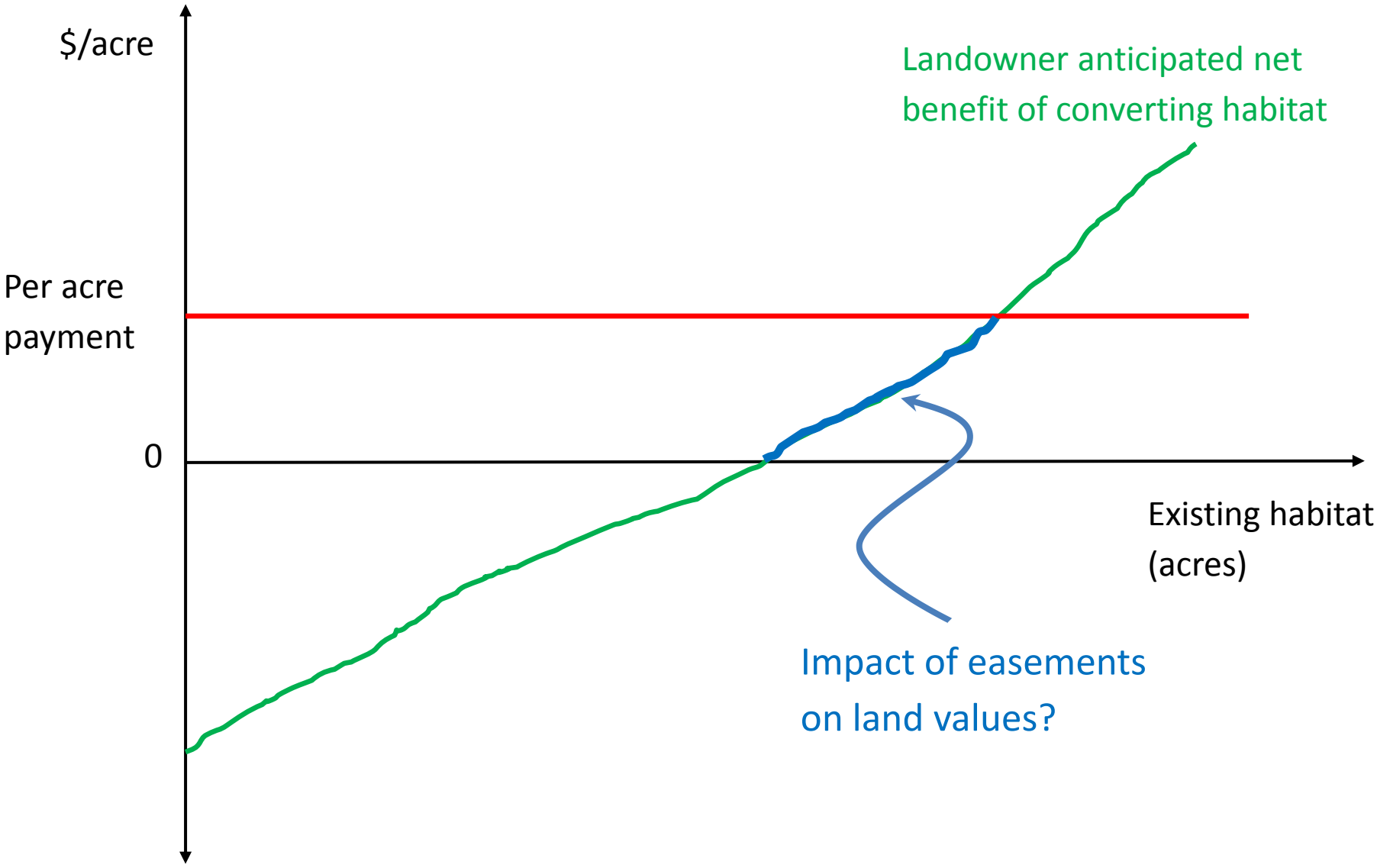
Targeted habitat



Outcome


$/acre
Per acre payment
0
Landowner anticipated net benefit of converting habitat
Existing habitat (acres)
Secured habitat?

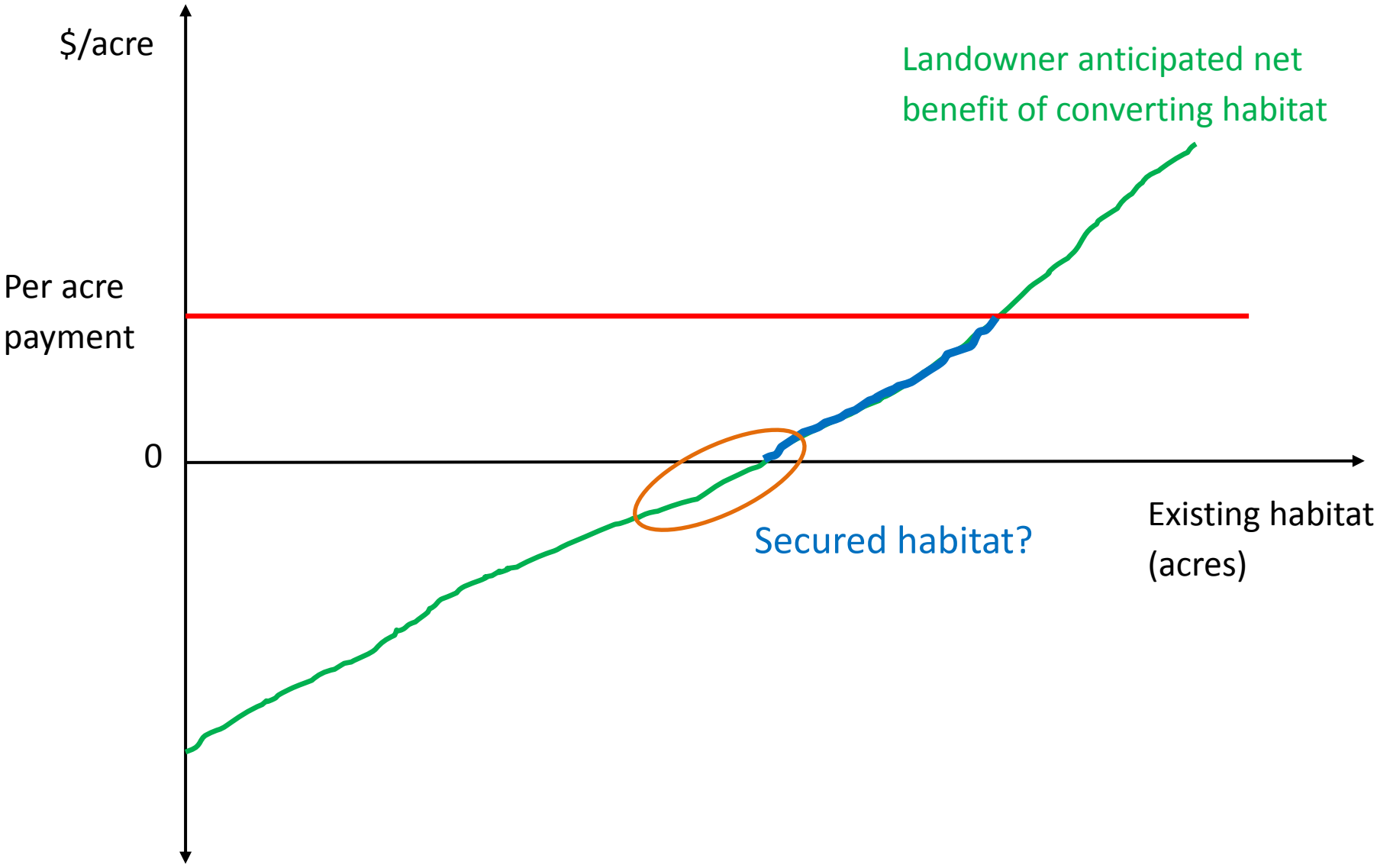
Outcome


$/acre
Per acre payment
0
Landowner anticipated net benefit of converting habitat
Existing habitat (acres)
Impact of easements on land values?

