

IMPLICATIONS OF BARRIER REMOVALS TO NATIVE TROUT POPULATIONS



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Native Trout & Salmon of Vermont



Brook Trout

Lake Trout



Landlocked Salmon



Nonnative Trout of Vermont



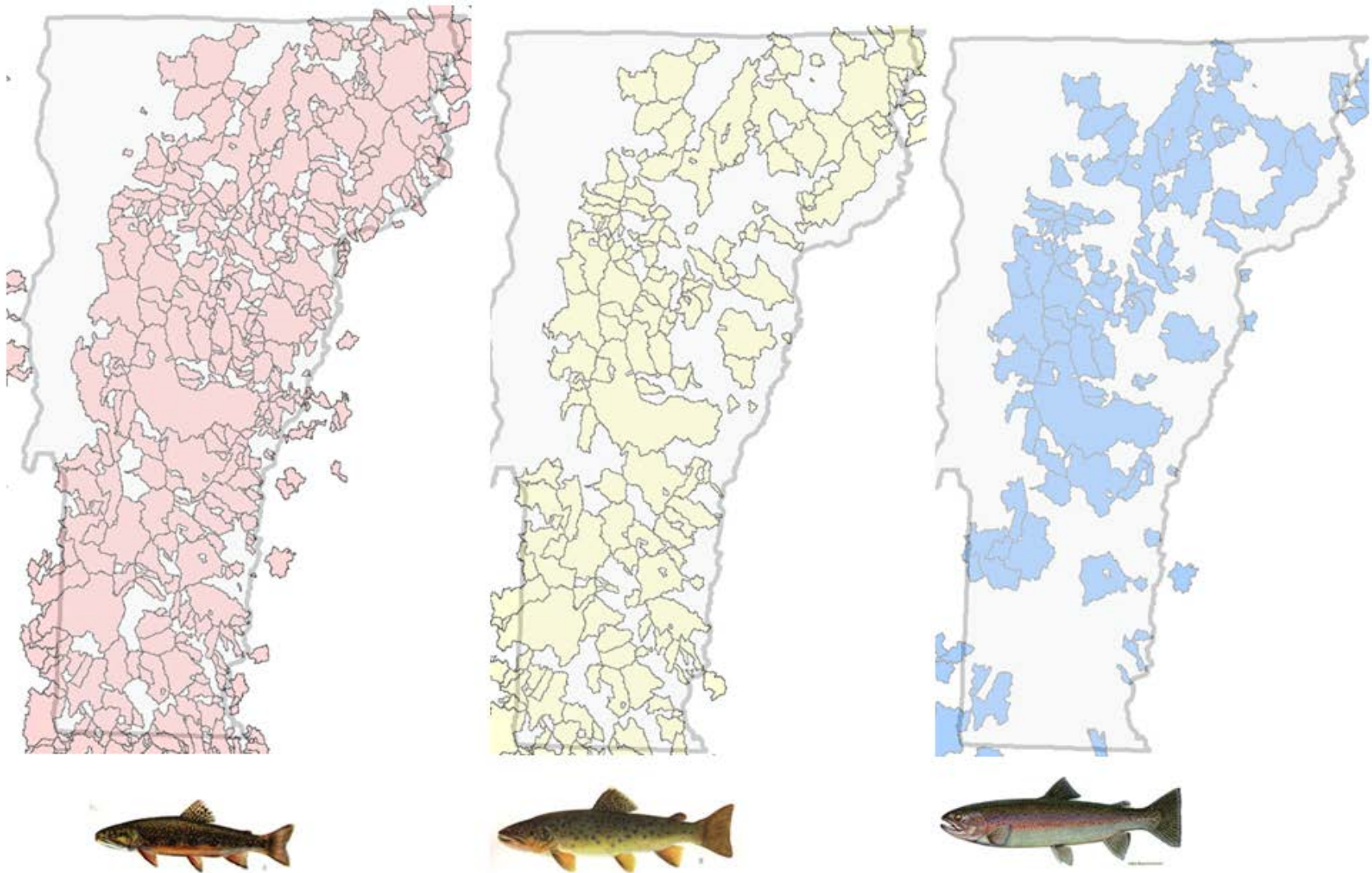
Brown Trout



Rainbow Trout

- *Both introduced in the late 1800's*
- *Naturalized populations widely established*
- *Often thrive in waters unsuitable for brook trout*
- *Support popular fisheries*

Figure 1. Distribution of wild brook trout, brown trout and rainbow trout. Map subject to change with future trout population assessments. (DRAFT MAP)



POTENTIAL BENEFITS TO NATIVE TROUT FROM BARRIER REMOVAL

- *Improved access to critical spawning, rearing, feeding or refuge habitats;*
- *Recolonization of upstream habitats following catastrophic events, such as floods, droughts or toxic discharges;*
- *Broader distribution;*
- *Improved genetic diversity and decreased risk of extirpation;*
- *Improved size distribution;*
- *Improved habitat and geomorphic conditions;*
- *Controlled removal eliminates risk of habitat impacts from catastrophic structure failure.*

POTENTIAL DETRIMENTS TO NATIVE TROUT FROM BARRIER REMOVAL

- *Expansion of naturalized non-native trout populations with potential for competition, displacement, disease;*
- *Potential interactions (competition, predation, genetic) with stocked trout;*

Essay

Invasion versus Isolation: Trade-Offs in Managing Native Salmonids with Barriers to Upstream Movement