Outcome


$/acre
Landowner anticipated net benefit of converting habitat
Secured habitat?
Per acre payment
0
Existing habitat (acres)

Outcome


$/acre
Per acre payment
0
Landowner anticipated net benefit of converting habitat
Secured habitat?
Existing habitat (acres)

Impact of easements on land values

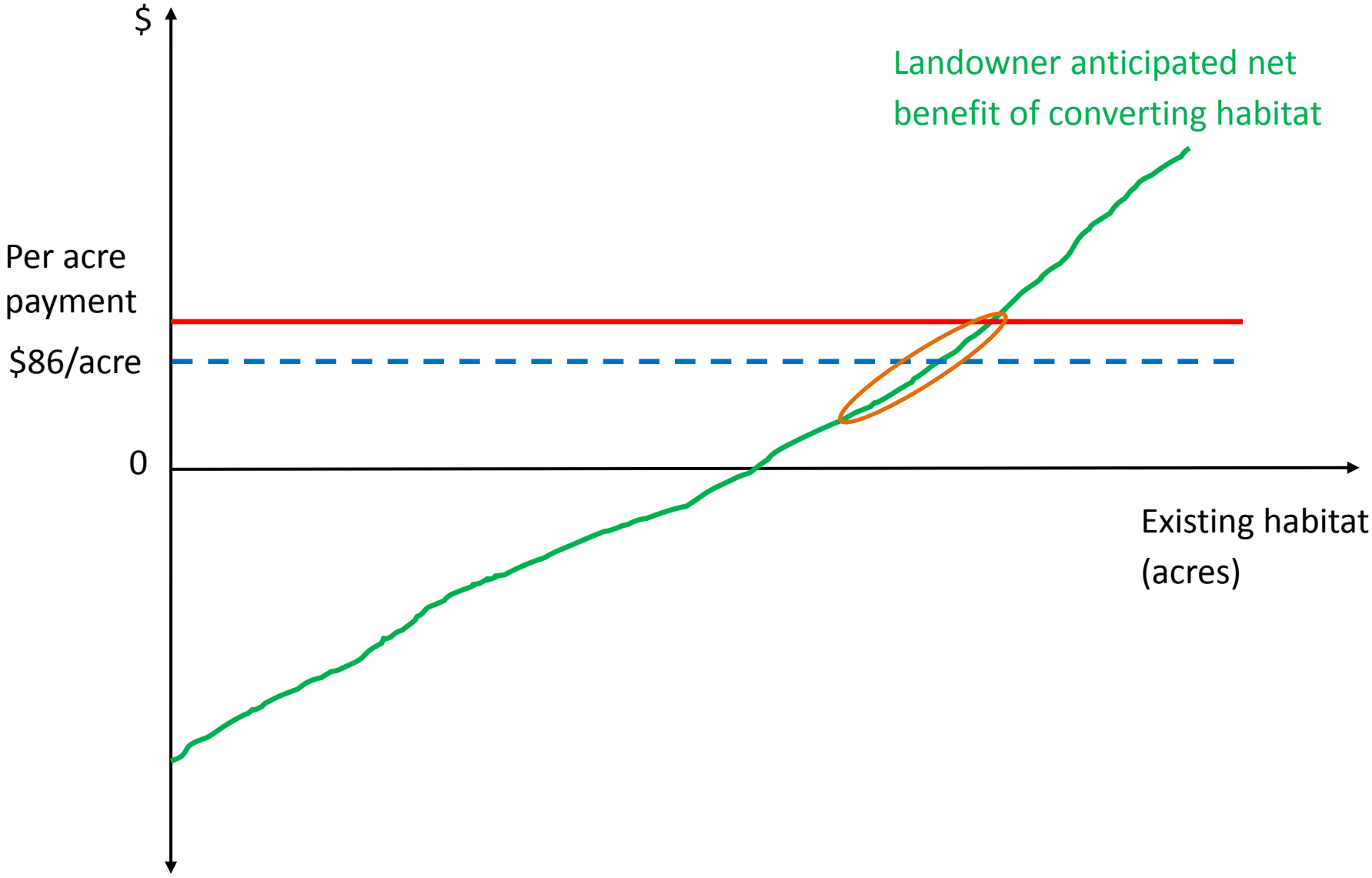
Table 4. Average Treatment Effect on the Treated (ATT)

	Propensity score matching	Regression adjusted		
	Linear price	Linear price (dummy variable)	Linear price (% of sale)	Log price (% of sale)
ATT	−47.71**	−32.19*	−0.86**	−0.0028**
Bootstrap Std. Err.	22.14	18.03	0.34	0.0011
95% confidence interval	(−89.23, −3.83)	(−67.53, 3.14)	(−1.52, −0.20)	(−.005, −.0006)