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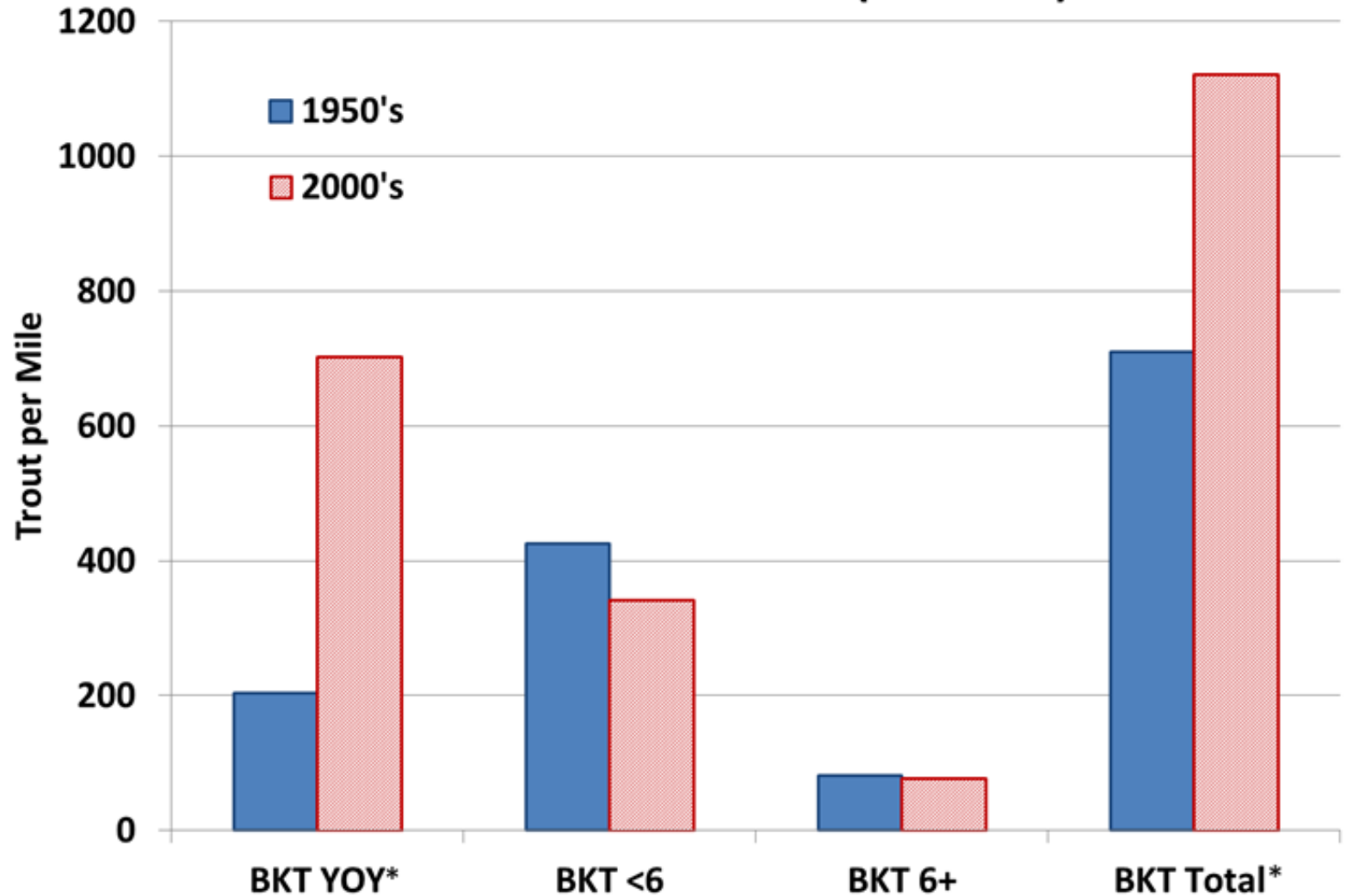
STATEWIDE BROOK TROUT EVALUATION

1950s = 1953-1960; 2000s = 2005-2016
Minimum 500 brook trout per mile in
one time period;
Final: 150 sites; 138 streams; 17
watersheds



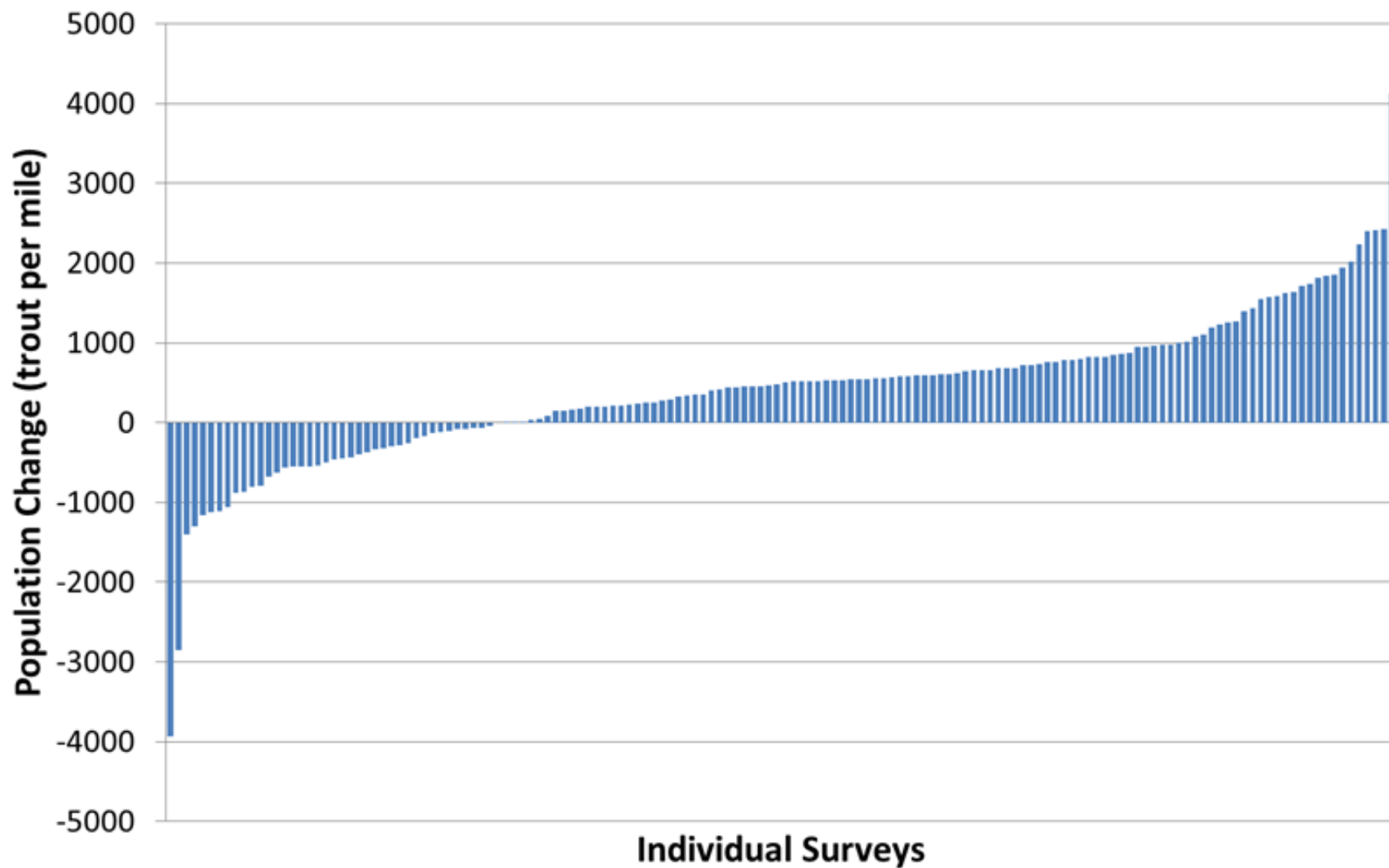
Watershed	Sites
Batten Kill	3
Black River	3
Connecticut (direct tributaries)	11
Deerfield River	2
Lamoille	16
Memphremagog	13
Missisquoi	17
Nulhegan	1
Ompompanoosuc	1
Ottauquechee	10
Otter Creek	9
Passumpsic	7
Poultney	2
Waits	14
Wells	4
White	15
Winooski	22

Wild Brook Trout Populations Comparison 1950's vs. 2000's (150 sites)

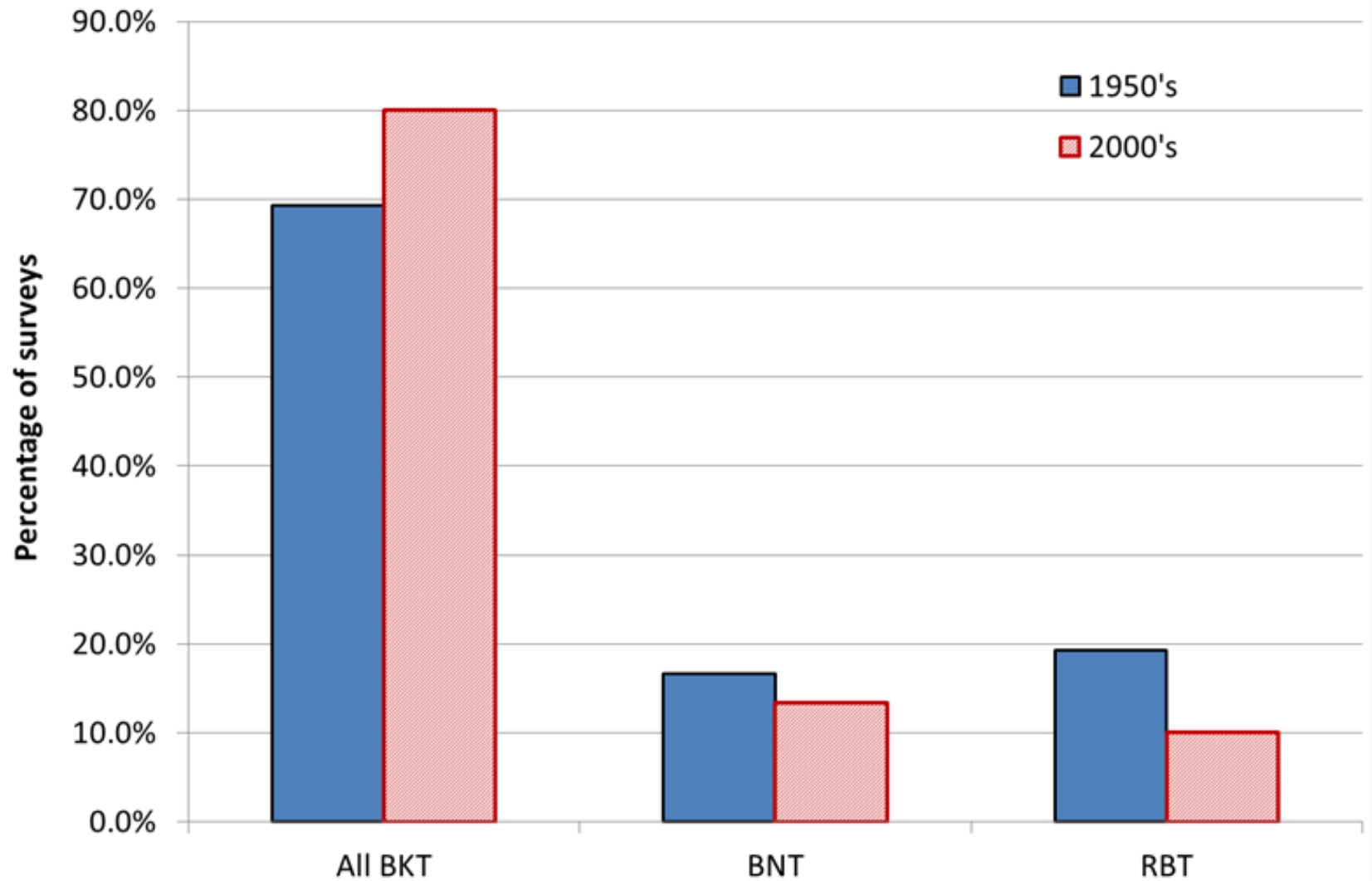


* denotes significant differences between time periods $p < 0.05$; t-test

Wild Brook Trout Population Changes 1950's - 2000's



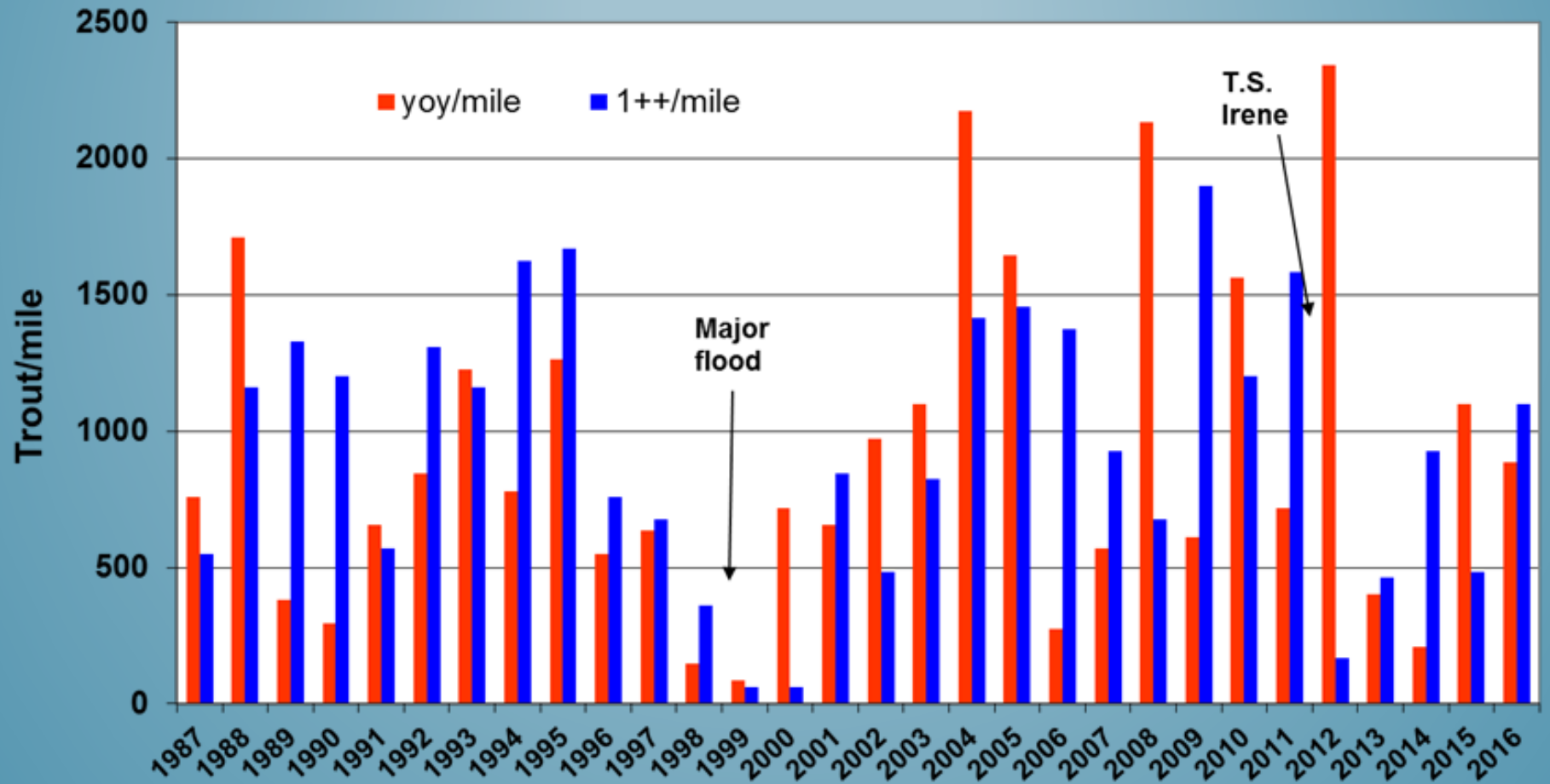
Wild Trout Species Composition



WILD TROUT SPECIES COMPOSITION