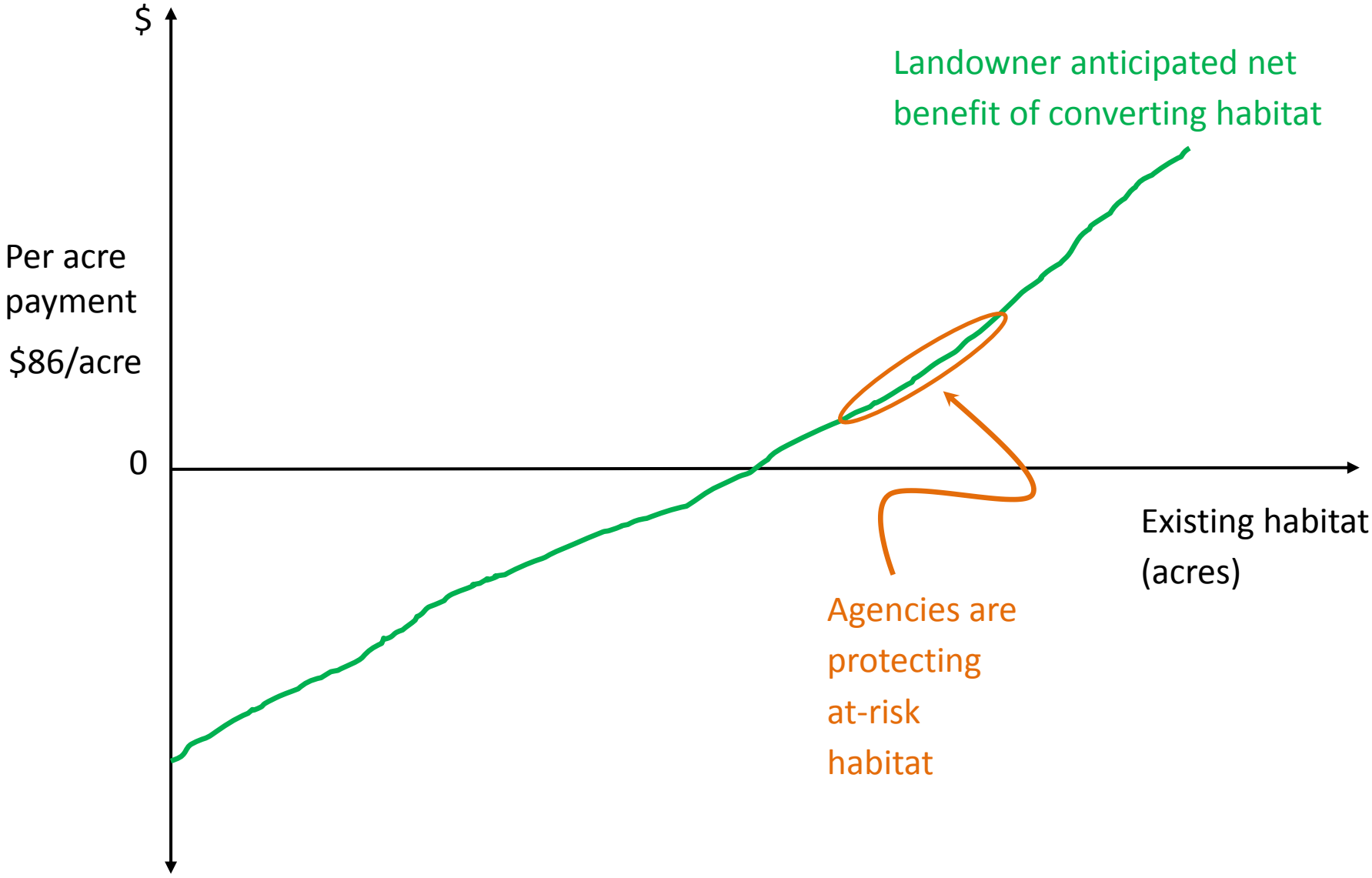
Notes: Asterisks ** and * denote statistical significance at the 5% and 10% levels, respectively. All results based on 5 nearest neighbors matched sample, which consists of 79 eased and 395 non-eased sales. All covariates (including year dummies) are included in the regression adjusted models. The 95% confidence interval (bias corrected) for the propensity score model is based on 1,000 bootstrap draws. The bootstrapped standard errors and 95% confidence interval (normal-based) for the regression adjusted models are based on 1,000 bootstrap draws.

Source: Lawley, Chad and Charles Towe. 2014. "Capitalized Costs of Habitat Conservation Easements," *American Journal of Agricultural Economics* 96(3): 657-672.