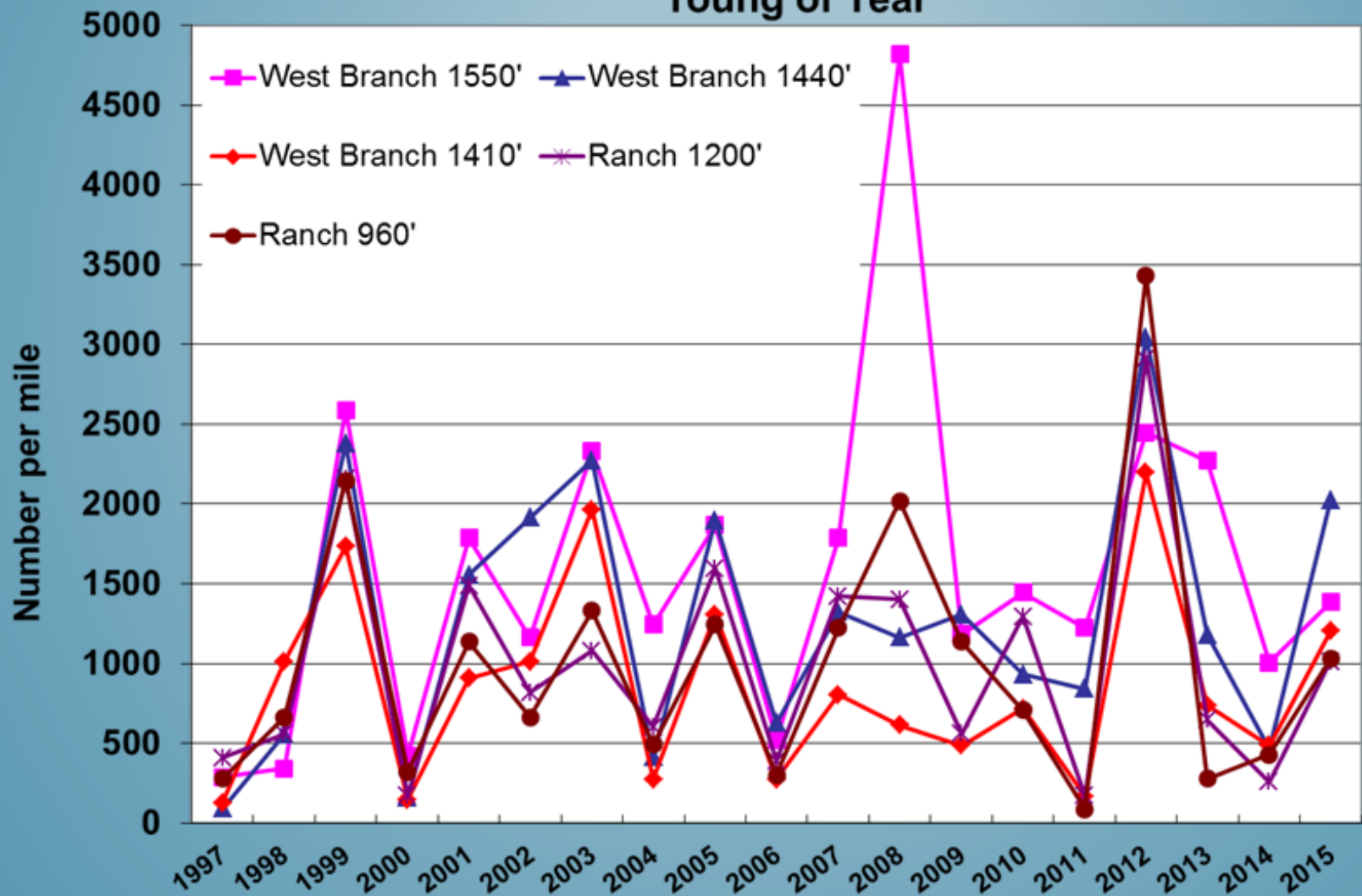
Population Composition	# Sites	Period	Brook Trout YOY	Brook Trout <6	Brook Trout 6+	Brook Trout Total	Brown Trout Total	Rainbow Trout Total	Total Trout
Allopatric (Brook Trout Only)	120	2000's	728	360	79	1166	0	0	1166
Sympatric (w/Brown &/ or Rainbow)	30	2000's	604	268	66	939	222	242	1403

Clay Brook Wild Brook Trout Population Estimates 1987-2016



Wild Brook Trout Surveys (1997-2015)

Young of Year



VT BROOK TROUT STUDY CONCLUSIONS

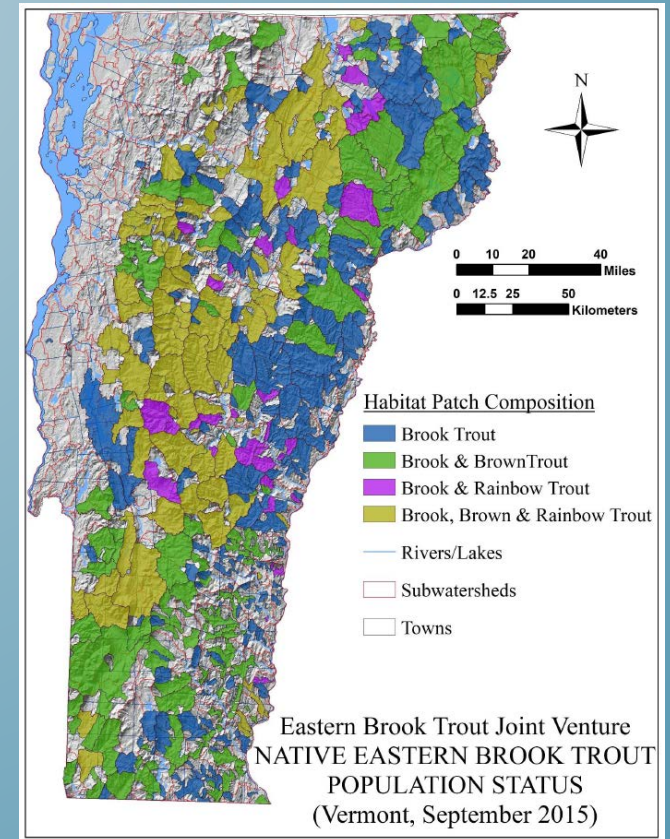
- *Brook trout populations stable/improving over 50+ year period*
- *Natural reproduction levels higher*
 - *Improved environmental protections?*
- *Nonnative trout not expanding to detriment of BKT*
- *Habitat protection & enhancement is key*
 - *Water quality, riparian, connectivity & habitat complexity*