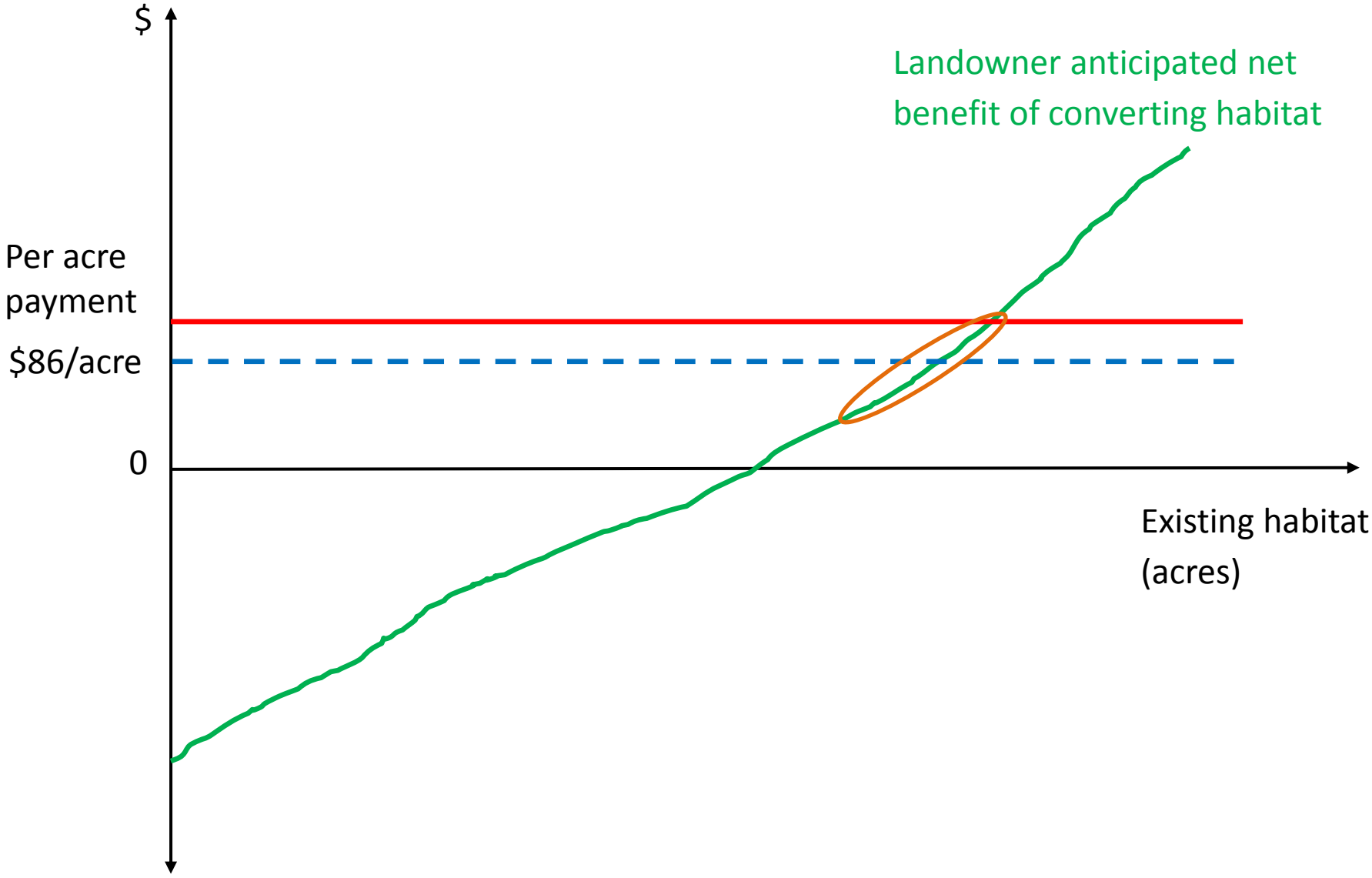
Impact of easements on land values



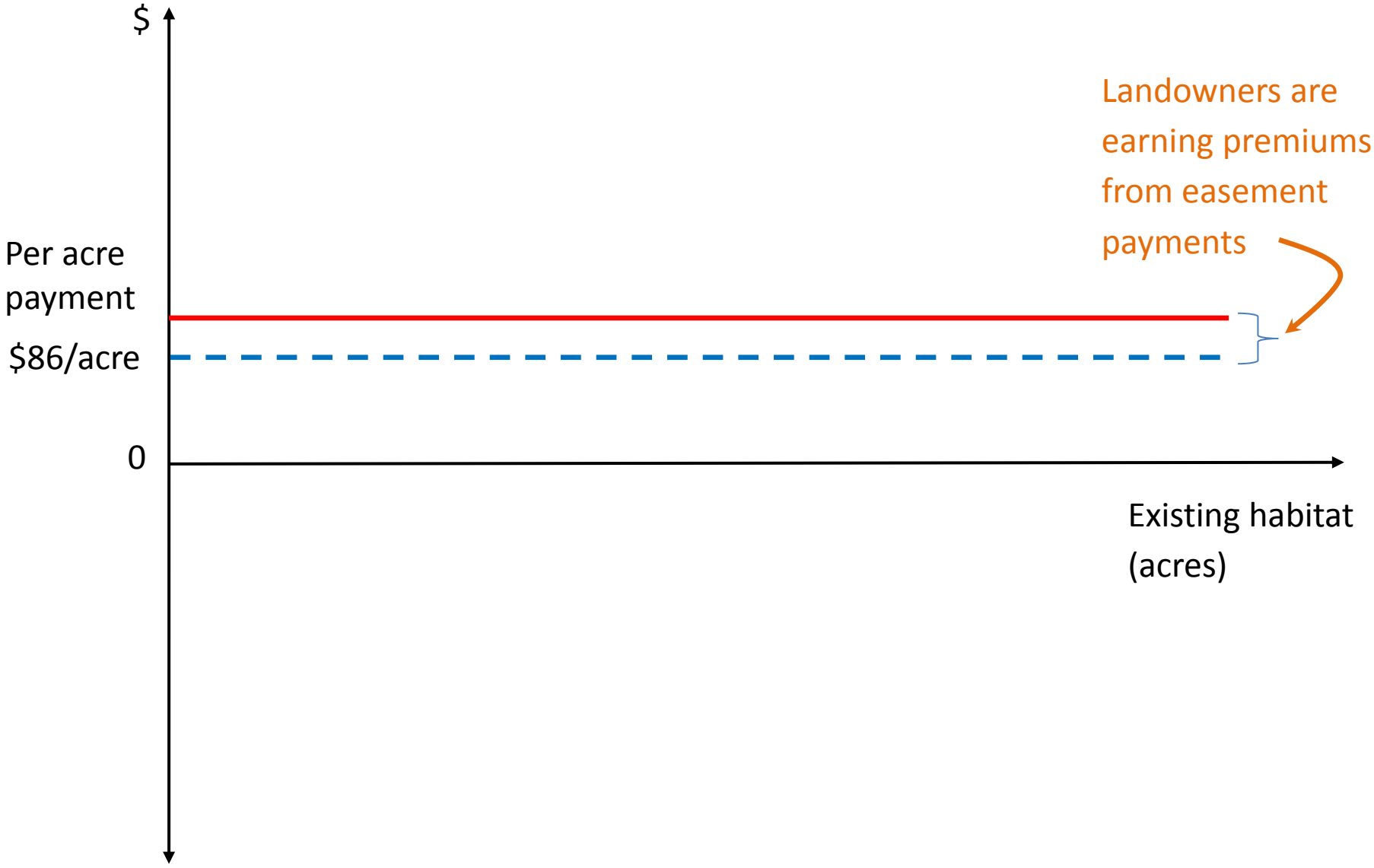
Impact of easements on land values



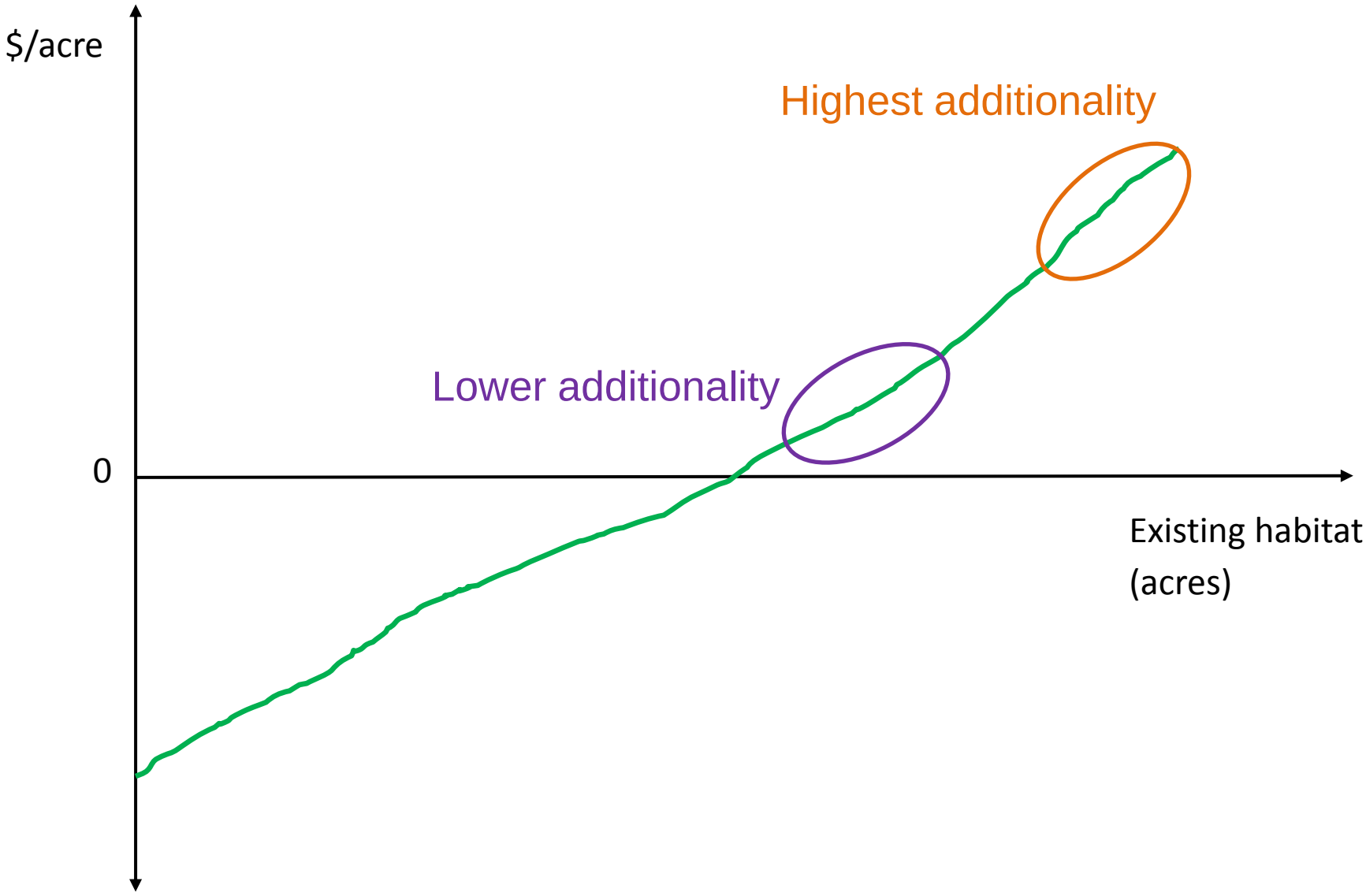