EASTERN BROOK TROUT JOINT VENTURE CATCHMENT ANALYSIS HIGHLIGHTS

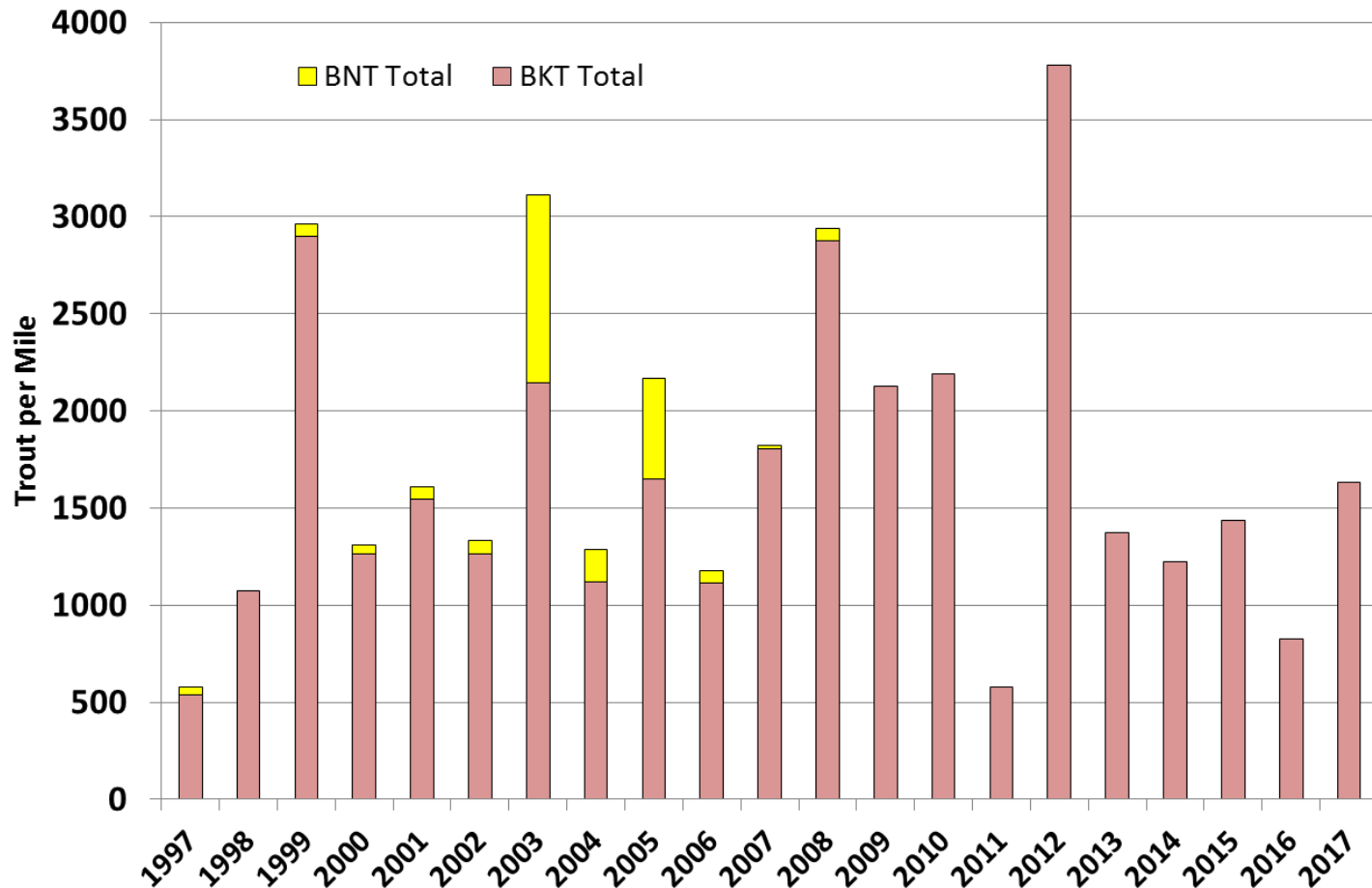


- Vermont had the highest percentage (14.3%) of its subwatersheds (HUC 12) classified as Intact followed by Maine (12.6%), New York (9.7%), and Virginia (9.0%).
- 47% of Vermont catchments (HUC14) support wild allopatric BKT; 91% of catchments support wild BKT in area and number.
- Habitat fragmentation considered a major threat to brook trout persistence.