Impact of easements on land values



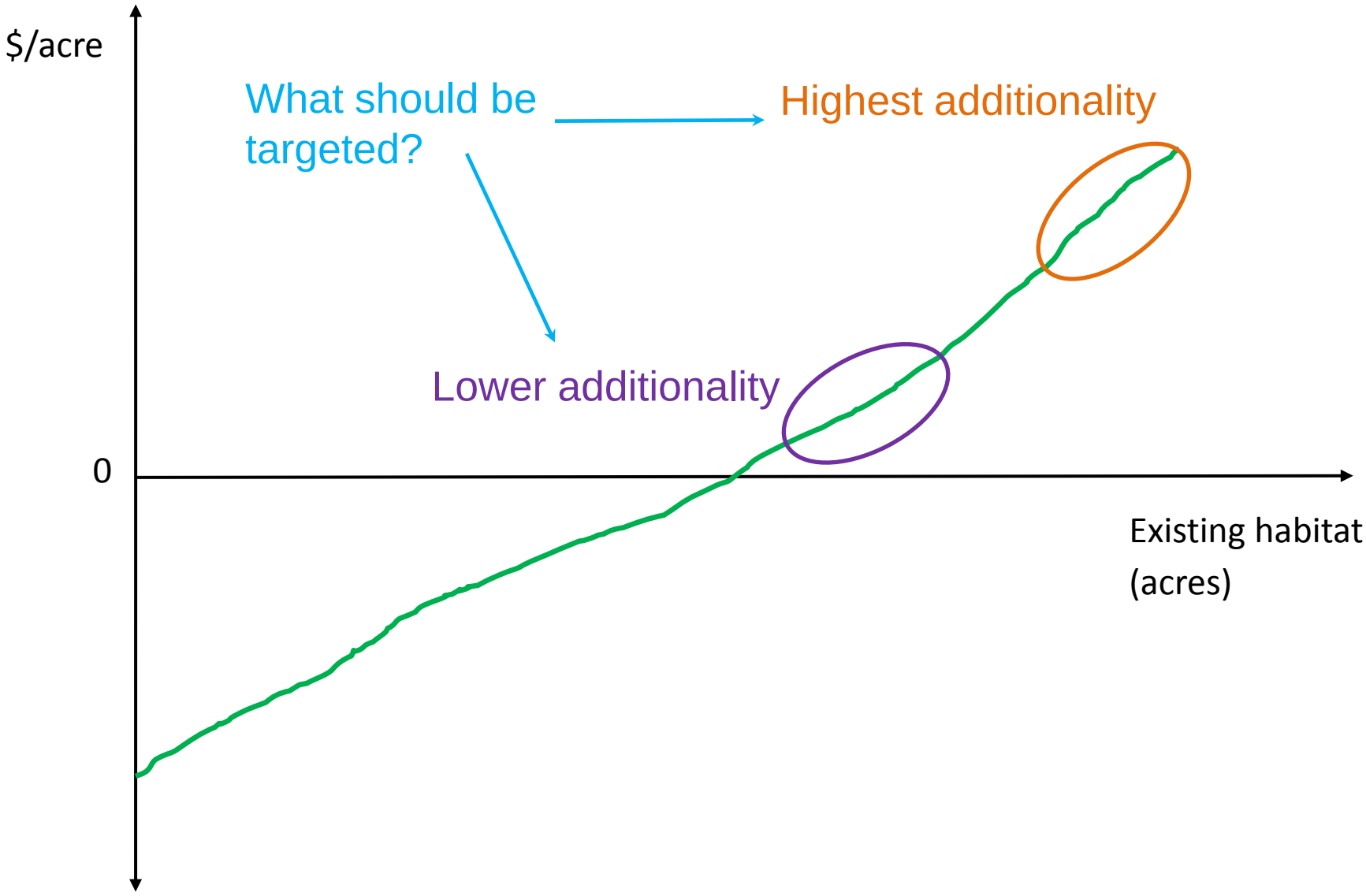
Impact of easements on land values



Highest benefit-cost?



Highest cost-benefit?