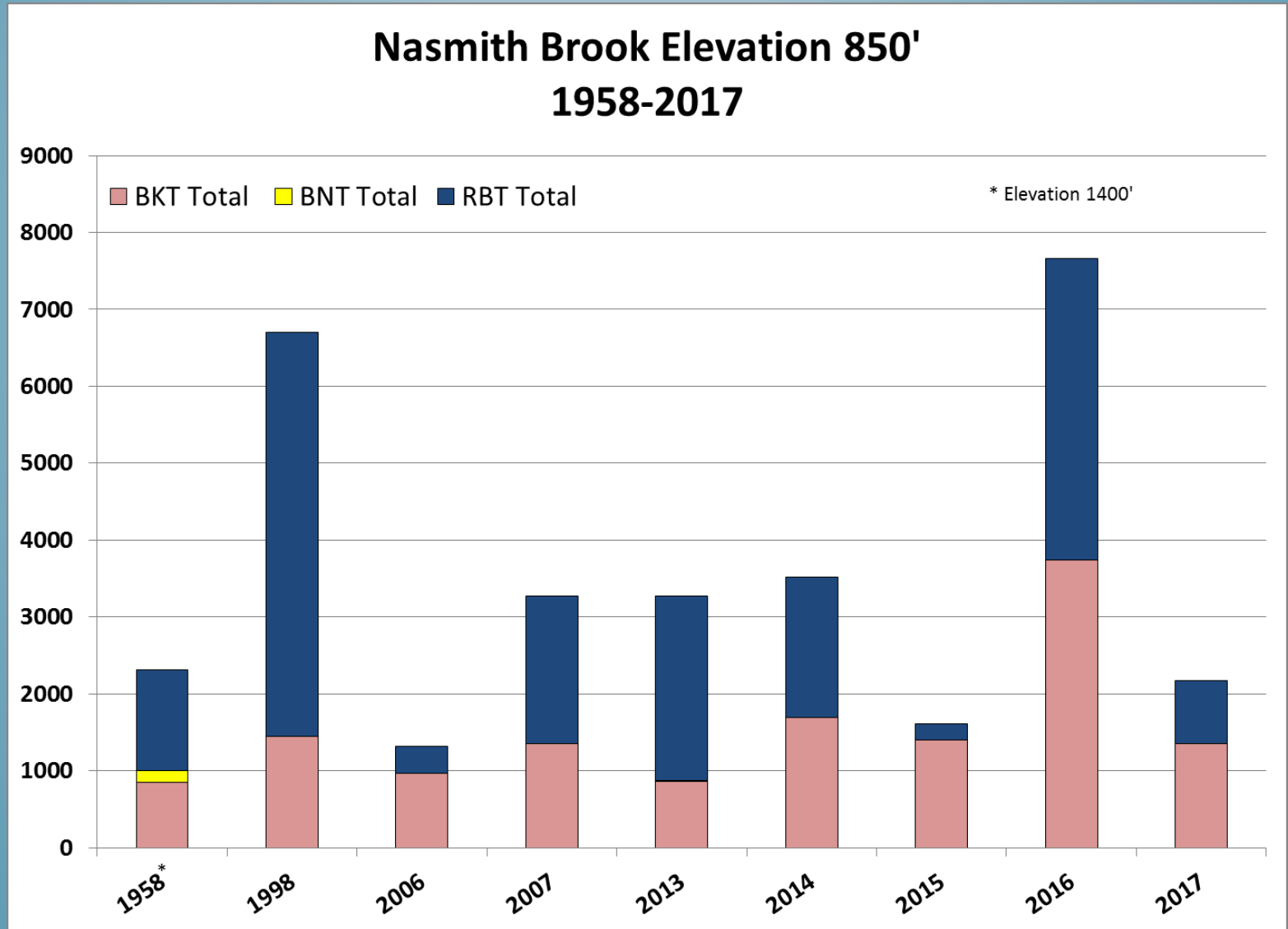


EXAMPLES OF SYMPATRIC POPULATIONS

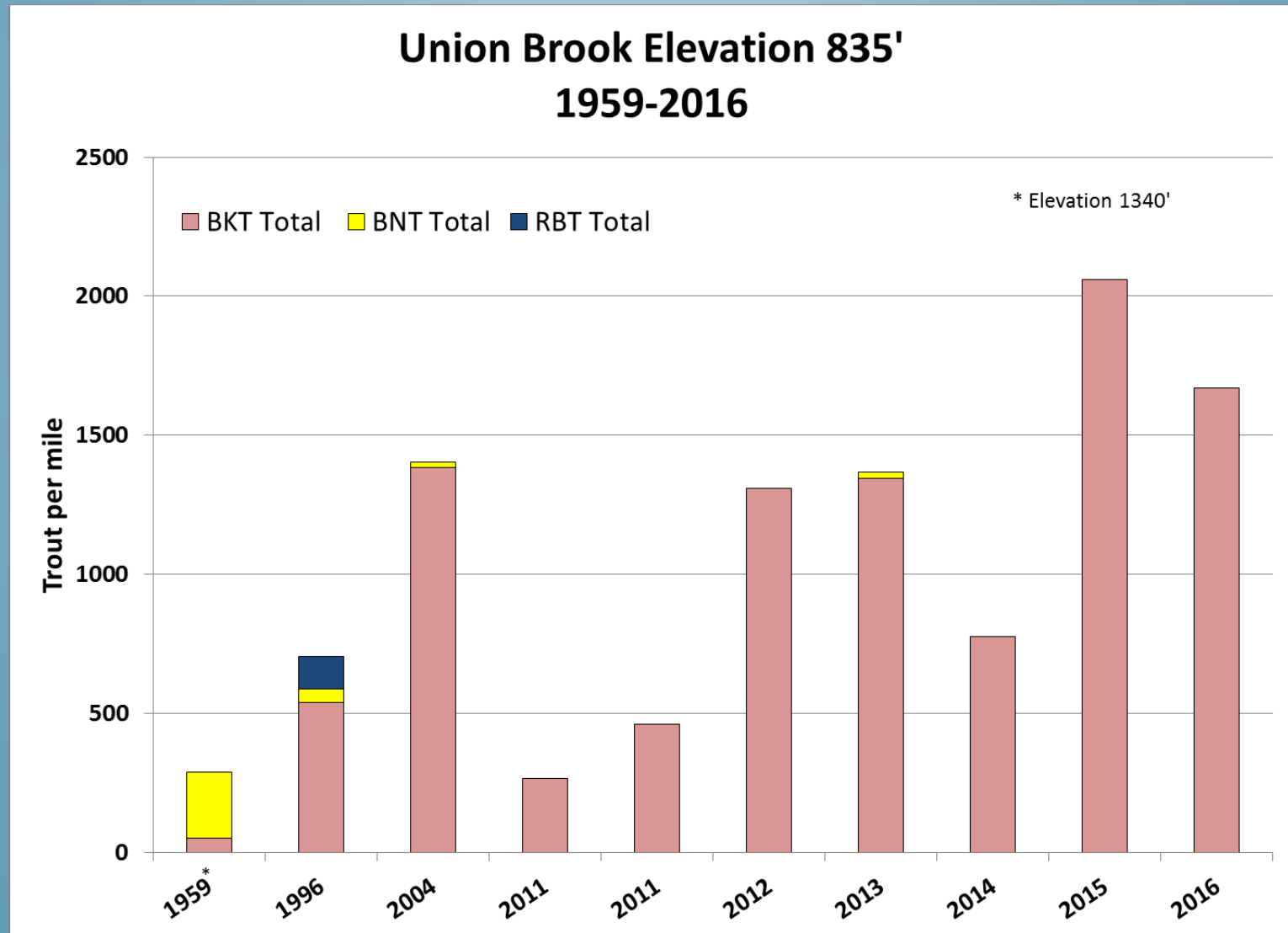
Ranch Brook Elevation 960' 1997-2017



EXAMPLES OF SYMPATRIC POPULATIONS

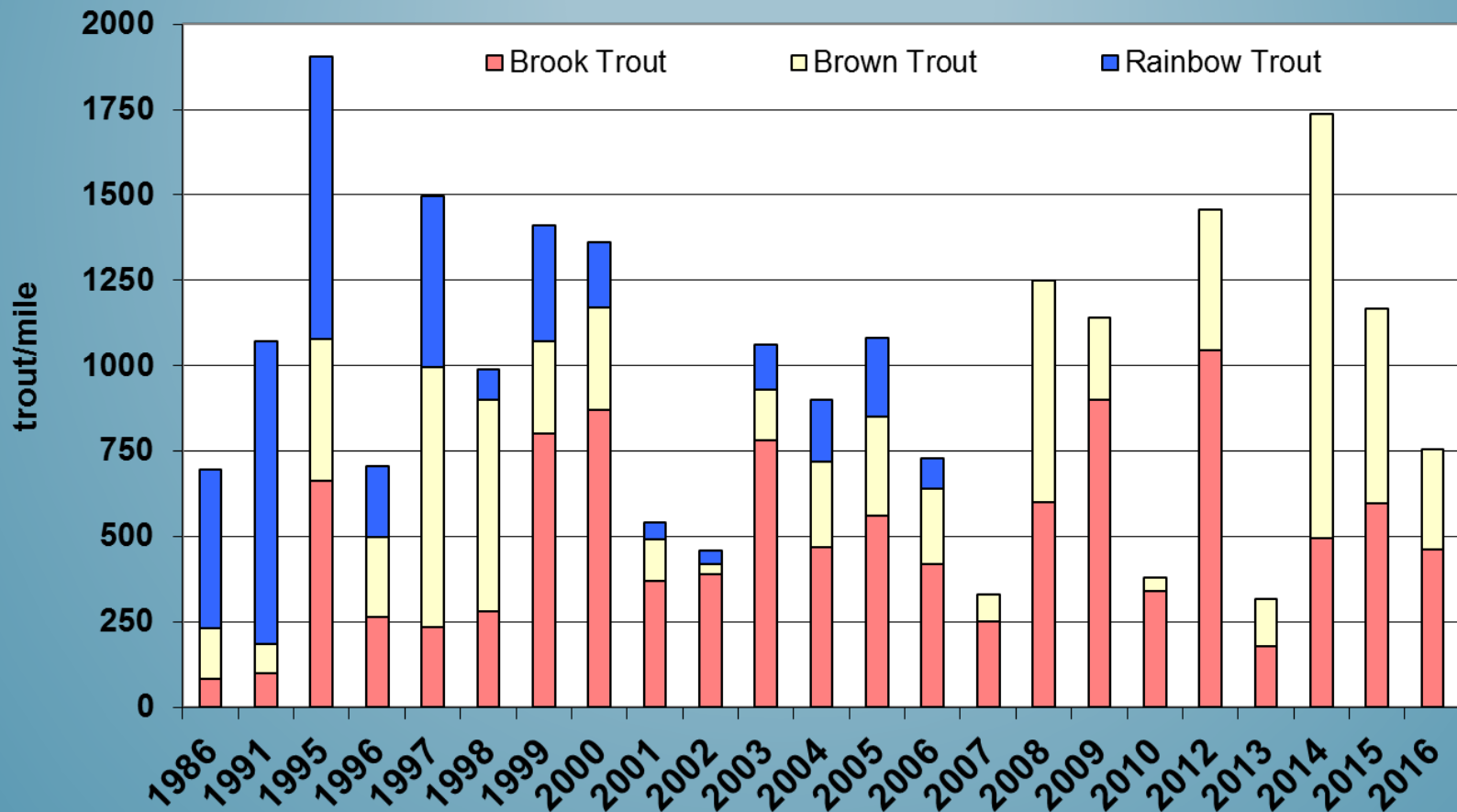


EXAMPLES OF SYMPATRIC POPULATIONS



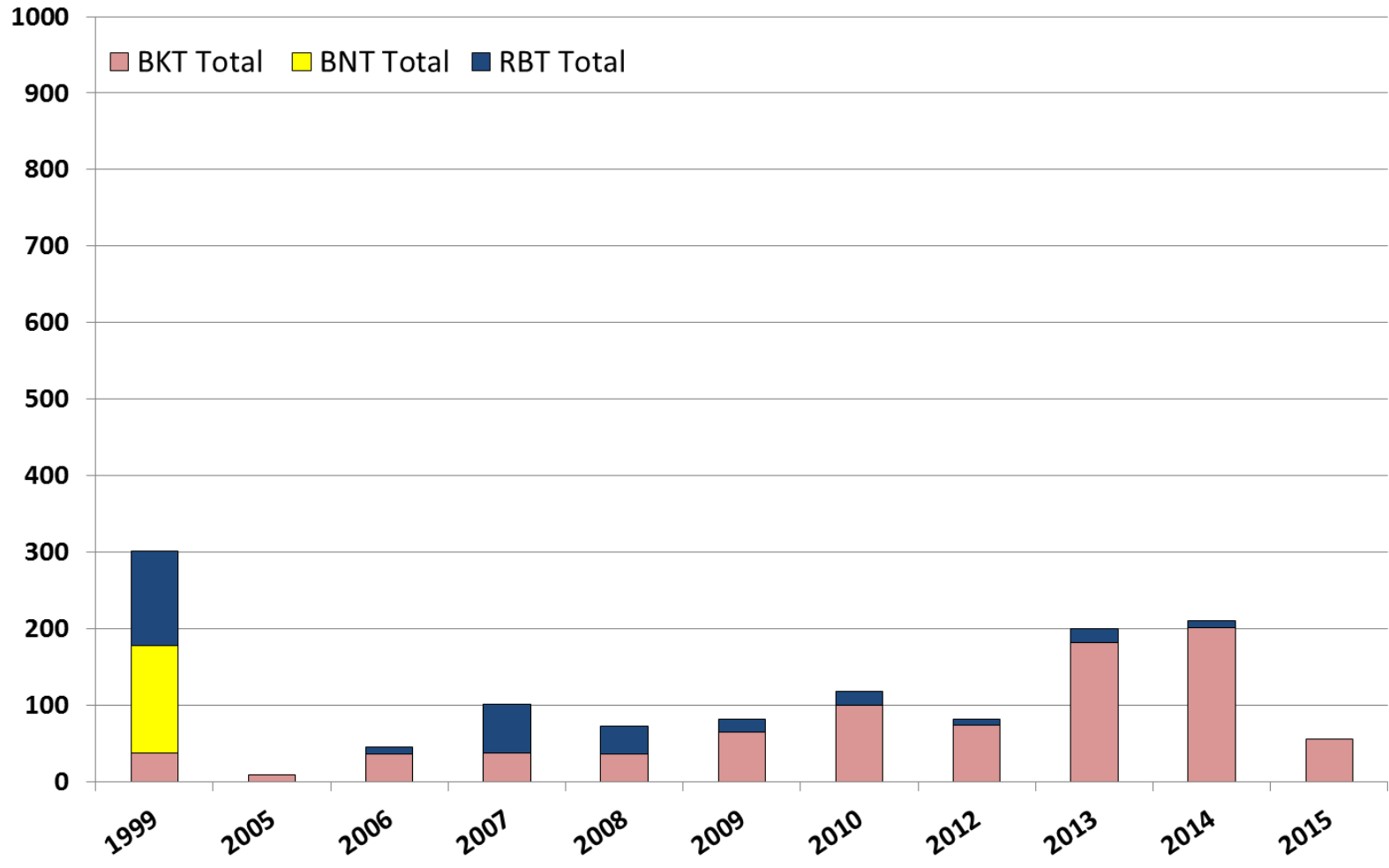
EXAMPLES OF SYMPATRIC POPULATIONS

Dog River - Elevation 805' 1986-2016



EXAMPLES OF SYMPATRIC POPULATIONS

Winooski River Elevation 784' 1999-2015



TROUT STOCKING RISKS

- *Most of VT wild trout resources are in streams & rivers;*
- *VFWD does not stock abundant wild trout waters;*
- *VT currently stocks ~8% of rivers & streams (100K scale);*
- *VT utilizes triploid (sterile) trout where genetic interactions with wild trout or population establishment are a concern;*
- *Overwinter survival of stocked trout in rivers and streams is very low.*
- *Many VT watersheds do not support non-native trout despite decades of stocking.*
- *Private Stocking – less control.*



SUMMARY

- *Wild allopatric brook trout populations, characterized by strong natural reproduction, multiple age classes including large sizes, are common in VT.*
- *Nonnative trout, although well established since initial introductions over 120 years ago, do not appear to be expanding their range; if anything population losses have been observed.*
- *Long-term persistence of robust wild brook trout populations have been observed to coexist with non-native trout.*
- *Habitat conditions, particularly temperature, appear to be the primary driver of brook trout distribution.*
- *Naturalized nonnative trout support popular recreational fisheries and are actively managed & protected by VFWD .*
- *VFWD stocking practices (avoidance/sterile trout) and poor overwinter survival further minimize threats to native stocks.*

SUMMARY

- *Presence of unnatural barriers (dams & culverts):*
 - *Degrades habitat & stream processes*
 - *Increases risks to native brook trout populations*
- *Structures have a finite lifespan and pose risk of catastrophic failure (& impacts) without intervention.*
- *Must consider if we would advocate for a new or replacement barrier.*

CONCLUSIONS

- *Must consider both risks and benefits to native trout & other species, as well as long-term impacts to aquatic habitat and stream processes when evaluating proactive barrier removal.*
- *While removal of man-made barriers may result in some risk to native trout, broader ecological and geomorphic benefits will usually outweigh these risks.*
- *Unless advocating to fund and implement maintenance of barrier structure, must also consider the impacts of gradual or catastrophic failure on aquatic habitat and populations.*