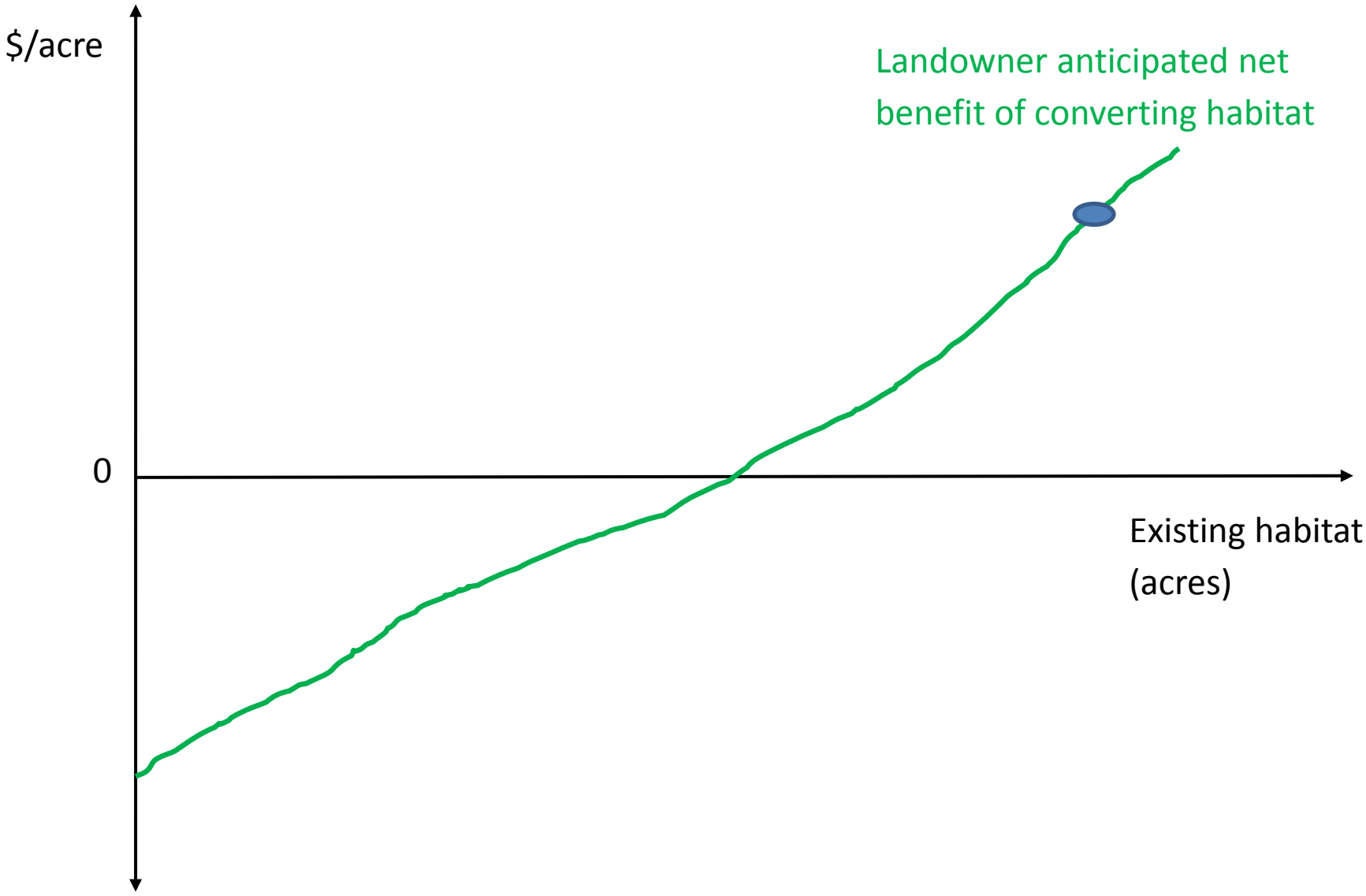
An alternative policy design

Revolving Land Purchase Program—Ducks Unlimited Canada

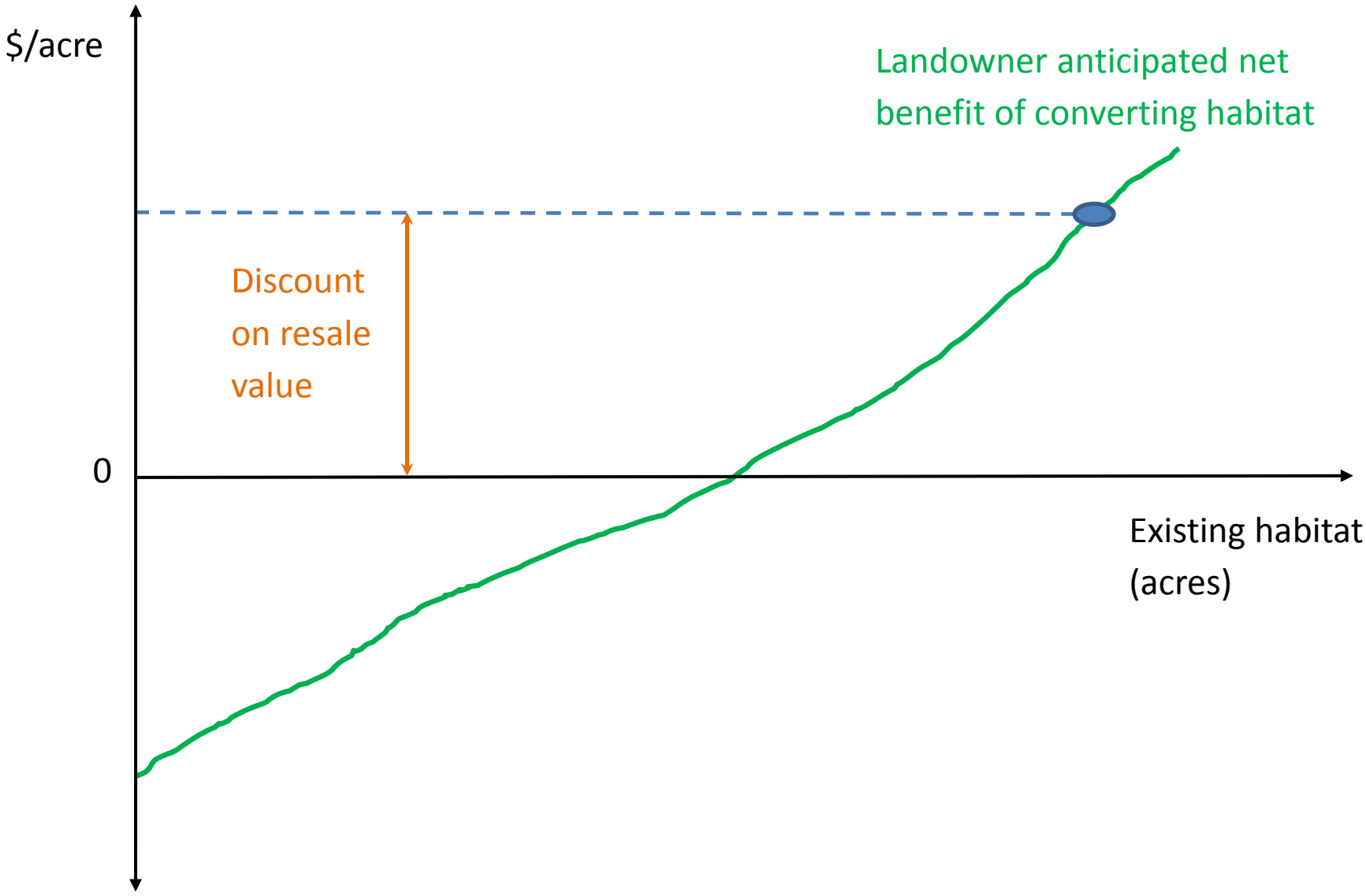
- Purchase land parcel
- Restore/enhance desired habitat
- Place conservation easement on the land parcel
- Resell the land parcel at a discount

- Overcomes challenge of price discovery in conservation easements
- Potential to overcome issues with additionality

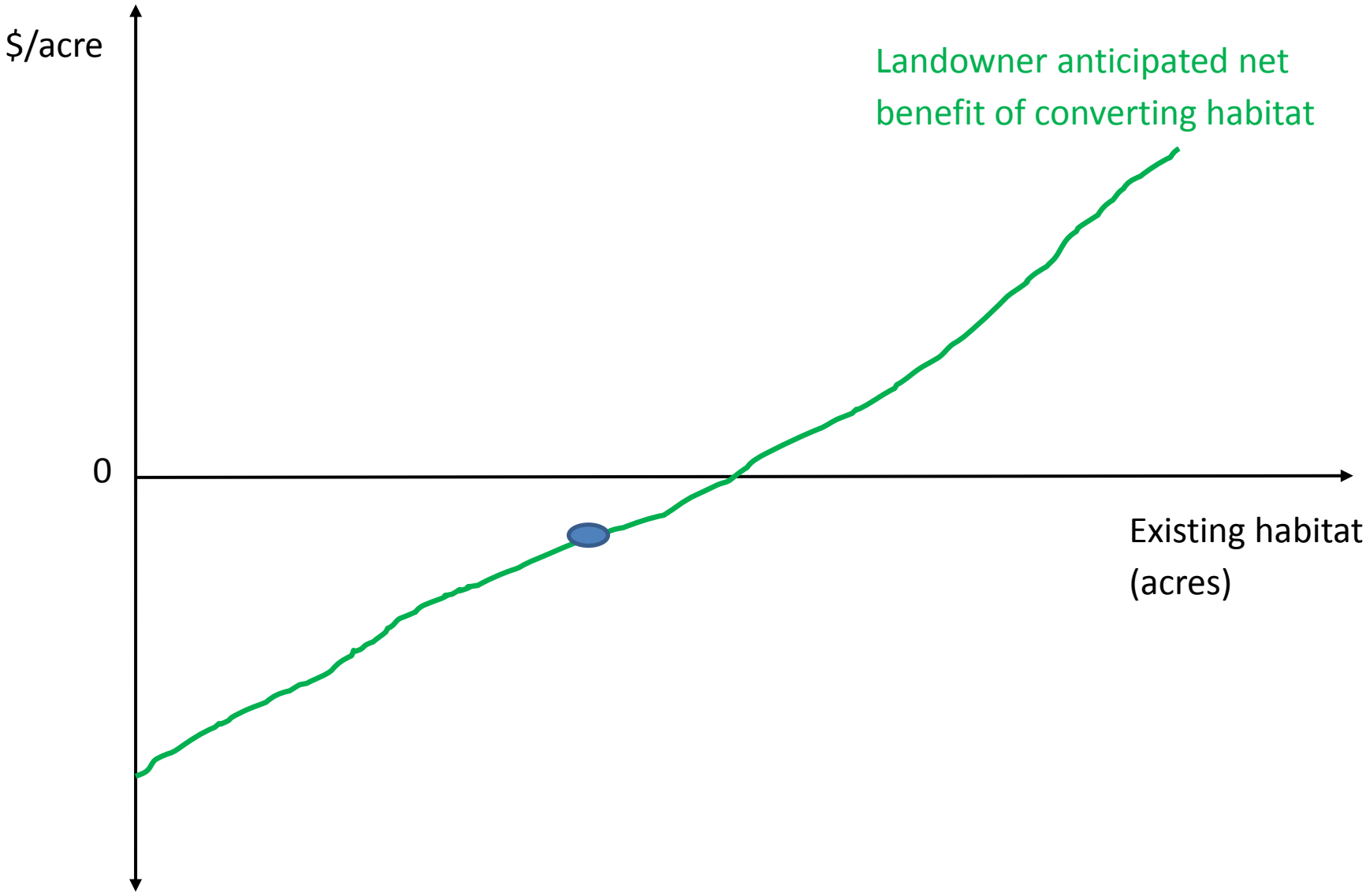
Revolving Land Purchase Program



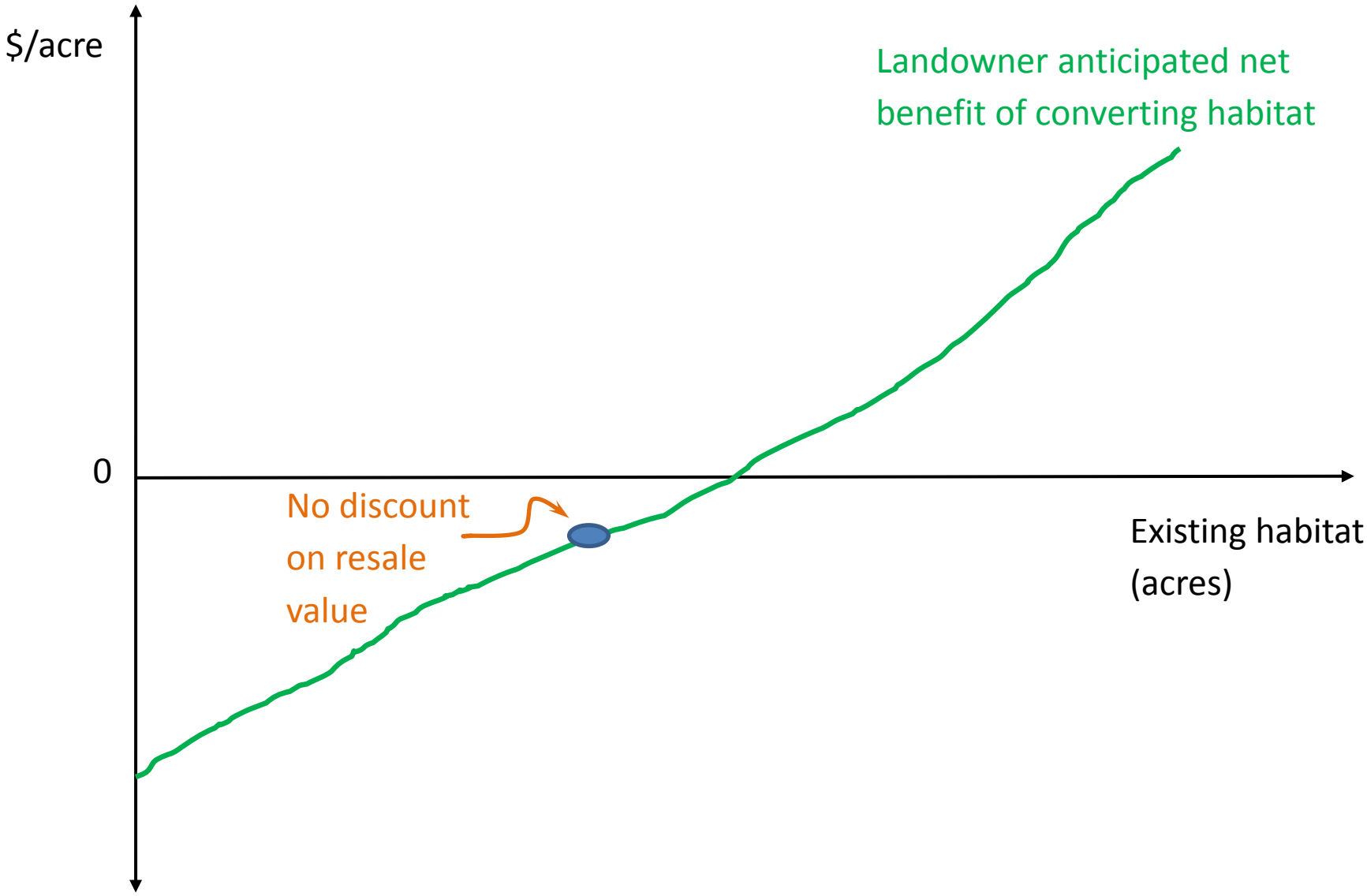
Revolving Land Purchase Program



Revolving Land Purchase Program



Revolving Land Purchase Program



Revolving Land Purchase Program

- Assumes DUC is not “over-bidding” for land
  - Local concern about DUC bidding up land prices

- Overcomes some issues with targeting
  - Can purchase most preferred land
  - Land resale discount reflects additionality of the conserved land

- Increased transaction costs
- DUC takes on short-term price risk

Adoption of agricultural management practices

Table 10b: Adoption rates of management practices on Rented and Own Property in Manitoba

Management Practice	Rented Property	Observations	Own Property	Observations
Minimum/No-Till	68.80%	234	61.28%	390
Residue Management	82.50%	240	76.65%	394
Precision Agriculture	13.45%	238	12.53%	391
Manure Application	5.42%	240	28.68%	394
Surface or Tile Drainage	40.00%	240	42.89%	394

Source: Nadella, Deaton, Lawley, and Weersink. 2013. “Does Tenure Status Influence the Adoption of Agricultural Management Practices?” LEARN Preliminary Report (PR-05-2013). https://learnnetwork.ualberta.ca/wp-content/uploads/sites/70/2018/07/PR-05-2013_Nadella-Deaton-Lawley-Weersink.pdf

Adoption of agricultural management practices

Table 10a: Adoption rates of management practices on Rented and Own Property in Ontario

Management Practice	Rented Property	Observations	Own Property	Observations
Minimum/No-Till	66.18%	204	60.98%	387
Cover Crop	18.84%	207	26.41%	390
Precision Agriculture	17.73%	203	15.01%	373
Manure Application	31.40%	207	53.57%	392
Surface or Tile Drainage	60.39%	207	84.69%	392

Source: Nadella, Deaton, Lawley, and Weersink. 2013. “Does Tenure Status Influence the Adoption of Agricultural Management Practices?” LEARN Preliminary Report (PR-05-2013). https://learnnetwork.ualberta.ca/wp-content/uploads/sites/70/2018/07/PR-05-2013_Nadella-Deaton-Lawley-Weersink.pdf

Applications for cost-share funding

Table 12: Applications to Cost-Share Programs in Ontario and Manitoba

Management Practice	Number of Applications (%)	Number of Funded Projects (%)	Total Number of Observations
Cover Crops	5 (1.28%)	2 (0.51%)	391
Residue Management	59 (14.97%)	13 (3.30%)	394
Conservation Tillage	68 (8.71%)	28 (3.59%)	781
Precision Agriculture	42 (5.35%)	21 (2.68%)	785

Source: Nadella, Deaton, Lawley, and Weersink. 2013. "Does Tenure Status Influence the Adoption of Agricultural Management Practices?" LEARN Preliminary Report (PR-05-2013). https://learnnetwork.ualberta.ca/wp-content/uploads/sites/70/2018/07/PR-05-2013_Nadella-Deaton-Lawley-Weersink.pdf

Evaluation of cost share programs

- Little research into the effectiveness of Fed-Province cost share programs

- Evidence on agri-environmental cost share programs mixed:
  - French study
    - Cover crop cost share offers low additionality, high windfall payments
    - Grass buffer stip also low additionality, but benefits make it worthwhile subsidy

  - US studies
    - Relatively high additionality for cover crop cost shares

Acknowledgements

Funding:

Linking Environment and Agriculture Research Network

Social Science and Humanities Research Council

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- Manitoba Provincial Assessor
- Manitoba Habitat Heritage Corporation
- Ducks Unlimited Canada
- Nature Conservancy Canada
- AAFC
- Manitoba Land Initiative

Renters, landlords, and farmland stewardship

B. James Deaton[a,*,†], Chad Lawley[b], Karthik Nadella[a]

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Abstract

Are farmers better stewards of the land they own than the land they rent from others? We answer this question using a data set that identifies Ontario farmers' conservation practices on their own land as well as the land they rent. Using a fixed-effects regression approach, we find that the role of tenure varies for different types of conservation practices. Farmers were found to be just as likely to adopt a machinery-related practice such as conservation tillage on their rented land as that land which they own. On the other hand, farmers were found to be less likely to adopt site-specific conservation practices such as planting cover crops on rented land. However, this effect diminishes as the expected length of the rental relationship increases when the landlord has a farming background.

JEL classifications: Q15, Q24

Keywords: Conservation; Rental contracts; Landlords; Agriculture; Tenure; Conservation tillage; Cover crops

Use of agricultural conservation practices

Table 2
Impact of tenure on use of conservation practices

	Conservation tillage		Cover crops	
	Coefficient	Standard error	Coefficient	Standard error
Rented	−0.018	0.033	−0.099***	0.035
Good productivity	0.033	0.110	0.153	0.115
Very good productivity	−0.030	0.117	0.069	0.125
Excellent productivity	−0.088	0.134	0.135	0.158
Hilly	0.088	0.100	0.032	0.103
Coarse	0.206***	0.067	−0.037	0.075
Plot size (thousand acres)	0.249	0.178	−0.155	0.132
Drainage	−0.022	0.064	0.072	0.070
Irrigation	−0.338	0.179	0.258	0.223
Corn planted in 2012	−0.177***	0.050	−0.063	0.053
Soybean planted in 2012	0.075*	0.042	−0.108**	0.048
Winter wheat planted in 2012	0.021	0.052	0.279***	0.064
Constant	0.671***	0.114	0.143	0.117
R^2 within	0.177		0.214	
R^2 between	0.003		0.126	
R^2 overall	0.022		0.154	
Observations	396		396	
Number of farmer clusters	198		198	

Notes: Standard errors adjusted for farmer clusters.
***Statistical significance at 1%; **statistical significance at 5%; *statistical significance at 10%.

Farmers are less likely to plant cover crops on land they rent compared to land they own

Source: Deaton, Lawley, and Nadella. 2018. “Renters, Landlords, and Farmland Stewardship” *Agricultural Economics* 49(2018): 521-531.

Table 4
Impact of landlord type and expected rental length on use of conservation practices

	Conservation tillage		Cover crops	
	Coefficient	Standard error	Coefficient	Standard error
Nonfarmer landlord × Short rental	0.008	0.053	−0.142*	0.078
Nonfarmer landlord × Long rental	−0.051	0.061	−0.137**	0.065
Farmer landlord × Short rental	−0.064	0.079	−0.151**	0.067
Farmer landlord × Long rental	−0.016	0.064	0.008	0.057
Good productivity	−0.036	0.094	0.121	0.122
Very good productivity	−0.054	0.110	0.093	0.141
Excellent productivity	−0.215	0.132	0.177	0.159
Hilly	0.050	0.101	0.097	0.078
Coarse	0.215*	0.083	0.046	0.076
Plot size (thousand acres)	−0.032	0.126	−0.252**	0.113
Drainage	0.021	0.082	0.005	0.073
Irrigation	−0.387*	0.199	0.310	0.227
Corn planted in 2012	−0.171***	0.052	−0.063	0.046
Soybean planted in 2012	0.130**	0.054	−0.131**	0.053
Winter wheat planted in 2012	0.022	0.058	0.172**	0.075
Constant	0.696***	0.105	0.209	0.131
R^2 within	0.255		0.219	
R^2 between	0.013		0.135	
R^2 overall	0.046		0.154	
Observations	284		284	
Number of farmer clusters	142[a]		142	

Farmers in long-term rental arrangements with farmer landlords treat rented land the same as they treat their own land

Source: Deaton, Lawley, and Nadella. 2018. "Renters, Landlords, and Farmland Stewardship" *Agricultural Economics* 49(2018): 521-531.

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R^2 between	0.013		0.135	
R^2 overall	0.046		0.154	
Observations	284		284	
Number of farmer clusters	142[a]		142	

Farmers renting from non-farmer landlords (or in short-term arrangements) are less likely to use cover crops on land they rent compared to land they own

Source: Deaton, Lawley, and Nadella. 2018. "Renters, Landlords, and Farmland Stewardship" *Agricultural Economics* 49(2018): 521-531.